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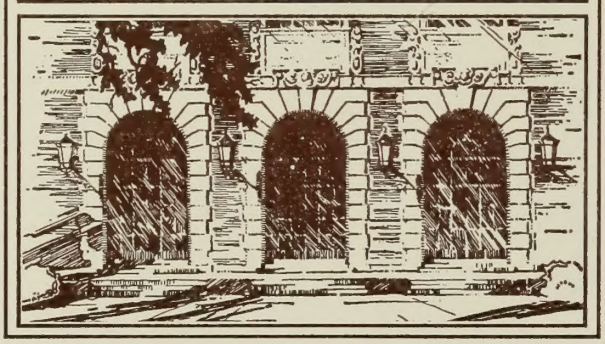

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 19
OCTOBER 1, 1972

W72-11089 --W72-11738

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 19
OCTOBER 1, 1972

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

THE VAPOR PRESSURE ISOTOPE EFFECT IN AQUEOUS SYSTEMS. I. H2O-D2O (-64 TO 100 DEG) AND H216O-H218O (-17 TO 16 DEG); ICE AND LIQUID. II. ALKALI METAL CHLORIDE SOLUTION IN H2O AND D2O (-5 TO 100 DEG),
Tennessee Univ., Knoxville. Dept. of Chemistry.
J. Pupezin, G. Jakli, G. Jancso, and W. A. Van Hook.
Journal of Physical Chemistry, Vol 76, No 5, p 743-762, 1972. 6 fig, 11 tab, 91 ref. OWRR-012-TENN (3).

Descriptors: *Vapor pressure, *Isotope studies, *Aqueous solutions, Heavy water, *Thermodynamic behavior.
Identifiers: *Vapor pressure isotope effect, Osmotic coefficients, Activity coefficients.

High precision data are reported over a broad temperature range for the vapor pressure isotope effects displayed by the systems H216O-H218O; H2O-D2O; H2O-D2O-NaCl (1.1, 2.9, 4.0, and 5.5 m); H2O-D2O-KCl (3.5 and 4.5 m); H2O-D2O-CsCl (1.0, 3.0, 4.5, and 6.0 m); and H2O-D2O-LiCl (3.0, 5.0, 7.0, and 15.0 m). Here m is the concentration in aquamolality. The results are summarized with analytical expressions reported in the text and are good to plus or minus 0.0003 ln R unit or better (R is the isotopic pressure ratio). The analytical expressions for the temperature dependence of the vapor pressure isotope effects reported are regarded as the best now available. For the salt solutions expressions for the change in the vapor pressure isotope effect as a function of concentration and temperature and expressions for the isotope effects on the excess thermodynamic properties of solution are extracted from the data (including isotope effects on the osmotic and the activity coefficients, and the excess free energies, enthalpies, entropies, and heat capacities of solution). The isotope effects on the standard thermodynamic properties of solution are also determined where possible (NaCl and KCl).
W72-11310

02. WATER CYCLE

2A. General

THE MOUTAIN SNOWPACK AS AN ENVIRONMENTAL INDICATOR,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 02C.
W72-11127

CATALOG OF INTERNATIONAL HYDROLOGICAL DECADE STATIONS AND NETWORKS IN THE UNITED STATES.
National Committee for the International Hydrological Decade, Washington, D. C.
For primary bibliographic entry see Field 07A.
W72-11280

MATHEMATICAL MODELLING IN HYDROLOGY,
Geological Survey, Fort Collins, Colo. Water Resources Div.
D. R. Dawdy, and G. I. Kalinin.
International Association of Scientific Hydrology Bulletin, Vol 16, No 4, p 25-35, December 1971. 133 ref.

Descriptors: *Mathematical models, *Systems analysis, *Simulation analysis, *Reviews, *Bibliographies, Stochastic processes, Statistical models, Parametric hydrology, Mathematical studies, Numerical analysis, Synthetic hydrology, International Hydrological Decade.

Achievements of theoretical and applied hydrology are closely related to the application of physical and mathematical analysis. Recent development of computation techniques and the construction of both analog and digital computers are important in the development of such branches of hydrology as hydrological forecasting, hydrological calculations, theory of water resources control, and mathematical processing of observation data. Determination of the branches of hydrology and the particular problems of each which can be most efficiently solved by the above methods, the principal directions of the development of physical and mathematical methods in hydrology, and experience in the methods of solving theoretical and applied problems in hydrology are reviewed. The most modern, powerful methods do not necessarily require the use of powerful computers. Rather, quite often an awareness of the mathematics available enables the hydrologist to choose that level of approximation necessary to solve his problem within the level of accuracy and cost determined by the resources available to him. These developments complement developments in other fields, such as the design and analysis of experimental results, proper collection of data, and problems of network design. The method of arriving at the solution of a particular problem may be more important than the particular mathematical tool used. This makes it even more necessary to be aware of mathematical advances in order to remain abreast of the powers which the latest methods present to the modern hydrologist for the solution of his problems. (Knapp-USGS)
W72-11292

CALCULATION OF EXPECTED VALUES OF OBSERVABLES IN SOME PROBLEMS OF STATISTICAL GEOMORPHOLOGY,
Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
A. K. Ghosh, and A. E. Scheidegger.
International Association of Scientific Hydrology Bulletin, Vol 16, No 4, p 57-61, December 1971. 1 tab, 8 ref.

Descriptors: *Statistical models, *Geomorphology, Parametric hydrology, Model studies, Topography, Drainage patterns (Geologic), Stochastic processes.
Identifiers: *Statistical geomorphology.

In statistical hydrology, three different methods have been used to calculate the expected values of observable quantities in an ensemble. The first is to use an observable as a parameter to characterize the states of the ensemble and then to calculate the average value of the observable over all possible states; this is the expected value. The second method is to use an observable as a parameter to characterize the states and then to designate the most probable value of the observable as the expected value; this is known as the minimum-variance principle. The third method is to use a parameter different from an observable to characterize the states and then to take the value of the observable for the most probable state as the expected value. Of all these different methods, only the first one is, in principle, physically correct. This study was designed to find the situations where methods other than the first can be used to calculate the expectation values of observables. This can be done only in those situations where all of the following conditions hold: the number of parameters used to characterize the states is finite; these parameters are either the same as the observables or are explicitly related to the observables; and each of the parameters has a symmetrical and unimodal probability distribution. The cases where the minimum variance principle is valid are thereby delineated. (Knapp-USGS)
W72-11294

SOME THOUGHTS ON ESTIMATING SPILLWAY DESIGN FLOOD,
Resources Research Centre, Ottawa (Ontario).
A. K. Biswas.
International Association of Scientific Hydrology Bulletin, Vol 16, No 4, p 63-72, December 1971. 5 tab, 44 ref.

Descriptors: *Flood forecasting, *Design flood, *Statistical methods, *Spillways, Design flow, Statistics, Peak discharge, Cost-benefit analysis, Rational formula.
Identifiers: *Spillway design flood.

There is no universally acceptable technique available to estimate the magnitude and frequency of floods. The rational method, empirical formulae and regional analysis all have restrictions. The remaining approaches are deterministic, using design precipitation maxima and probabilistic, the latter using streamflow data to calculate frequencies. The concepts of design maxima and the fitting of statistical distributions to flood frequencies are discussed in detail. A more logical cost/benefit approach is required for decision making in spillway design. (Knapp-USGS)
W72-11295

CONTROL OF THE DAILY WATER LEVEL DATA--TEST BY RELATING REDUCED LEVELS (CONTROLE DES COTES HYDROMETRIQUES JOURNALIERES--TEST DU RAPPORT DES COTES REDUITES),
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
F. Bultot, G. L. Dupriez, and J. Seyvert.
International Association of Scientific Hydrology Bulletin, Vol 16, No 4, p 73-82, December 1971. 2 fig, 4 tab.

Descriptors: *Water levels, *Stream gages, *Networks, *Calibrations, *Statistical methods, Streamflow, Statistics, Stage-discharge relations, Data collections, Data processing.
Identifiers: *Data quality control.

A statistical test reveals automatically any doubtful water levels in a data collection and detects sudden or gradual modifications of the streamflow. Each hydrometric station in a catchment area, homogeneous as to climatic conditions, is compared with a reference station. For this purpose ratios of the daily reduced water levels of the station under examination are compared to the corresponding levels of the reference station. The reduction of the daily water stages is achieved by a fictitious shift of the scale, so that the mean yearly water level is placed at a predetermined level (the same everywhere) and by a scale change to make the range delta (the difference between the largest and the smallest monthly water levels) equal to that of the reference station. The daily ratios of the reduced water levels are consequently approximately unity either with high or low water. When a daily ratio deviates too much from the mean monthly ratio, the corresponding water level is considered doubtful and must be verified. If the running mean monthly ratios do not remain approximately uniform but change, it is because the streamflow is disturbed and the reason for this disturbance must be investigated. The test, used in a converse way, can also be satisfactorily used for filling in gaps in the observational data. (Knapp-USGS)
W72-11296

AUTOMATIC DETECTION OF WATER-BORNE FLUORESCENT TRACERS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 07B.
W72-11297

THE GROUNDWATER FLOW SYSTEM IN THE DELMARVA PENINSULA,
Delaware Univ., Newark. Water Resources Center.
J. R. Mather, and R. D. Varrin.
Available from the National Technical Information Service as PB-210 810, $3.00 in paper copy, $0.95 in microfiche. Delaware Water Resources

Center Research Project Technical Completion Report, January 1972. 18 p. A-004-DEL (5).

Descriptors: *Water balance, Small watersheds, Hydrologic data, *Climatic data, *Analog models, *Groundwater movement, Aquifer management, Saline water intrusion, Aquifer systems, *Geologic formations, Subsurface mapping.
Identifiers: Delmarva peninsula.

Evaluation of many years of monthly and daily climatic water balances at locations on the Delmarva peninsula has provided basic data on the time and space variations of different climatic and hydrologic factors. This information has been utilized in various studies involving evapotranspiration, runoff, and soil moisture storage and as input data for analog models. Detailed topoclimatic analyses of several small watersheds have shown the relation among climate, soils, vegetation, topography, and hydrologic factors. Such studies must form the basis for multi-choice decision-making in the planning and management of water resources. Groundwater analog models, a vertical and a horizontal viscous flow and two electric R-C networks, were used to analyze specific flow problems in the Delmarva peninsula. These included flow in multiaquifer wells, multiple well hydraulics, salt-water encroachment and optimum pumping of aquifers. The results are being utilized in the proper allocation of the groundwater resources. A geologic cross section of the Delmarva peninsula showing stratigraphic correlation and aquifer distribution has been published.
W72-11309

A GEOGRAPHIC ANALYSIS OF HYDROLOGIC RESPONSE IN THE SOUTHEASTERN UNITED STATES,
Franklin Coll. of Arts and Sciences, Athens, Ga. School of Forest Resources.
J. F. Woodruff, and J. D. Hewlett.
Available from the National Technical Information Service as PB-210 945, $3.00 in paper copy, $0.95 in microfiche. Completion report 1972, 59 p., 8 fig, 8 tab, 11 ref. OWRR A-018-GA (1).

Descriptors: *Hydrologic properties, *Storm runoff, *Precipitation, *Land use, *Soil physical properties, Geomorphology, Basins, Porosity, Permeability, Runoff, Hydrographs, Storage, Southeast U.S.

Relationships between hydrologic response, storm discharge volumes and the physical and land use properties of 21 small watersheds in the eastern United States were analyzed by multiple regression. The best correlations achieved were with the log of discharge of the 20 largest storm flows, storm precipitation, area in uplands, area in urban land use in valley bottoms and a soil factor. Analyses using these parameters explained 74 percent of the variation in storm flow for 11 basins in the same climatic region. The principal effect of geomorphic basin factors is on peak flows rather than volumes. The basin is adjusted in its physical attributes to the larger storm events. The study suggests that failure to identify definitely any single basin attribute or set of parameters controlling storm discharges may indicate that basin morphology and land use have an inconsequential affect upon discharge; that the study failed to isolate and measure the significant basin characteristics; that basin form and land use do have an affect upon the storm discharge characteristics but that the combination is peculiar to each basin; and that no single or set of attributes is significant for all basins. The latter is supported by the fact that no valid universal prediction equation could be written but that significant levels of prediction were achieved for limited areas and storm situations. (Conway-Georgia Tech)
W72-11312

A COMPUTER MODEL OF THE TIDAL PHENOMENA IN COOK INLET, ALASKA,
Alaska Univ., Fairbanks, Inst. of Water Resources.
For primary bibliographic entry see Field 02L.
W72-11355

WATER TABLE INVESTIGATION IN THE MESILLA VALLEY,
New Mexico State University. University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W72-11387

2B. Precipitation

THE MOUTAIN SNOWPACK AS AN ENVIRONMENTAL INDICATOR,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 02C.
W72-11127

SNOWPACK ACCUMULATION IN RELATION TO TERRAIN AND METEOROLOGICAL FACTORS IN SOUTHWESTERN MONTANA,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 02C.
W72-11128

METEOROLOGICAL DATA, 1950-1970,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
For primary bibliographic entry see Field 07C.
W72-11281

REPORT ON PRECIPITATION,
Institute of Hydrology, Wallingford (England).
J. C. Rodda.
International Association of Scientific Hydrology Bulletin, Vol 16, No 4, p 37-47, December 1971. 140 ref.

Descriptors: *Rain gages, *Networks, *Calibrations, *Reviews, *Bibliographies, International Hydrological Decade, Precipitation gages, Precipitation (Atmospheric), Rainfall, Gaging stations.

National IHD programs include studies of precipitation, measurement, network design, frequency of intense rainfall, and assessment of probable maximum precipitation. Outside the IHD, work on precipitation is being carried out in a variety of disciplines: ecologists are studying the nutrient supply in rain, the occurrence of heavy rain, hail and its suppression, and how precipitation interferes with the propagation of microwaves. Subjects that are considered most central to hydrology are reviewed. Although precipitation measurement has a long history and a voluminous literature, awareness of the significance of the conventional type of instrument's shortcomings has grown only during recent years. It is now being recognized that measurements of precipitation, particularly rainfall, are neither reliable nor accurate and that hydrologists have been misled in assuming that they are. None of the other networks of hydrological instruments can match those employed for assessing the distribution of precipitation in terms of number of gages and length of records. No other records are used so extensively, not only in hydrology but also in allied fields. No other records are as readily accepted as being correct when in fact they are not. Some of the topics that continue to demand the attention of research workers are: measurement at a point, networks, areal relations, and space time analyses. (Knapp-USGS)
W72-11293

MEASUREMENT OF PRECIPITATION IN THE CHIRCHIK-KELES INTERFLUVE (K VOPROSU O VYCHISLENII OSADKOV V CHIRCHIK-KELESSKOM MEZHDURECH'YE),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
S. I. Doronina.
In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 42-52, 1970. 2 fig, 8 tab, 6 ref.

Descriptors: *Precipitation (Atmospheric), *Precipitation gages, *Measurement, *Interfluves, Water year, Water balance, Wetting, Winds, Wind velocity, Evaporation, Moisture deficit, Seasonal, Topography, Elevation, Equations.
Identifiers: USSR, *Soviet Central Asia, Tretyakov precipitation gages, Isohyetal lines.

Calculation of precipitation totals in the 2,395-sq-km area between the Chirchik and Keles Rivers in northern Soviet Central Asia for three consecutive water years (October 1, 1962 to September 30, 1965) was based on data of 27 meteorological stations ranging in elevation from 203 m to 1,154 m. Inaccuracy of Tretyakov precipitation gages requires corrections to obtain true precipitation totals for all stations in the area. The average correction applied to measured values for these water years was 15.4%, which included 5.8% for wetting, 7.4% for wind, and 2.2% for evaporation. Total precipitation in the interfluve for the 1962-63 water year was 469 mm and for the 1963-64 and 1964-65 water years--506 mm and 262 mm, respectively. (Josefson-USGS)
W72-11454

ODROP--OKLAHOMA DROUGHT RELIEF OPERATIONAL PROGRAM,
Weather Science, Inc., Norman, Okla.
For primary bibliographic entry see Field 03B.
W72-11657

STORM RAINFALL VARIABILITY OVER CONNECTICUT,
The Center for the Environment and Man, Inc., Hartford, Conn.
J. W. Wilson, and M. A. Atwater.
Journal of Geophysical Research, Vol 77, No 21, p 3950-3956, July 20, 1972. 5 fig, 20 ref.

Descriptors: *Rainfall, *Precipitation (Atmospheric), *Variability, *Connecticut, Topography, Networks, Rain gages, Data collections, Distribution patterns, Meteorological data, Meteorology, Climatology.
Identifiers: *Rainfall variability.

Storm rainfall variability over Connecticut was investigated by using data from the 66 cooperative rain gages of the National Weather Service supplemented by 70 volunteer stations. The analysis concentrated on large-scale stratiform type rainstorms. Much of the observed rainfall variability within storms can best be explained by variations in terrain. A minimum in rainfall generally occurs in the Connecticut River valley and along the coastal plain and a maximum on the windward side of the hills. The wind direction at hilltip level is an important factor in explaining differences in the rainfall pattern between storms. More upper-air stations and more frequent soundings would be needed to assess the importance of other atmospheric variables in influencing the effectiveness of topography as a modifier of precipitation patterns. The results emphasize the importance of topography, even in regions with small elevation differences, when attempts are being made to evaluate man's planned or inadvertent modification of precipitation. (Knapp-USGS)
W72-11668

2C. Snow, Ice, and Frost

FORMATION AND DISTRIBUTION OF MAGNESIUM BICARBONATE WATERS IN MESOZOIC BASINS OF EASTERN TRANSBAYKAL (NEKOTORYYE VOPROSY RASPROSTRANENIYA I FORMIROVANIYA GIDROKARBONATNYKH MAGNIYEVYKH VOD V MEZOZOYSKIKH VPADINAKH VOSTOCHNOGO ZABAYKAL'Y A),
Irkutskii Gosudarstvennyi Universitet (USSR).

For primary bibliographic entry see Field 02K.
W72-11117

THE MOUTAIN SNOWPACK AS AN ENVIRONMENTAL INDICATOR,
Montana State Univ., Bozeman.
A. B. Super.
Available from NTIS-Springfield, Va, 22151 as AD-735 696 $3.00 paper copy; $0.95 microfiche. Montana State University Final Contract Report, September 1971. 17 p, 3 ref. DAHC 04-67-C-0058.

Descriptors: *Snowpacks, *Mountains, *Montana, *Snow surveys, *Meteorological data, Topography, Remote sensing, Temperature, Snow cover, Depth, Water equivalent, Winds, Elevations, Slopes, Climates.
Identifiers: *Mountain snowpacks (Mont).

A study was made concerning the interrelationships existing between the seasonal mountain snowpack and climate and terrain. The field investigations were carried out in the mountains of southwestern Montana over four winter seasons. Most studies were conducted in the Bridger Mountain Range near Bozeman, Montana. The investigation included three main areas: (1) Snowpack accumulation as related to terrain and meteorological factors, (2) remote sensing of snow surface temperature by infrared radiometry, and (3) study of some of the physical properties of the seasonal mountain snowpack through snowpit sampling. An abstract and summary and conclusion of the investigation into each area are included. (See W72-11128 thru W72-11130) (Woodard-USGS)
W72-11127

SNOWPACK ACCUMULATION IN RELATION TO TERRAIN AND METEOROLOGICAL FACTORS IN SOUTHWESTERN MONTANA,
Montana State Univ., Bozeman.
J. T. McPartland, A. B. Super, and V. L. Mitchell.
In: The Mountain Snowpack as an Environmental Indicator; Montana State University Final Contract Report, p 2-8, September 1971. DAHC 04-C-0058.

Descriptors: *Snowpacks, *Mountains, Montana, *Meteorlogical data, Topography, Elevation, Slopes, Snow surveys, Depth, Snow cover, Water equivalent, Winds, Climates.
Identifiers: *Mountain snowpack accumulation.

The relationships between mountain snowpack accumulation and terrain and meteorological parameters were investigated in three separate mountain areas in southwestern Montana. Elevation, aspect, slope, geographic location and degree of potential windiness were used as terrain/meteorological parameters in the data analysis. Snowpack variables measured were snow depth and water equivalent. A very high simple linear correlation consistently existed between the snow depth and water equivalent. Statistical treatment of the data included simple correlation and multiple linear regression analyses, and principal component analysis. In the Bangtail area of the Bridger Range, elevation was the most important variable in explaining variance in snowpack depth. The potential windiness parameters were second in importance in explaining the depth variance. Aspect, slope, and location parameters were not effective in explaining the variance in snowpack depth. Variations in snowpack depth at the Carrot Basin area of the Madison Range and the Cooke City area of the Beartooth Range were explained by the elevation parameter. (See also W72-11127) (Woodard-USGS)
W72-11128

INFRARED TEMPERATURE SENSING OF SNOW-COVERED TERRAIN,
Montana State Univ., Bozeman.
B. A. Shafer, and A. B. Super.
In: The Mountain Snowpack as an Environmental Indicator; Montana State University Final Contract Report, p 9-12, September 1971. DAHCO4-67-C-0058.

Descriptors: *Snow cover, *Temperature, *Remote sensing, *Infrared radiation, *Thermal radiation, Snowpacks, Thermal properties, Thermometers, Analytical techniques, Aircraft, Cold regions.

The feasibility of remotely monitoring snow surface temperatures was investigated with a Barnes IT-3 infrared thermometer. The emissivity of various snow surface types was measured using an apparatus called an emissivity box. An average emissivity for freshly fallen snow was 0.975. The average emissivity for snow surfaces crusted by the effects of wind or melt phenomenon was 0.985. The mean emissivity for all snow surface types examined was 0.978. These high emissivity values substantiate the hypothesis that snow possesses characteristics in the 8 to 14 micron spectral interval. An analysis of errors in radiometrically obtained snow surface temperatures revealed that the IT-3 is capable of accurately measuring the true surface temperature to within 2 deg Celsius for the temperature range experienced. Inversions in snow covered mountain valleys were successfully mapped during airborne case studies. Tops of inversions were located by measuring the snow surface temperature variation with elevation and noting the intersection of the inversion top with the mountain slope. Remote radiometric temperature sensing of snow surfaces appears to offer a potentially useful tool for monitoring surface temperature gradients in arctic environments. (See also W72-11127) (Woodard-USGS)
W72-11129

PHYSICAL INVESTIGATIONS OF THE SEASONAL MOUNTAIN SNOWPACK: BRIDGER RANGE, MONTANA,
Montana State Univ., Bozeman.
A. B. Super, J. T. McPartland, and V. L. Mitchell.
In: The Mountain Snowpack as an Environmental Indicator, Montana State University Final Contract Report, p 13-15, September 1971. DAHCO4-67-C-0058.

Descriptors: *Snowpacks, *Physical properties, *Mountains, *Montana, Data collections, Analytical techniques, Depth, Density, Age, Temperature.
Identifiers: *Bridger Mountain Range (Mont), Grain size, Ram resistance, Shear vane strength, Air permeability.

Information on several mountain snowpack parameters was obtained from a number of snowpits dug in the Bridger Mountains of southwestern Montana. The data were collected during three winters from three separate sites. The primary parameters studied included depth, density, age, grain size, ram resistance, shear vane strength, temperature, and air permeability. Statistical analyses were made to determine how the snowpack parameters were related. Snow density was strongly related to the overburden pressure or load of the overlying snowpack and to the age of the snowpack. The relationship with age apparently resulted from the rate of loading, being approximately a linear function of time. Ram resistance was strongly related to density and shear vane strength. Air permeability correlated significantly with depth, age, grain size, and shear vane strength, but the individual relationships were relatively weak. (See also W72-11127) (Woodard-USGS)
W72-11130

JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-11131

A SYSTEM TO COMBINE STRATIGRAPHIC AND ANNUAL MASS-BALANCE SYSTEMS: A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,
Geological Survey, Fairbanks, Alaska.
L. R. Mayo, M. F. Meier, and W. V. Tangborn.
Journal of Glaciology, Vol 11, No 61, p 3-14, 1972. 4 fig, 2 tab, 5 ref.

Descriptors: *Glaciology, *Ice, *Mass, *Firn, *Meteorology, Meteorological data, Mathematical studies, Snow, Compaction, Density, Glaciers, Analytical techniques, Ablation, Summer, Surfaces, Stratification.
Identifiers: *Mass-balance systems.

Mass-balance quantities at specific points on a glacier relate either to annual maxima or minima in ice mass at that point (the stratigraphic system), or to values at the beginning and end of a hydrologic year (the annual or fixed-date system). Most quantities measured in the field relate to summer surfaces, which correspond to the annual minima at the measurement points. When stratigraphic system point values are integrated over a whole glacier, the result may be meaningless because annual maxima and minima and summer surfaces may form at different times at different places. The combined system utilizes several kinds of data to derive meaningful area-average results that can be directly related to other hydrologic and meteorologic information. Measurements to summer surfaces at certain specific times, including the beginning and end of a hydrologic year, are added together with proper recognition of the types of material involved: old firn and ice, snow and superimposed ice of the year under study, new firn formed during that year, and late snow deposited toward the end of the year. Other balance increment terms relate values at the beginning and end of a hydrologic year to corresponding area-average balance minima. As a result, two types of net balance and many other terms are given precise meaning for a glacier as a whole. (Woodard-USGS)
W72-11298

SNOWMELT CONTROL ON BELORUSSIAN ERODED LOAMY SOD PODZOLIC SOILS,
For primary bibliographic entry see Field 04D.
W72-11345

THE ROLE OF THE GROWTH OF PHYTOPLANKTON UNDER ICE IN PRODUCING ORGANIC MATTER IN LAKE BAIKAL,
For primary bibliographic entry see Field 05C.
W72-11409

GLACIER DAMMED LAKES AND OUTBURST FLOODS IN ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11445

WINTER CLIMATOLOGY AND ICE CHARACTERISTICS: ST. MARYS RIVER-WHITEFISH BAY WATERWAY,
United States Lake Survey, Detroit, Mich.
A. J. Brazel.
Available from NTIS, Springfield, Va 22151 as AD-733 958, $3.00 in paper copy, $0.95 in microfiche. National Oceanic and Atmospheric Agency Technical Memorandum NOS LSCR 3, September 1971. 29 p, 5 tab, 32 ref, 2 append.

Descriptors: *Iced lakes, *Ice cover, *De-icers, *Lake Superior, *Climatology, Rivers, Channels, Solar radiation, Winds, Air temperature, Data collections, Navigation.
Identifiers: *St. Marys River Waterway, *Whitefish Bay (Mich).

On a regional basis the thermal behavior of Lake Superior and its interaction with the atmosphere in late fall and early winter promote widely varying

temperature and snowfall patterns around the lake periphery. Snowaice layers make up a large portion of the total ice thickness around the lake and on the St. Marys River Waterway. Field observations of radiation, temperature, wind, ice thickness, and structure indicate a close relation between climatic parameters and ice growth and decay. De-icing schemes, particularly dusting with darkened materials, must account for climatic factors to be successfully implemented. There is a probability of successful de-icing on St. Marys River by correlating the dusting with solar radiation and air temperature data. (Woodard-USGS)
W72-11447

DAILY VARIATIONS IN SNOW DENSITY AS A POSSIBLE SOURCE OF ERROR IN CALCULATING WATER CONTENT OF SNOW IN MOUNTAINS (VNUTRISUTOCHNYYE IZMENENIYA PLOTNOSTI SNEGA KAK VOZMOZHNYY ISTOCHNIK OSHIBOK PRI RASCHETAKH SNEGOZA PASOV V GORAKH),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
G. Ye. Glazyrin.
In: Gornaya Gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 37-41, 1970. 1 fig, 6 ref.

Descriptors: *Orography, *Mountains, *Snow cover, *Snowpacks, *Density stratification, Snowmelt, Air temperature, Precipitation (Atmospheric), Variability.
Identifiers: USSR, *Uzbek SSR, *Snow density.

Daily variations in snow density at the 'Dukant' course in the Uzbek SSR in March 1968 and March-April 1969 were investigated as a possible source of error in determining water content of snow in mountains. Three causes are given for these variations: (1) addition of precipitation to snowpack; (2) irregular daily rates of snowmelt; and (3) compaction of snow under effect of gravity. Regardless of causes, the range of daily fluctuations of snow density generally decreases with increases in snow depth and water content. (See also W72-11450) (Josefson-USGS)
W72-11453

ELECTRICAL PROPERTIES OF ICE--ANNUAL REPORT FOR THE PERIOD NOVEMBER 1970 TO OCTOBER 1971,
New Mexico Inst. of Mining and Technology, Socorro.
G. W. Gross, and C. McKee.
Available from NTIS, Springfield, Va. 22151 as AD-738 193; Price $3.00 paper copy; $0.95 microfiche. New Mexico Institute of Mining and Technology Annual Contract Report, January 1972. 43 p, 10 fig, 2 tab, 24 ref, append. Project No. NR 082-094/9-29-70 (412), ONR-N 00014-67-A-0267-0005.

Descriptors: *Electrochemistry, *Freezing, *Ice-water interfaces, Laboratory tests, Ion exchange, Chemical reactions, Electrolytes, Clouds, Analytical techniques, Laboratory equipment.
Identifiers: Freezing potentials, Electrochemical charge separation, Ice-water solute partitioning.

Electrochemical charge separation in freezing water (Workman-Reynolds effect) is modified in the presence of multiple solute species. This interference may either increase or decrease the charge separation. One important type of interference alters the solution pH. Depending on the type of solute, a moderate increase of pH above 7 or a moderate decrease below 7 may result in maximum charge separation effects, and conversely, in their suppression. Another type of interference causes a reversal of the freezing-potential sign as a function of concentration (of the interfering species) or of concentration and time. This effect probably operates through the solute partition coefficients. The most important interference effects studied thus far involve ammonia, carbon dioxide, and possible silica. Interference effects cannot always be separated from concentration effects. Certain interference processes broaden the concentration range in which appreciable charge separation may occur for a given solute. (Woodard-USGS)
W72-11471

POSTGLACIAL LAHARS FROM MOUNT RAINIER VOLCANO, WASHINGTON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W72-11473

SNOW COVER AT THE TIMBERLINE AND ITS EFFECT ON TREE VEGETATION,
S. G. Shiyatov.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 69. 141-157. 1969.
Identifiers: Density, Forests, *Larch-G, Plants, Siberia, *Snow cover, Thaw, *Timberline, Trees, USSR, Vegetation.

Investigations were conducted on the eastern slope of the Polar Urals (the Sob' River basin). A profile of 820 x 20 m was established and mapped through the timberline formed by Siberian larch. In addition, 30 sample plots were also established. The following were studied: thickness of the snow cover, its structure, snow density, snow thaw rate, etc., in relation to topography and vegetation, and the effect of snow cover on vegetation (injuries to plants, their phenological development). The insular nature of larch open forest is due to the fact that on the open plots, snow cover attains a thickness of 4-5 m or more and thaws slowly. Minimum thickness of snow cover for larch in the open forest on the timberline is 40-50 cm, optimal is 1-2 m. Old trees and undergrowth at an age of 20-30 yr can grow on plots with a thick snow cover, since the trees start growing before the snow has melted, while for the undergrowth a short growing season is sufficient. Larch at the age of 30-80 years suffers particularly on plots with a thick snow cover. Forest belts in the forest tundra should be wind-pervious and oriented against the dominant winds. In order to help regeneration, snow retention is recommended for 5-10 yr. By regulating the thickness of the snow cover the terminal shoots of the undergrowth may be protected from snow corrosion in snowstorms.--Copyright 1972, Biological Abstracts, Inc.
W72-11639

THE MEASUREMENT OF CONDUCTIVITY AND TEMPERATURE IN THE SEA FOR SALINITY DETERMINATION,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 07B.
W72-11669

THE MEASUREMENT OF SNOW DEPTH AND DENSITY USING A SHORT PULSE RADAR SYSTEM,
Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
R. S. Vickers.
Available from NTIS, Springfield, Va 22151 as PB-206 685, Price: $3.00 paper copy; 95 cents microfiche. Report REC-14-06-D-7159-1, December 1971. 30 p, 12 fig, 2 tab, 10 ref.

Descriptors: *Remote sensing, *Snowpacks, *Radar, *Snow surveys, Density stratification, Water equivalent, Snow cover, Water yield, Electromagnetic waves, Instrumentation.

Progress in the measurement of the thickness and water content of snow and ice layers from a remote location is reviewed. Several radar techniques have been applied to the problem with varying degrees of success. A short pulse radar system is described. It measures the thickness and water equivalent of snow and ice layers. Representative data from field tests of the system are included. Snow density and thickness can be measured to better than 10% accuracy. The limitations and future potential of the system in an airborne application are discussed. Discontinuities in density can be detected and their location can be determined by inspection of the radar returns. The potential of the radar to evolve into an airborne, operational system is considered good, even with the constraint of using standard commercial components. (Knapp-USGS)
W72-11671

2D. Evaporation and Transpiration

EFFECT OF GROUNDWATER TABLES ON THE WATER--SALT REGIME OF SOILS AND THEIR EVAPORATION CAPACITY IN THE VOLGA-AKHTUBA FLOODPLAIN,
For primary bibliographic entry see Field 03C.
W72-11346

BOUNDARY LAYER RESISTANCE AND TEMPERATURE DISTRIBUTION ON STILL AND FLAPPING LEAVES: I. THEORY AND LABORATORY EXPERIMENTS,
Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
J. Y. Parlange, P. E. Waggoner, and G. H. Heichel.
Plant Physiol. Vol 48, No 4, p 437-442. 1971. Illus.
Identifiers: Boundary layers, Distribution, Flapping, Laboratory, *Leaves, *Resistance, Still, *Temperature, Theory, Velocity, Wind.

If the evaporation is uniform on a flat exposed leaf, forced convection will also be nearly uniform, and the leaf temperature will vary with the square root of the distance from the leading edge. Then the resistance expressed in terms of the proper, i.e., average, temperature has the same value as the resistance of a leaf at uniform temperature. Compared to a steady laminar flow, the turbulence of a realistic wind decreases the resistance by a constant factor of about 2.5. The same constant factor was observed whether the leaf was flapping or not, when the wind velocity was not too low.--Copyright 1972, Biological Abstracts, Inc.
W72-11435

THE EFFECT OF DIFFERENT MINERAL FERTILIZER PROPORTIONS ON THE WATER REGIME OF SOME TREE SPECIES,
N. H. Babajev.
Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior. Vol 8, p 94-105. 1968.
Identifiers: *Fertilizers, Fraxinus-pennsylvanica D, Dry matter, Minerals, Photosynthesis, Pinus eldarica G, Proportions, Robinia pseudacacia D, Species, Transpiration, Trees, *Water balance.

With the application of N90P90 in Robinia pseudacacia and of N120P60/ha in Fraxinus pennsylvanica and Pinus eldarica stands, the daily and seasonal transpiration increased. Application of various doses and proportions of NPK positively influenced the accumulation of water in leaves, intensified the mechanism of stomatal behavior, the course of photosynthesis and the accumulation of dry matter.--Copyright 1972, Biological Abstracts, Inc.
W72-11436

TOTAL EVAPORATION DURING LEACHING OF SALINE SOIL (SUMMARNOYE ISPARENIYE PRI PROMYVKAKH ZASOLENNYKH ZEMEL'),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
S. I. Vanichkina.

In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 53-62, 1970. 2 fig, 2 tab, 12 ref.

Descriptors: *Evaporation, *Measurement, *Leaching, *Drainage, *Saline soils, Salinity, Water loss, Water balance, Heat balance, Heat transfer, Radiation, Border irrigation, Groundwater, Evaporation pans, Equations.
Identifiers: USSR, *Tadzhikistan, *Solonchaks, Soil monoliths.

The effectiveness of horizontal drainage during leaching of saline soil was investigated in 1964-66 by the Moscow Water Reclamation Institute on a water-balance plot in the Kanibadam Rayon of Tadzhikistan. Soils of the region are Meadow-Sierozem Solonchaks with a chloride-sulfate salinity. To measure evaporation from the surface during leaching, heat-transfer equations and GGI-500-50 evaporation pans designed by the Leningrad State Hydrologic Institute were used. An empirical equation was developed to estimate evaporation from leached saline soil after removal of water from fields, using the radiation budget expressed in cal/day/sq cm as a parameter. (See also W72-11450) (Josefson-USGS)
W72-11455

DETERMINATION OF EVAPORATION FROM FREE-WATER SURFACES DURING LEACHING OF SALINE SOIL (RASCHET ISPARENIYA S VODNOY POVERKHNOSTI PRI PROMYVKAKH ZASOLENNYKH ZEMEL'),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
S. I. Vanichkina.
In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 63-70, 1970. 3 tab, 3 ref.

Descriptors: *Evaporation, *Measurement, *Leaching, *Saline soils, Heat balance, Heat transfer, Radiation, Albedo, Water loss, Water temperature, Border irrigation, Seasonal, Winter, Summer.
Identifiers: USSR, *Tadzhikistan, Heat exchange.

Observations of evaporation from free-water surfaces during leaching of strongly saline, fine-textured soil at a water-balance plot in the Kanibadam Rayon of Tadzhikistan in June-November 1964, June 1965, and March-April 1968 were compared with data obtained under standard conditions at a site 70 km to the west. In winter, evaporation at the border and at the site was practically the same and amounted to 30-35 mm/month in December-January and 37-38 mm/month in February. In summer, evaporation measurements under leaching conditions were excessive. Conversion factors based on heat balances were computed for relating evaporation at the site to that at the border. Application of conversion factors to evaporation values obtained under standard conditions is the most convenient method of obtaining evaporation data at flooded plots. (See also W72-11450) (Josefson-USGS)
W72-11456

ACCURACY OF MEASURING EVAPORATION FROM SOIL SURFACES USING SMALL EVAPORATION PANS (O TOCHNOSTI NABLYUDENIY ZA ISPARENIYEM S POVERKHNOSTI POCHVY PO MIKROISPARITELYAM),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Yu. N. Ivanov.
In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 71-76, 1970. 2 fig, 1 tab, 3 ref.

Descriptors: *Evaporation, *Evapotranspiration, *Evaporation pans, *Measurement, Analysis, Diurnal, Drying, Cotton, Probability.
Identifiers: USSR, *Uzbek SSR, Tashkent Oblast, Soil monoliths.

Investigations were conducted in a cotton field in the Yangiyul' Rayon of Tashkent Oblast (Uzbek SSR) in June-August 1968 to determine the accuracy of pan measurements of evaporation from soil surfaces during daylight hours. Area of the evaporating surface of the pan is 50 sq cm; pan depth is 10 cm; and volume of the soil block in the pan is 500 cu cm. The average difference in daytime evaporation values for the different pans is 12.7%. To measure daytime changes in evaporation from soils, the soilblock can be replaced twice a day. Daytime evaporation results obtained from installation of 3 to 4 of these pans are within plus or minus 10% of the true values. Replaceable soil-block equipment gives results 1-2% higher than pans containing undisturbed soil samples. (See also W72-11450) (Josefson-USGS)
W72-11457

PHOTOSYNTHESIS--POLICIES AND PROGRAMS FOR GREAT POTENTIALS, BEGINNING STAGES FOR EFFECTIVE WATER MANAGEMENT,
Utah Univ., Salt Lake City, Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-11594

WATER CONSUMPTION BY PLANTS,
Universidad Nacional de Colombia, Palmira. Facultad de Agronomia.
M. Crillo-F.
Acta Agron (Palmira). Vol 21, No 2, p 87-91. 1971.
Identifiers: *Consumptive use, Energy balance, Plants, Soils, Solar, *Transpiration, *Evapotranspiration.

Water consumption by plants (transpiration-evapotranspiration) is primarily controlled by solar energy, but modified by the plant, soil and atmospheric factors that control the absorption and distribution of energy at the evaporating surface (leaves, soil surface, etc.). Plants' moisture content makes up only a small portion (1%) of the total water consumed or used (transpired water). To convert 1 cm3 of liquid water to vapor at environmental temperature and 1 atm pressure takes about 585 cals. The sun supplies about 99.97% of the heat energy required for the physical processes in the earth-atmosphere system. The balance of energy is discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-11689

DETERMINATION OF TIME FOR IRRIGATING CORN ON THE BASIS OF DAILY CALCULATION OF WATER CONSUMPTION DUE TO EVAPO-TRANSPIRATION,
Novi Sad Univ. (Yugoslavia). Faculty of Agriculture.
N. Vucic, and B. Jocic.
Arh Poljoprivr Nauke. Vol 23, No 80, p 56-65. 1970. Illus. English summary.
Identifiers: Calculations, Consumption, Daily, Determination, *Irrigation, Time, *Evapotranspiration, *Rates of application.

Daily calculation of water consumption due to evapo-transpiration was used as a basis for determining irrigation regime. The method is applicable where there is little deviation in the time of irrigation.--Copyright 1972, Biological Abstracts, Inc.
W72-11690

THE EFFECTS OF COPPER IONS ON TRANSPIRATION,
Eotvos Lorant Univ., Budapest (Hungary). Chair of Plant Physiology.
T. D. Ninh.
Bot Kozl. Vol 58, No 2, p 99-102. 1971. Illus.
Identifiers: *Copper ions, Glycine-Soja-D, Ions, Sulfates, *Transpiration, *Zea-Mays-M.

Seeds of Glycine soja and Zea mays were soaked in a 0.005% CuSO4 solution. Transpiration in the young plants from these seeds was lower than young plants from seeds soaked in water.--Copyright 1972, Biological Abstracts, Inc.
W72-11691

2E. Streamflow and Runoff

FLOODS ON THE GUYANDOTTE RIVER IN THE VICINITY OF LOGAN, LOGAN COUNTY, WEST VIRGINIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11278

WATER RESOURCES DATA FOR KANSAS, 1971: PART I. SURFACE WATER RECORDS.
Geological Survey, Lawrence, Kans.

Geological Survey Data Report, 1972. 206 p, 2 fig, 3 ref.

Descriptors: *Surface waters, *Streamflow, *Gaging stations, *Flow rates, *Kansas, Average flow, Low flow, Peak discharge, Lakes, Reservoirs, Water levels, Crest-stage gages, Hydrologic data, *Basic data collections.

Surface-water records are presented for the 1971 water year for Kansas, including records of streamflow or reservoir storage at gaging stations and partial-record stations. Records for a few pertinent gaging stations in bordering States also are included. The data reported comprise a description of the gaging station, and tables showing the daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. Data for partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow, partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W72-11282

WATER RESOURCES AND GEOLOGY OF WINSTON COUNTY, ALABAMA,
Geological Survey, University, Ala.
K. D. Wahl, W. F. Harris, and P. O. Jefferson.
Alabama Geological Survey Bulletin 97, 1971. 51 p, 10 fig, 6 plate, 7 tab, 23 ref.

Descriptors: *Water resources development, *Groundwater, *Surface waters, *Hydrogeology, *Alabama, Water yield, Water quality, Hydrologic data, Basic data collections, Water wells, Aquifer characteristics, Streamflow, Flow rates, Lakes, Water analysis, Chemical analysis.
Identifiers: *Winston County (Ala).

Water resources data for Winston County, Alabama, show quantity and quality of surface and groundwaters as related to the geology and water use. The Bangor Limestone and the Pottsville Formation are the two major sources of groundwater. The Bangor Limestone consists of about 400 to 550 feet of limestone and shale. Water-bearing openings occur primarily in the upper 25 to 50 feet, which is a potential source of 25 to 50 gpm. Water from the Bangor generally is moderately hard to hard and low in iron content. The Pottsville Formation consists of 1,200 feet of sandstone, shale, and coal. Individual wells produce from less than 5 to about 375 gpm. The water ranges from soft to hard and is of good chemical quality except in places where the iron

content may be objectionable. Most of the streams draining Winston County originate within the county. The average flow into Lewis Smith Lake is approximately 670 mgd. Sipsey Fork, the largest stream, had a maximum recorded flow of 48,400 cfs near Falls City. The total use of water in Winston County during a peak demand period was about 1.2 mgd in 1965. Groundwater sources supply about 75% of the water and surface water sources about 25%. (Woodard-USGS)
W72-11283

TEMPERATURE OF FLORIDA STREAMS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W72-11284

SUMMARY OF PLANS FOR ACQUISITION OF SURFACE-WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1973: STAGE, STREAMFLOW AND QUALITY.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07A.
W72-11287

SOME THOUGHTS ON ESTIMATING SPILLWAY DESIGN FLOOD,
Resources Research Centre, Ottawa (Ontario).
For primary bibliographic entry see Field 02A.
W72-11295

CONTROL OF THE DAILY WATER LEVEL DATA--TEST BY RELATING REDUCED LEVELS (CONTROLE DES COTES HYDROMETRIQUES JOURNALIERES--TEST DU RAPPORT DES COTES REDUITES),
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
For primary bibliographic entry see Field 02A.
W72-11296

AUTOMATIC DETECTION OF WATER-BORNE FLUORESCENT TRACERS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 07B.
W72-11297

WATER RESOURCES INVESTIGATIONS IN PENNSYLVANIA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11305

WATER RESOURCES INVESTIGATIONS IN MAINE, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11306

WATER RESOURCES INVESTIGATIONS IN TENNESSEE, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11307

A GEOGRAPHIC ANALYSIS OF HYDROLOGIC RESPONSE IN THE SOUTHEASTERN UNITED STATES,
Franklin Coll. of Arts and Sciences, Athens, Ga. School of Forest Resources.
For primary bibliographic entry see Field 02A.
W72-11312

CONTRIBUTIONS TO THE THEORY OF WATER WAVES ON A SLOPING BEACH,
Wisconsin Univ., Madison. Dept. of Mathematics.
M. A. Gwaiz.
Ph.D. thesis, 1972. 158 p, 20 fig, 38 ref. OWRR A-037-WIS (5).

Descriptors: *Laplaces equation, *Mathematical studies, *Flow, *Energy, *Waves (Water), *Ocean waves, Fourier analysis, *Frequency.
Identifiers: *Sloping beach, *Velocity potential.

In the linear theory, the motion of an inviscid, incompressible and irrotational fluid of constant density on a uniformly sloping beach may be posed as a boundary-value problem for the Laplace equation. Two types of solutions are considered: those which are bounded at the shore (reflected waves), and those which have a logarithmic singularity. The latter type is supposed to represent ocean waves which 'break' along the shoreline. In part I the uniqueness of two-dimensional waves under the influence of an external pressure disturbance is investigated. Uniqueness is guaranteed if and only if the coefficient of the logarithmic singularity at the shore is prescribed, in particular if the solution is bounded there. The bounded solution generated by an oscillatory impulse is constructed and its steady-state limit is shown to coincide with the solution of the corresponding time-harmonic problem. In part II time-harmonic, three dimensional waves whose dependence on the third dimension is sinusoidal are discussed. Over a certain range, the frequency of oscillation determines the behavior of the waves at the shore: for certain discrete values of the frequency, bounded waves are obtained, while singular waves exist over the rest of the frequency spectrum. The two types of waves do not coexist.
W72-11389

MOUNTAIN HYDROLOGY (GORNAYA GIDROLOGIYA).
Sredneaziatskii Nauchno-Issledovatel skii Gidrometeorologicheskii Institut, Tashkent (USSR).

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), Yu. N., Ivanov, and P. M. Mashukov, editors, 1970. 124 p.

Descriptors: *Hydrology, *Hydrologic aspects, *Orography, *Mountains, Rainfall-runoff relationships, Stage-discharge relations, Discharge measurement, Gages, Channels, Streamflow forecasting, Flood routing, Overland flow, Sediment discharge, Water balance, Heat balance, Evaporation, Watersheds (Basins), Lakes, Analytical techniques, Hypsometric analysis.
Identifiers: USSR, *Soviet Central Asia, Amu-Dar'ya River, Syr-Dar'ya River, Hydrometric stations, Firn line, Snow line, Snow density, Solonchaks, Soil monoliths.

This collection contains 13 papers dealing with formation and calculation of mountain streamflow, sediment discharge in rivers, and techniques for calculating precipitation, snow cover, and evaporation in Soviet Central Asia. Specific topics include: (1) average annual runoff in the Fergana basin; (2) maximum melt-water discharges of ungaged mountain rivers in upper Amu-Dar'ya reaches; (3) daily variations in snow density as a possible source of error in computing water content of snow in mountains; (4) precipitation in the Chirchik-Keles interfluve; (5) evaporation from free-water surfaces during leaching of saline soil; (6) evaporation from soil surfaces using small evaporation pans; (7) water-discharge measurements in the Amu-Dar'ya River; (8) use of flood-routing techniques to forecast runoff in regulated reaches of the Syr-Dar'ya River; (9) overland flow from mountains of Soviet Central Asia; and (10) new data on lakes of Soviet Central Asia. (See also W72-11451 thru W72-11459) (Josefson-USGS)
W72-11450

DISTRIBUTION OF AVERAGE ANNUAL RUNOFF IN THE FERGANA BASIN (RASPREDELENIYE SREDNEGO GODOVOGO STOKA V PREDELAKH FERGANSKOY KOTLOVINY),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
O. P. Shcheglova, and V. Ye. Chub.
In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy. No 54 (69), p 3-17, 1970. 3 fig, 4 tab, 13 ref.

Descriptors: *Runoff, *Average runoff, *Mountains, *Orography, *Hypsometric analysis, Elevation, Height, Watersheds (Basins), Glaciers, Firn, Snowmelt, Floods, Precipitation (Atmospheric), Rainfall-runoff relationships, Maps.
Identifiers: USSR, *Uzbek SSR, *Fergana, Snow line, Firn line, Firn limit, Glacier tongues, Hydrometric stations.

Hypsometric relations of zonal runoff in the Fergana basin in east Uzbek SSR were investigated for preparing a map of average annual streamflow. Zonal runoff values in individual basins range from 200-300 mm in lower zones to 2,000 mm or more in high mountain areas. The highest point of zonal runoff is about 4,100 m and coincides approximately with the height of the firn line on glaciers. Runoff values at lower elevations along the eastern ridge of the northern slope of the Alay mountain rangl are the same as those in the western part. Calculated runoff values agree with the precipitation recorded at different elevations. (See also W72-11450) (Josefson-USGS)
W72-11451

CALCULATION OF MAXIMUM MELT-WATER DISCHARGES OF UNGAGED MOUNTAIN RIVERS IN UPPER AMU-DAR'YA REACHES (RASCHET MAKSIMAL'NYKH RASKHODOV TALOGO STOKA NEIZUCHENNYKH GORNYKH REK VERKHOV'YEV AMUDAR'I),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
B. K. Sheremet, and A. I. Khon.
In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 18-29, 1970. 4 tab, 8 ref.

Descriptors: *Melt water, *Discharge (Water), *Discharge measurement, *Rivers, *Mountains, Orography, Elevation, Hypsometric analysis, Watersheds (Basins), Drainage area, Gaging stations, Runoff, Floods, Snowmelt, Water yield, Air temperature, Equations, Probability.
Identifiers: USSR, *Tadzhikistan, *Pamirs, Snow line, Firn line.

Analysis of maximum water discharges of mountain rivers was based on runoff observations at 23 gaging stations in upper reaches of the Amu-Dar'ya River in Soviet Central Asia. Maximum discharges of purely melt-water origin are formed in basins whose areal extent above an elevation of 3 km is at least one-third the entire basin area. Using basin area and height of snow line as parameters, semiempirical equations are developed to calculate average long-term maximum melt-water discharges for central and southern Tadzhikistan and the western Pamirs. When height of snow line is 4.9 km, the error of discharge measurement is not more than plus or minus 25%. (See also W72-11450) (Josefson-USGS)
W72-11452

DAILY VARIATIONS IN SNOW DENSITY AS A POSSIBLE SOURCE OF ERROR IN CALCULATING WATER CONTENT OF SNOW IN MOUNTAINS (VNUTRISUTOCHNYYE IZMENENIYA PLOTNOSTI SNEGA KAK VOZMOZHNYY ISTOCHNIK OSHIBOK PRI RASCHETAKH SNEGOZA PASOV V GORAKH),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11453

MEASUREMENT OF PRECIPITATION IN THE CHIRCHIK-KELES INTERFLUVE (K VOPROSU O VYCHISLENII OSADKOV V CHIRCHIK-KELESSKOM MEZHDURECH'YE),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02B.
W72-11454

TOTAL EVAPORATION DURING LEACHING OF SALINE SOIL (SUMMARNOYE ISPARENIYE PRI PROMYVKAKH ZASOLENNYKH ZEMEL'),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W72-11455

DETERMINATION OF EVAPORATION FROM FREE-WATER SURFACES DURING LEACHING OF SALINE SOIL (RASCHET ISPARENIYA S VODNOY POVERKHNOSTI PRI PROMYVKAKH ZASOLENNYKH ZEMEL'),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W72-11456

ACCURACY OF MEASURING EVAPORATION FROM SOIL SURFACES USING SMALL EVAPORATION PANS (O TOCHNOSTI NABLYUDENIY ZA ISPARENIYEM S POVERKHNOSTI POCHVY PO MIKROISPARITELYAM),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W72-11457

ACCURACY OF WATER-DISCHARGE MEASUREMENTS IN THE AMU-DAR'YA RIVER (O TOCHNOSTI OPREDELENIYA RASKHODOV VODY V R. AMUDAR'YE),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
P. M. Mashukov.
In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 77-86, 1970. 1 fig, 3 tab, 1 ref.

Descriptors: *Discharge (Water), *Stage-discharge relations, *Discharge measurement, Gages, Gaging stations, Water levels, Runoff, Streamflow, Channels, Channel morphology, Width, Depth, Seasonal.
Identifiers: USSR, *Soviet Central Asia, *Amu-Dar'ya River, Hydrometric stations.

The Amu-Dar'ya River in Soviet Central Asia is characterized by extensive and rapid channel alterations which affect the accuracy of discharge measurements. On the basis of hydrometric work by the hydrologic expedition of the All-Union Experimental Design and Planning Scientific Research Institute (Gidroproyekt) in 1951, measurements of discharges in the vicinity of Lavak village were compared with those at the Chatly station 18 km downstream. The water-level record at the Chatly station and discharge measurements at the two sites were used to calculate runoff. Water discharges for ten-day periods computed at Lavak in March-May were 16% lower and during the remainder of the year 17% higher than those at Chatly station. To obtain a more reliable water-level record, several staff gages should be installed along the stream to compute the correct discharge. (See also W72-11450) (Josefson-USGS)
W72-11458

NEW DATA ON LAKES IN SOVIET CENTRAL ASIA (NOVYYE SVEDENIYA OB OZERAKH SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02H.
W72-11459

ANALYSIS OF POTENTIAL ERRORS IN REAL--TIME STREAMFLOW DATA AND METHODS OF DATA VERIFICATION BY DIGITAL COMPUTER,
Geological Survey, Portland, Oreg.
D. J. Lystrom.
Geological Survey Open-file Report, May 1972. 41 p, 13 fig, 1 tab, 8 ref.

Descriptors: *Streamflow, *Hydrologic data, *Data collections, *Remote sensing, *Analytical techniques, Correlation analysis, Data processing, Digital computers, Reliability, Methodology.
Identifiers: *Real-time data, Data collection methods, Comparison.

The magnitude, frequency, and types of errors inherent in real-time streamflow data are presented. Real-time data are generally less accurate than historical data, primarily because real-time data are often used before errors can be detected and corrections applied. Various methods of verifying real-time streamflow data are outlined. Relatively large errors (those greater than 20-30 percent) can be detected readily by use of well-designed verification programs for a digital computer. Smaller errors can be detected only by discharge measurements and field observations. The capability to substitute a simulated discharge value for missing or erroneous data is incorporated in some of the verification routines. The routines represent concepts ranging from basic statistical comparisons to complex watershed modeling and provide a selection from which real-time data users can choose a suitable level of verification. (Woodard-USGS)
W72-11460

A PRELIMINARY ANALYSIS OF LOW FLOWS AT SELECTED SITES IN THE SOUTHERN PART OF THE TOWN OF BETHLEHEM, NEW YORK,
Geological Survey, Albany, N.Y.
O. P. Hunt, and R. M. Beall.
New York Water Resources Commission Report of Investigation R I-1, 1968, 10 p, 2 fig, 1 tab, 3 ref.

Descriptors: *Streamflow, *Low flow, *Base flow, Hydrologic data, *New York, Basic data collections, Flow rates, Stream gages, Precipitation (Atmospheric), Geology, Topography.
Identifiers: *Bethlehem (NY).

Low-flow characteristics are described for the following stream sites in and near the town of Bethlehem, N. Y.: Vloman Kill at Jericho Road at Mallorys Corners; Vloman Kill at Highway 144 at Cedar Hill; South Albany Creek near mouth, near South Bethlehem; Coeymans Creek at Highway 396, near South Bethlehem; and Coeymans Creek near Interstate Route 87, near Coeymans. In addition, results of discharge measurements made at 18 sites in the Vloman Kill and Coeymans Creek basins since 1952 are listed. The study includes an area of about 75 square miles, of which about 30 square miles are in the Vloman Kill basin and about 45 square miles are in the Coeymans Creek basin. Both basins are directly tributary to the Hudson River estuary. U. S. Weather Bureau precipitation records for the city of Albany illustrate the annual variability of the source of supply. Also shown are the extremes and average of annual precipitation for the 141-year period, 1826-1966. Most of the streamflow data were collected during the period of recovery from the severe drought of 1962-65. (Woodard-USGS)
W72-11461

HYDROLOGIC CONDITIONS DURING 1970 IN DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. E. Hull.
Geological Survey Open-file Report, 1972. 80 p, 38 fig, 4 tab, 5 ref.

Descriptors: *Hydrologic data, *Basic data collections, *Surface waters, *Groundwater, *Florida, Rainfall, Runoff, Streamflow, Flow rates, Stream gages, Water table, Water levels, Water wells, Water level fluctuations, Water utilization, Pumping, Withdrawal, Water yield, Groundwater recharge, Aquifer characteristics, Hydrographs.
Identifiers: *Dade County (Fla).

Hydrologic data collected during the 1970 water year in Dade County, Florida, show that rainfall was 25 inches below the 30-year average; groundwater levels were about average; and the yearly lowest groundwater levels were 2 ft above the average lowest in the western part of the county and about average in the northern and southern parts. The combined average daily discharge from six major streams and canals that flow into Biscayne Bay was 1,755 cfs, only 75 cfs less than during the 1969 water year. The range in discharge for 1970 was less than that for 1959-65, and during low-flow periods the discharge was greater in 1970 than in 1959-65. During 1969 and 1970 the salt front remained stationary. The major advances of the salt front occurred prior to 1946, at which time salt barriers in all major canals were constructed. From 1946 to 1969 the salt front retreated seaward. (Woodard-USGS)
W72-11469

HYDROLOGIC STUDIES OF LITTLE POND CREEK AND NORTH ELM CREEK WATERSHEDS, BRAZOS RIVER BASIN, TEXAS, 1963-69,
Geological Survey, Austin, Tex. Water Resources Div.
R. O. Hawkinson.
Geological Survey Data Report, January 1972. 137 p, 3 fig, 8 tab, 13 ref, append.

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Texas, *Basic data collections, *Hydrologic data, Streamflow, Storms, Storm runoff, Peak discharge, Flow rates, Hydrographs, Mass curves, Regression analysis, Reviews, Watershed management.
Identifiers: *Brazos River Basin (Tex), Little Pond Creek (Tex), North Elm Creek (Tex).

The drainage areas of Little Pond Creek and North Elm Creek (Brazos River Basin), within the study area near Waco, Texas, are 22.2 and 48.6 square miles, respectively. The watersheds are adjoining and are about 40 miles south of Waco. Average annual rainfall for this area is 33.85 inches. During the period 1962-69, average annual rainfall on the Little Pond Creek watershed was 31.73 inches compared to 31.74 inches on the North Elm Creek watershed. Average annual runoff for this same period was 7.28 inches on the Little Pond Creek watershed and 6.12 inches on the North Elm Creek watershed. The peak discharges on North Elm Creek, in cubic feet per second per square mile, were significantly less than those occurring on Little Pond Creek at the 1-percent level. Runoff from the two watersheds, expressed as a percentage of annual rainfall, was not significantly different at the 1-percent level. No significant difference at the 1-percent level was detected in runoff expressed as a percentage of total rainfall from 40 concurrent storm events on the two watersheds. Multiple regression analyses were used to develop peak-flow predictions equations for each watershed. The standard error of estimate of the prediction equation for Little Pond Creek is 69 percent, and for North Elm Creek 30 percent. (Woodard-USGS)
W72-11470

WATER RESOURCES INVESTIGATIONS IN NEVADA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11653

WATER RESOURCES INVESTIGATIONS IN NEW HAMPSHIRE, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11654

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1970,
Geological Survey, Austin, Tex. Water Resources Div.
J. K. VanZandt.
Geological Survey Open-file Report (Texas District), January 1972. 70 p, 3 fig, 1 tab, append.

Descriptors: *Rainfall-runoff relationships, *Streamflow, *Urban hydrology, *Basic data collections, *Texas, Hydrologic data, Storms, Hydrographs, Mass curves, Stream gages, Gaging stations, Flow rates, Rain gages, Watershed management, Small watersheds, Urban runoff, Storm runoff.
Identifiers: *Austin (Tex).

Rainfall and runoff data are presented for Waller Creek (Austin, Tex area) for the 1970 water year. The Waller Creek drainage area lies entirely within the city of Austin, with the headwaters originating in the northern part of the city. The creek flows south for 6.6 miles to the Colorado River. Storm sewers and Street gutters divert runoff both into and out of the natural drainage area. The headwaters of Wilbarger Creek originate in Travis County near the Williamson County line and flow southeasterly about 40 miles to the Colorado River. The Wilbarger Creek study area is about 15 miles north of the city of Austin. The weighted-mean rainfall upstream from 38th Street was 35.82 inches, 10% above the mean annual rainfall for Austin of 32.58 inches. Mean daily discharge was 1.65 cfs; annual runoff was 9.68 inches, or 27% of rainfall. The weighted-mean rainfall upstream from 23rd Street was 34.95 inches, 7% above the mean annual rainfall for Austin. Mean daily discharge was 3.24 cfs; annual runoff was 10.66 inches, or 30% of rainfall. Rainfall-runoff data for 4 storms are summarized. (Woodard-USGS)
W72-11661

TECHNIQUES FOR ASSESSING WATER RESOURCE POTENTIALS IN THE DEVELOPING COUNTRIES WITH EMPHASIS ON STREAMFLOW, EROSION AND SEDIMENT TRANSPORT, WATER MOVEMENT IN UNSATURATED SOILS, GROUND WATER, AND REMOTE SENSING IN HY DROLOGIC APPLICATIONS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11672

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11675

2F. Groundwater

CHANGES IN NITROGEN REGIME OF PEAT SOIL AS A FUNCTION OF GROUNDWATER DEPTH (IZMENENIYE AZOTNOGO REZHIMA TORFYANOY POCHVY V ZAVISIMOSTI OT UROVNYA GRUNTOVYKH VOD),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11124

ANALOG SIMULATION OF WATER-LEVEL DECLINES IN THE SPARTA SAND, MISSISSIPPI EMBAYMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11279

WATER RESOURCES AND GEOLOGY OF WINSTON COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 02E.
W72-11283

RECORDS OF PRECIPITATION, WATER LEVELS, AND GROUND-WATER RECHARGE TO THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1971.
Geological Survey, San Antonio, Tex.
For primary bibliographic entry see Field 07C.
W72-11288

WATER WELL AND GROUND-WATER CHEMICAL ANALYSIS DATA, SUTTON COUNTY, TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 04B.
W72-11290

HYDRODYNAMICS IN DEEP AQUIFERS OF THE ILLINOIS BASIN,
Illinois State Geological Survey, Urbana.
D. C. Bond.
Illinois Geological Survey Circular 470, 1972. 72 p, 22 fig, 7 tab, 34 ref, 2 append.

Descriptors: *Groundwater movement, *Deep percolation, *Hydrodynamics, *Aquifer characteristics, *Illinois, Deep wells, Water levels, Pressure, Density, Brines, Pressure head, Stratified flow, Pressure head, Injection wells, Underground waste disposal, Oil-water interfaces.
Identifiers: *Illinois Basin.

Data on water levels, pressures, and water densities in deep aquifers in and around the Illinois Basin are presented. Brines in the deep aquifers of the Illinois Basin are highly stratified. Over a distance of about 120 miles, along a line from West Chicago to Tuscola, the density of the interstitial water in the Mt. Simon aquifer is approximately a linear function of depth. To the west of this line the density is less, while to the east the density is greater, for a given elevation. In the northern third of Illinois, water flows through the Mt. Simon Aquifer from the west to the east. Some net head exists (about 100 to 200 feet) to cause vertical flow from the Mt. Simon Aquifer to shallower aquifers. Effects of variations in water density in problems related to gas storage, oil accumulation, origin of brines, and underground waste disposal include, for example, a tilted oil-water interface maintained with zero flow. (Woodard-USGS)
W72-11291

WATER RESOURCES INVESTIGATIONS IN PENNSYLVANIA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11305

WATER RESOURCES INVESTIGATIONS IN MAINE, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11306

WATER RESOURCES INVESTIGATIONS IN TENNESSEE, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11307

THE GROUNDWATER FLOW SYSTEM IN THE DELMARVA PENINSULA,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 02A.
W72-11309

SUBSURFACE SITE CONDITIONS AND GEOLOGY IN THE SAN FERNANDO EARTHQUAKE AREA,
California Univ., Los Angeles. School of Engineering and Applied Science.
J. A. Johnson, Y. Kharraz, K. W. Campbell, N. A. Malpiede, and C. M. Duke.
Research Report UCLA-ENG-7206 Dec 1971, 118 p. Folder. 3 fig, 4 tab, append. OWRR B-144-CAL (1).

Descriptors: *Earthquakes, *Seismic studies, Geophysics, *Subsurface investigations, Velocity, Seismic properties, *California.
Identifiers: *San Fernando (Calif.).

Progress is reported in establishing the facts about dynamic subsurface properties and geological features in the area affected by the San Fernando earthquake of February 9, 1971. Special emphasis is given to the locations of accelerographs, seismoscopes and Seismological Field Survey aftershock instruments. Thirty shallow geophysical survey were made for determination of shear and compressional wave velocities, with damping measured at some sites. Deep velocity data were obtained from geophysical surveys by others. Soil mechanics data and water well borings by others were utilized. Published and ongoing geological studies were applied. Results are presented in the form of five geological cross-sections subsurface exploration models extending through basement complex to depths of 14,000 ft., a general geologic map, the shallow geophysical surveys, and selected data on damping.
W72-11316

WATER TABLE INVESTIGATION IN THE MESILLA VALLEY,
New Mexico State University. University Park. Dept. of Civil Engineering.
G. L. Richardson.
M. S. Thesis, 1971. 206 p, 20 fig, 24 tab, 1 plate, 21 ref, 7 append. OWRR B-016-NMEX (4), B-019-NMEX (4) and B-026-NMEX (4).

Descriptors: *Surface-groundwater relationships, *Mathematical models, *Model studies, *Computer models, *Water level fluctuations, New Mexico, Hydrologic budget, Groundwater movement, Water table, Water wells, Storage coefficient, Darcys law, Transmissivity, Water balance, Inflow, Outflows, Evaporation, Precipitation (Atmospheric), Seepage, Consumptive use (Water), Canals, Irrigation district.
Identifiers: *Mathematical groundwater model, *Groundwater investigation, *Rio Grande, Mesilla Valley, Groundwater resource, Groundwater budget, Storativity, Mass-continuity equation.

The objective was to develop and verify a mathematical model of the Mesilla Valley ground-water basin. All available geologic and hydrologic data were compiled and incorporated into a computer program that was developed by Willem Brutsaert of New Mexico Institute of Mining and Technology. The model was calibrated by adjusting the storativity of the aquifer until the computer generated data closely duplicated existing historic data on water table fluctuation. The storativity is a very important parameter which is poorly defined by actual data. A storativity of 20 percent produced close correlation between historic and computer generated data. Following verification of the model, several production runs were made to determine the sensitivity of water table fluctuations to changes in some imput parameters. These results indicate that the modeling efforts would

benefit greatly by the gathering of more comprehensive data concerning the storativity of the aquifer and the exchange of water between the Rio Grande and the ground-water reservoir. The hydrologic data compiled and used in the model are included. (Creel-New Mexico)
W72-11387

DEEP THERMAL STREAM IN THE DAGESTAN TERRITORY,
Scientific Council for Geothermal Studies, Moscow (USSR).
A. S. Dzhamalova.
Trans. available from the National Technical Information Center as NASA TT F-696, $3.00 in paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Technical Translation Publication NASA TT F-696, May 1972. 122 p, 29 fig, 19 tab, 207 ref. (Translated from 'Glubinnyy Teplovoy Potok na Territorii Dagestana', Nauka Press, Moscow, 1969).

Descriptors: *Geothermal studies, *Thermal water, *Groundwater, *Thermal conductivity, *Sediments, Rocks, Clays, Limestones, Thermal springs, Geology, Sedimentology, Depth, Radioisotopes, Sampling, Analytical techniques, Rock properties, Thermal properties.
Identifiers: *USSR, *Dagestan (USSR).

Thermal conductivity of the various types of rocks comprising the sedimentary sheath of Dagestan A. S. S. R., was determined from 125 samples. Sandstones have the highest thermal conductivity (up to 8.9 mcal per cm per sec per deg C), and the clays have the lowest (up to 1.5 mcal per cm per sec per deg C). The coefficient of thermal conductivity for the same type rock increases with an increase in the depth of the deposit, which is related to the compression of the rock and is not dependent on its age. The magnitude of correction in the coefficient of thermal conductivity under natural conditions in comparison with laboratory conditions under the influence of moisture reaches 10-15% for the clays and 30% for the sandstones. Values were determined for the conductive thermal flow in 12 exploratory fields and differentiation of the conductive thermal flow was established in the different geologic-tectonic zones. The content of long-lived radioactive isotopes was determined in 160 samples of the various sedimentary rocks. The highest content of isotopes is in the clays, and the limestones have the lowest content. (Woodard-USGS)
W72-11444

GROUND-WATER INVESTIGATIONS IN OKLAHOMA,
Geological Survey, Oklahoma City. Water Resources Div.
J. H. Irwin.
In: Environmental Aspects of Geology and Engineering in Oklahoma; Symposium of Oklahoma Academy of Science, Stillwater, Dec. 4, 1970: Annals of the Oklahoma Academy of Science Publication No 2, p 58-70, 1971. 8 fig.

Descriptors: *Groundwater resources, *Oklahoma, *Groundwater potential, *Aquifer characteristics, Alluvium, Sandstones, Limestones, Pleistocene epoch, Water resources development, Overdraft, Waste water (Pollution), Irrigation, Investigations.

The geohydrologic framework of Oklahoma is summarized, some of the groundwater problems are listed, and the investigative programs are outlined. The fairly well distributed groundwater reservoirs are estimated to contain more than 300 million acre-feet of water valued at several billion dollars. Because of the critical need for scientific evaluation of groundwater in several parts of the State, the U. S. Geological Survey in cooperation with the Water Resources Board and the Oklahoma Geological Survey initiated, a program of reconnaissance and detailed studies several years ago which is continuing. Principal aquifer systems may be placed in four groups: (1) alluvial deposits along streams and valleys, (2) sandstone, (3) limestone including dolomite and gypsum, and (4) semiconsolidated sand and gravel under the High Plains. The States' groundwater problems include (1) overdevelopment of aquifers, (2) dangers from injection of wastes polluting water supplies, and (3) need for development of domestic and stock supplies in areas of no surface water. (Lang-USGS)
W72-11448

DRILLERS' LOGS OF WELLS IN HARRIS COUNTY, TEXAS, 1905-71,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W72-11449

GROUNDWATER IN LAKE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W72-11462

GEOHYDROLOGY OF JEFFERSON COUNTY, NORTHEASTERN KANSAS,
Kansas State Geological Survey, Lawrence.
For primary bibliographic entry see Field 04B.
W72-11464

HYDROLOGIC CONDITIONS DURING 1970 IN DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W72-11469

WATER RESOURCES INVESTIGATIONS IN NEVADA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11653

WATER RESOURCES INVESTIGATIONS IN NEW HAMPSHIRE, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11654

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11675

GEOHYDROLOGY OF THE LOWER VERDIGRIS RIVER VALLEY BETWEEN MUSKOGEE AND CATOOSA, OKLAHOMA,
Geological Survey, Washington, D.C.
H. H. Tanaka.
Available from GPO, Washington, D C 20402 - Price 75 cents. Geological Survey Water-Supply Paper 1999-A, 1972. 23 p, 4 fig, 2 plate, 5 tab, 6 ref.

Descriptors: *Hydrogeology, *Surface-groundwater relationships, *Oklahoma, *Alluvium, Alluvial channels, Base flow, Water level fluctuations, Recharge, Water balance, Hydrologic budget, Aquifer characteristics, Water yield, Water quality, Discharge (Water).
Identifiers: *Verdigris River (Okla).

Alluvium is the principal aquifer along the Verdigris River between Muskogee and Catoosa, Okla. Yields of 1 to 10 gallons of water per minute, adequate for most domestic and stock uses, are available in almost all areas underlain by alluvium. In places where the proportion of gravel to fine material is high, yields ranging from 10 to 30 gpm are possible from large-diameter wells. Terrace deposits yield small amounts of water (1 to 10 gpm), adequate for most domestic and stock uses. Water-level fluctuations, in response to seasonal changes in recharge and discharge, range from 1 to 5 feet. Long-term fluctuations are about 10 feet in the alluvium and less than 5 feet in the terrace deposits. Recharge to the alluvium is mainly by precipitation. Recharge maintains groundwater levels above the level of the Verdigris River. Discharge from the alluvium is by seepage into the river and its tributaries and by evapotranspiration. Generally, the quality of the water in the alluvium and terrace deposits is suitable for domestic, stock, and irrigation uses. (Knapp-USGS)
W72-11677

PRELIMINARY APPRAISAL OF GROUND WATER IN STORAGE WITH REFERENCE TO GEOTHERMAL RESOURCES IN THE IMPERIAL VALLEY AREA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W72-11678

2G. Water in Soils

RECLAMATION AND WATER MANAGEMENT (MELIORATSIYA I VODNOYE KHOZYAYSTVO).
Ministerstvo Melioratsii i Vodnogo Khozyaistva Ukrainskoi, Kiev (USSR).
For primary bibliographic entry see Field 05D.
W72-11120

EFFECTS OF WETTING ON DENSITY AND WATER PERMEABILITY OF FINE-TEXTURED SOILS (VLIYANIYE STEPENI UVLAZHNENIYA NA PLOTNOST' I VODOPRONITSAYEMOST' TYAZHELYKH POCHV),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
D. A. Tyutyunnik.
In: Melioratsiya i Vodnoye Khozyaystvo, No 17, p 35-41, Izdatel'stvo 'Urozhay', Kiev, 1971. 3 fig, 1 tab, 10 ref.

Descriptors: *Soil physical properties, *Soil density, *Bulk density, *Permeability, *Wetting, Moisture content, Field capacity, Porosity, Particle size, Soil structure, Soil profiles, Podzols, On-site investigations.
Identifiers: USSR, *Ukraine, Ivano-Frankovsk Oblast, Sod-Podzolid soils, Kolkhozes.

On-site investigations were carried out in 1961-69 to study the water and air regime of Sod-Podzolic gley, silty-loam soils at kolkhozes in the Ivano-Frankovsk Oblast in southwest Ukraine. A clear relationship was established between soil bulk density and moisture content. After drying, soil density in the humus-eluvial horizon increased from 1.2 to 1.4 g/cu cm, in the podzolic horizon from 1.3 to 1.68 g/cu cm, and in the illuvial horizon from 1.42 to 1.87 g/cu cm. Varying particle sizes and porosities accout for the sharp decrease in water permeability in the eluvial horizon and for the significant increase in water permeability in the illuvial horizon. Empirical formulas are given for calculation of more reliable bulk densities. (See also W72-11120) (Josefson-USGS)
W72-11122

LABORATORY DETERMINATION OF THE VAPOR DIFFUSION COEFFICIENT IN DESICATED SOIL (LABORATORNYY OPYT PO OPREDELENIYU KOEFFITSIYENTA DIFFUZII PARA V ISSUSHENNOY POCHVE),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
V. G. Charnyy.
In: Melioratsiya i Vodnoye Khozyaystvo, No 17, p 42-45, Izdatel'stvo 'Urozhay', Kiev, 1971. 2 fig, 1 tab, 5 ref.

Descriptors: *Soil physics, *Water vapor, *Vapor pressure, *Diffusion, Humidity, Atmosphere,

Evaporation, Moisture content, Soil water movement, Porosity, Bulk density, Chernozems, Model studies.
Identifiers: USSR, *Ukraine, Vapor density, Water vapor movement, Maximum hygroscopicity, Dessication.

The effects of different humidities on diffusion of water vapors through a dessicated layer of southern Chernozem were investigated in the laboratory through the use of model techniques. Soil bulk density was 1.22 g/cu cm and porosity, 47%. The vapor diffusion coefficient in soil at low moisture content was similar to the molecular diffusion coefficient of water vapors in free air and varied between 0.17 and 0.26 sq cm/sec, the average of 4 determinations being 0.22 sq cm/sec. Density distribution of vapor sorbed by soil when soil thickness increases to 8 cm deviates from the linear relation and must be taken into account in calculating the diffusion coefficient. (See also W72-11120) (Josefson-USGS)
W72-11123

CHANGES IN NITROGEN REGIME OF PEAT SOIL AS A FUNCTION OF GROUNDWATER DEPTH (IZMENENIYE AZOTNOGO REZHIMA TORFYANOY POCHVY V ZAVISIMOSTI OT UROVNYA GRUNTOVYKH VOD),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
Kh. N. Starikov, N. K. Krasovskiy, and I. N. Yakovenko.
In: Melioratsiya i Vodnoye Khozyaystvo, No 17, p 46-53, Izdatel'stvo 'Urozhay', Kiev, 1971. 1 fig, 7 tab, 9 ref.

Descriptors: *Groundwater, *Water table, *Water levels, *Peat, *Nitrogen cycle, Ammonia, Nitrates, Nitrites, Organic matter, Soil moisture, Moisture content, Crops, Sugar beets, Oasts, Lysimeters, Seasonal.
Identifiers: USSR, *Ukraine, Rovno Oblast, Nitrogen losses, Agrochemistry.

Investigations were carried out in 1967-68 to study the nitrogen cycle of 2.5-3.5 m-thick lowmoor peat in the Rovno Oblast in the western Ukraine. The soil was encased in water-table lysimeters, 100 cm in diameter and 1.3-1.9 m deep. A drop in water-table depth from 70 cm after planting to 120-160 cm in the latter half of the growth period created conditions most favorable to the soil nitrogen regime. In 1967, at a constant water table of 80 cm, dry-matter weight and total nitrogen loss for sugar beets from one lysimeter were 1,266 g and 12.8 g, respectively, and at water tables ranging from 70 cm in spring to 160 cm in summer-1,659 g and 29.8 g. In 1968, at a groundwater depth of 80 cm, dry-matter weight and total nitrogen loss for oats were 870 g and 7.8 g respectively, and at water tables ranging from 70 cm to 160 cm-843 g and 13.21 g. The principal form of nitrogen in groundwater is ammonia. Nitrates are either missing or found in small amounts (0.3-2.4 mg of water/liter) during most of the growth period. Both nitrogen forms predominate in lysimeters with high water tables. (See also W72-11120) (Josefson-USGS)
W72-11124

EFFECTS OF WETTING ON NITROGEN REGIME OF OLD-PLOWED PEAT SOIL, BASED ON POT TESTS (VLIYANIYE STEPENI UVLAZHNENIYA NA AZOTNYY REZHIM STAROPAKHOTNOY TORFYANOY POCHVY (PO DANNYM VEGETATSIONNOGO OPYTA)),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
N. K. Krasovskiy.
In: Melioratsiya i Vodnoye Khozyaystvo, No 17, p 54-58, Izdatel'stvo 'Urozhay', Kiev, 1971. 4 tab, 13 ref.

Descriptors: *Wetting, *Moisture content, *Soil moisture, *Peat, *Nitrogen cycle, Nitrogen fixation, Nitrification, Denitrification, Nitrates, Ammonia, Organic matter, Crops, Barley, Soil analysis.
Identifiers: *USSR, *Ukraine, Rovno Oblast, Nitrogen losses, Pot tests, Mineralization.

Pot tests were conducted in 1968 to study mineralization of organic nitrogen in old-plowed Peat soil of the Chemernoye bog in the Rovno Oblast (western Ukraine). Conditions for mineralization of peat organic nitrogen and its uptake by barley were optimal at soil moisture contents of 60% and 75% of full moisture capacity. Soil nitrogen uptake by barley at these moisture contents was maximum and was 805.8 and 769.7 mg/pot, respectively. Plant nitrogen consumption increased with decrease in soil moisture content from 90% to 60% of full moisture capacity. Barley uptake of nitrate nitrogen was more intense than that of ammonium nitrogen under all soil-moisture conditions examined. Changes in total nitrogen content of Peat soil at different moisture contents were determined largely by rate of organic-matter decomposition, plant uptake of mineral nitrogen, and rate of biological nitrogen fixation in soil. Under optimal moisture conditions, total and unproductive nitrogen losses were minimal. (See also W72-11120) (Josefson-USGS)
W72-11125

METHODS FOR EFFECTIVE RECLAMATION OF SALINE CALCAREOUS PEAT SOILS IN THE UKRAINE (PRIYEMY EFFEKTIVNOGO OSVOYENIYA ZASOLENNYKH KARBONATNYKH TORFYANYKH POCHV USSR),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
B. I. Dem'Yanchik, L. V. Sushitskiy, and F. N. Dudinets.
In: Melioratsiya i Vodnoye Khozyaystvo, No 17, p 59-65, Izdatel'stvo 'Urozhay', Kiev, 1971. 3 tab, 7 ref.

Descriptors: *Land management, *Land reclamation, *Peat, *Soil types, Soil properties, Drainage, Drainage systems, Fertilizers, Nutrients, Nutrient requirements, Nitrogen, Phosphorus, Potassium, Crop production, Field crops, Grasses.
Identifiers: *USSR, *Ukraine, *Rovno Oblast, *Superphosphates, Granulated fertilizers, Phosphorus pentoxide, Phosphorus pentoxide, Phosphoric acid, Kolkhozes, Agrochemistry.

Calcareous Peat soils of the forest steppe of the Ukraine are extremely deficient in potassium and readily available phosphorus. Hydrophysical and agrochemical properties of lowmoor sedge-hypnum peat were investigated in 1968-69 in the 1,200-ha Kutyanskaya drainage system of the 'Kommunist' kolkhoz, Ostrog Rayon, Rovno Oblast. Application of at least 60 kg of P205/ha, along with potassium and copper fertilizers, is required to effectively reclaim the soils and to ensure high crop yields. The best field crops to be grown on these soils are mangel-wurzel and pea, and the best grass species of perennials are timothy and smooth bromegrass. (See also W72-11120) (Josefson-USGS)
W72-11126

THE MINIMUM SOIL MOISTURE AS AN INDICATION FOR IRRIGATION,
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
For primary bibliographic entry see Field 03F.
W72-11217

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, CATRON COUNTY,
New Mexico State Univ., University Park, Dept. of Agronomy.
H. J. Maker, R. E. Neher, and J. U. Anderson.
Available from the National Technical Information Service as PB-210 811, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University, Agricultural Experiment Station Research Report 229 1972, 49 p, 11 fig, 7 tab, 6 ref. OWRR B-015-NMEX (18).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Catron County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

The suitability of soils in Catron County, New Mexico for irrigation is described. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The irrigation land classes were assigned primarily on the basis of soil data available from a general soil map. Although such general soil maps are often made by generalizing from large-scale detailed soil maps, this was possible only to a limited extent in Catron County. Detailed soil surveys were limited to irrigated lands and small areas of rangeland where special studies were conducted. The general soil map of this county, therefore, was prepared largely on the basis of a field reconnaissance together with interpretation of airphotos, topographic maps, geological maps, and other available information. The data were organized and presented on the basis of soil associations shown on the general soil map and on the irrigation land classification map. Catron County has about 4,414,700 acres, of which about 24 percent were considered suitable for irrigation. About 53,088 acres were in irrigation class 1; 311,156 acres in class 2; 399,583 acres in class 3; and 300,447 acres in class 4. The remaining 3,350,426 acres were in land class 6, which was not considered suitable for irrigation. Information also is provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color are included.
W72-11311

FINITE ELEMENT SOLUTION OF UNSTEADY AND UNSATURATED FLOW IN POROUS MEDIA,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
J. C. Bruch, Jr., and G. Zyvoloski.
(1972), 22 p. 6 fig, 10 ref. OWRR A-039-CAL (1).

Descriptors: *Porousmedia, *Unsteady flow, *Finite element analysis, Mathematical studies, Flow.
Identifiers: Galerkin Process.

The nonlinear equation describing the unsteady and unsaturated, one-dimensional flow in porous media is formulated with the finite element representation employing the Galerkin approach. A linear shape function and two-dimensional triangular elements in space and time were used in solving the problem for several common forms of the diffusivity function. The results are compared with finite difference solutions as well as other numerical techniques.
W72-11313

CORRECTNESS OF THE CALCULATION METHOD FOR THE SOLUTION OF PROBLEMS ON MOISTURE TRANSFER IN SOIL,
V. A. Yangarber.
Sb Tr Po Agron Fiz. Vol 23. p 32-40. 1969.
Identifiers: *Mathematical studies, Movement.

A method of finite differences is suggested for numerical solution of nonsteady boundary-value problems describing the movement of soil moisture. Semi-implicit grid diagrams are constructed and their stability is proven by the maximum principle. The algebraic equations involved in this procedure are solved by matching techniques.--Copyright 1972, Biological Abstracts, Inc.
W72-11322

GENESIS OF GYPSUM SOLONCHAKS OF SOUTHERN KIRGHIZIA,
G. I. Roichenko.
Tr Kirg Nauchno-Issled Inst Pochvoved. Vol 2, p 92-100. 1969.
Identifiers: Drainage, Gypsum, *Kirghizia (USSR), *Saline soils, *Solonchaks, USSR.

The saline soils are formed under conditions of weak drainage in the presence of moderately mineralized groundwaters not under pressure. The gypsum is a weathering product of gypsiferous Tertiary rocks. The soil-forming rocks have considerable contents of carbonates. Chloride-sulfate and sulfate types of saline soil and groundwaters are predominant. Measures are recommended for the prevention of secondary salination.--Copyright 1972, Biological Abstracts, Inc.
W72-11335

EFFECT OF POLYMERS ON THE RESISTANCE OF SOILS TO EROSION,
For primary bibliographic entry see Field 04D.
W72-11337

WATER REGIME OF SOIL UNDER PROLONGED IRRIGATION AND FERTILIZATION,
For primary bibliographic entry see Field 03F.
W72-11338

GREEN MANURE IN EROSION CONTROL AND FERTILITY IMPROVEMENT OF ERODED SOILS,
For primary bibliographic entry see Field 04D.
W72-11339

EFFECT OF THE TEXTURE AND STRUCTURE OF SOIL ON ITS WATER-RAISING CAPACITY,
M. S. Tsyganov, and V. I. Reztsova.
Zap Voronezh S-Kh Inst. Vol 40, p 23-32. 1969.
Identifiers: *Chernozem soils, *Soil texture, *Soil structure, Capillary water.

Tubes (35 mm diameter, 130 cm tall) filled with sand, sandy loam, light and heavy loam, structural fractions 5-1 mm and 1-0.25 mm, and mixtures of these with the fraction <0.25 mm were immersed in water to a depth of 2 cm. The rising of water was observed for 25 days, and the moisture content of the filling in the tubes was determined according to layers at the end of the experiment. The capillary rise of water was very slow in crumbly and granular soils without an appreciable content of silt indicating that the water requirement of plants on these soils is probably not satisfied by moisture from deeper horizons. The observations were made on structural chernozem soils in the Voronezh Region.--Copyright 1972, Biological Abstracts, Inc.
W72-11344

SNOWMELT CONTROL ON BELORUSSIAN ERODED LOAMY SOD PODZOLIC SOILS,
For primary bibliographic entry see Field 04D.
W72-11345

COMPARATIVE DESCRIPTION OF THE MORPHOLOGICAL, CERTAIN PHYSICAL AND HYDROPHYSICAL PROPERTIES OF ZONAL CHERNOZEMS IN THE VORONEZH REGION,
V. N. Ovchinnikov.
Zap Voronezh S-Kh Inst. 40: p 61-70. 1969.
Identifiers: Capillary water, *Chernozems, Soil density, Soil moisture, Soil types, *Voronezh (USSR), *Clay loam.

The Voronezh Region is dominated by weakly leached, typical clayey, ordinary clayey, ordinary heavy-loamy and southern chernozems. The bulk density of the soils gradually increased with depth in the profile, from 1.07-1.12 to 1.30-1.69. Capillary moisture capacity (determined in loose soil within glass tubes 3 cm in diameter and 10 cm in length), was greatest in the arable horizon of typical chernozem (58-60%) and lowest in ordinary chernozem (50-52). Gradually decreasing down the profile, it levelled out to 42-46% in all these soils at a depth of 145-150 cm.--Copyright 1972, Biological Abstracts, Inc.
W72-11349

SOME SOILS GROUPS IN THE SOUTH OF THE KIROV REGION,
E. M. Isupova.
Uch Zap Kirov Gos Pedagog Inst. 33. p 60-74. 1969.
Identifiers: *Kirov (USSR), Soils, *Soil texture, Vegetation, *Clay soils, *Gleyey soils.

The soils in the Kichma-Nemda interfluve and the valley of Toima River are floodplain sod soils (gley and gleyey), light-gray forest, sod-weakly podzolic, sod-calcareous (ordinary, leached and podzolized), dark-gray forest and laminated floodplain soils. The texture of soils and soil-forming rocks with a brief agrochemical characterization is described. The soil associations result from the local vegetation and geological-geomorphological conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-11350

PHYSICAL PROPERTIES OF CERTAIN BOG--SOILS IN THE BELORUSSIAN SSR AND THEIR AMELIORATION,
M. I. Afanas'Ew.
Vyestsi Akad Nauk Byelarus SSR Ser Sel'-Skahaspad Nauk. 2. p 19-22. 1969.
Identifiers: Absorption, Amelioration, *Belorussian-SSR, *Bog-soils, Density, *Gley horizons, Logging, Permeability, Soils, USSR.

Temporary waterlogging of bog-soils by atmospheric precipitation is due to the high density of gley horizons and low water permeability of the soils. Deep loosening is a radical ameliorative practice provided the precipitation does not exceed 700 mm, and the compact horizons are located at depth not exceeding 1 m. Deep loosening promotes water-holding capacity and permeability to water. Excess water is absorbed by the soil in spring and utilized by the plants in summer.--Copyright 1972, Biological Abstracts, Inc.
W72-11351

PESTICIDE MOBILITY IN SOILS: II. APPLICATIONS OF SOIL THIN-LAYER CHROMATOGRAPHY,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
For primary bibliographic entry see Field 05B.
W72-11353

PESTICIDE MOBILITY IN SOILS: III. INFLUENCE OF SOIL PROPERTIES.
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
For primary bibliographic entry see Field 05B.
W72-11354

EFFECT OF CERTAIN SURFACTANTS AND OTHER ORGANIC SUBSTANCES ON THE PHYSICAL PROPERTIES OF SOIL AND DEVELOPMENT OF PLANTS,
O. Dobozi, M. Lakatosh, and F. Mate.
Zh Prikl Khim. Vol 43, No 3, p 639-645. 1970.
Identifiers: Absorption, Capillary, Carboxymethyl cellulose, *Plants, Resistant, *Soils, *Surfactants.

Treatment of samples of brown forest soil with anion-active substances (tensides) appreciably increased their content of water-resistant aggregates of 2.5-3 mm, while that of smaller aggregates diminished. The content of large aggregates in soil was diminished by complexers ('evazin,' carboxymethyl cellulose) and cation-active 'tensides,' while the content of small aggregates increased. Efficacy of doses 1%, 0.1%, 0.01% differed for different 'tensides.' Large artificial aggregates impregnated with the 'tensides' proved more stable than natural nonimpregnated aggregates. The capillary absorption of solutions was hardly affected by anion-active 'tensides,' but increased appreciably due to cation-active ones (in concentration 0.01%). Sprouting of wheat on 0.01 and 0.001% solutions of 'tensides' increased the number and total mass of the sprouts.--Copyright 1972, Biological Abstracts, Inc.
W72-11391

OPTIMIZATION OF AVAILABLE MOISTURE IN SOIL,
B. N. Michurin, and V. G. Onishchenko.
Dokl Otd Komis Geogr O-Va SSSR. 13. p 124-129, 1970.
Identifiers: Bulk, Density, *Soil moisture, *Optimization, Surface.

Moisture contents of various soils were determined at pF 2.5 and 4.2, respectively, corresponding to field capacity and wilting percentage, the specific surface of soil (10-300 m2/g) and its bulk density (1-2.1 g/cm3) being used as the variables. The observed differences between natural soils with respect to their moisture characteristics were mainly due to differences in their specific surfaces and bulk densities. The field capacity of a soil varies continuously with its specific surface and is affected by compaction. Compaction with a specific surface > 70 m2/g decreases the available moisture content. Soil in the experiments consisted of various mixtures of silt (0.05-0.01 mm) and bentonite with definite specific surfaces.--Copyright 1972, Biological Abstracts, Inc.
W72-11416

IMPROVING THE FERTILITY OF SANDY SOILS BY CLAYING,
A. A. Nizova.
Dokl Otd Komis Geogr O-Va SSSR. 13. p 155-161. 1970.
Identifiers: Claying, *Fertility, Moisture, *Sands, Soils.

Claying in conjunction with liming and peat-manure compost improved crop yields for 3 yr. The best effect was obtained with 60 tons/ha clay. Clayed soils also had a larger content of available moisture and improved chemical properties.--Copyright 1972, Biological Abstracts, Inc.
W72-11417

SOIL PROPERTIES AFFECTING THE RETENTION OF PHOSPHORUS FROM EFFLUENT,
Department of Agriculture, Agassiz (British Columbia). Research Station.
For primary bibliographic entry see Field 05B.
W72-11430

THE INFLUENCE OF LIQUID SURFACE TENSION AND LIQUID-SOLID CONTACT ANGLE ON LIQUID ENTRY INTO POROUS MEDIA,
California Univ., Riverside.
C. L. Watson, J. Letey, and M. A. Mustafa.
Soil Science, Vol 112, No 3, p 178-183, 1971. 6 fig, 1 tab, 8 ref. OWRR B-072-CAL (4).

Descriptors: *Soil water movement, *Infiltration, *Porous media, *Surface tension, Testing, Analytical techniques, Soil properties, Water pollution sources, Surfactants, Repellents, Wettability, Liquids, Aqueous solutions.
Identifiers: Ethanol solutions.

Liquid surface tension and liquid-solid contact angle parameters were used to estimate relative initial rates of liquid entry into soil as a function of surface tension. The method can predict the surface tension at which infiltration rate will be maximized, and this value is readily found for water-repellent soils. Expected relative rates were

derived as a function of surface tension for two water-repellent and two wettable soils and were compared with actual infiltration and capillary rise data for the same media using both a series of aqueous ethanol and surfactant solutions. There was reasonable agreement between expected and actual rates of entry of ethanol solutions using both infiltration and capillary rise techniques. However, actual infiltration data with surfactant solutions and repellent soils did not give the expected result. The anomaly was attributed to the adsorption of surfactant by the soil with a resultant increase in surface tension. This effect was not a major factor the Pachappa sandy loam, which gave good agreement between expected and measured data. (Woodard-USGS)
W72-11463

EFFECT OF TWO NONIONIC SURFACTANTS ON PENETRABILITY AND DIFFUSIVITY OF SOILS,
California Univ., Riverside.
M. A. Mustafa, and J. Letey.
Soil Science, Vol 111, No 2, p 95-100, 1971. 4 fig, 3 tab, 9 ref. OWRR B-072-CAL (2).

Descriptors: *Soil water movement, *Surfactants, *Penetration, *Diffusivity, *Infiltration rates, Irrigation, Testing, Analytical techniques, Agricultural, Water conservation.
Identifiers: Nonionic surfactants, Water-repellent soil, Alkyl polyopyethylene ethanol.

The effects of two nonionic surfactants, Soil Penetrant and Aqua Gro, on penetrability and diffusivity of 0.01 N CaSO4 solution in wettable (Pachappa) and water-repellent (Morris Dam) soils were studied. The usefulness of equations in predicting unsaturated flow of surfactant-treated water in soils was also evaluated. The addition of the two surfactants either slightly decreased or had no effect on penetrability and diffusivity of .01 N CaSO4 solution in the wettable Pachappa soil. The slight decrease was attributed to decrease in aggregate stability of the soil. Addition of the two nonionic surfactants increased penetrability and diffusivity of .01 N CaSO4 in the water-repellent Morris Dam soil. The equations held to some extent in the wettable system. Slight deviations were explained on the basis of change in geometry. These equations failed to predict penetrability and diffusivity in the water-repellent system. (Woodard-USGS)
W72-11658

SOIL MOISTURE INFLUENCE ON TREATMENT AND EXTRACTION OF DDT FROM SOILS,
Agricultural Research Service, Beltsville, Md. Maryland Plant Science Research Div.
For primary bibliographic entry see Field 05A.
W72-11714

THE RAPID DETERMINATION OF TUNGSTEN IN SOILS, STREAM SEDIMENTS, ROCKS AND VEGETATION,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 05A.
W72-11730

NOTE ON THE SOILS OF THE LORRAINE LIASSIC (JURASSIC) PLATEAU (REGION OF NOMENY),
Ecole National Superieure d'Agronomie, Nancy (France). Laboratoire de Pedol.
A. Guckert, A. Girard, and F. Jacquin.
Bull Assoc Fr Etud Sol. 2. p 29-51. 1970. Illus. Maps.
Identifiers: *France, *Jurassic plateau, Liassic, Lorraine, Nomeny, Plateau, *Soils.

A systematic charting, on a scale of 1/25,000 made it possible to establish general lines concerning the characteristics, systematics (soil geology) and evolution of the heavy soils of the liassic plateau of Lorraine and to outline the hydromorphous zones deserving drainage priority. Three large groups of soils are distinguished as to origin: alluvial soils, heavy soils on a marno-calcareous substrate, and brownish hydromorphous soils superposed on limonite formations.--Copyright 1972, Biological Abstracts, Inc.
W72-11734

2H. Lakes

NONDESTRUCTIVE DETERMINATION OF ELEMENTS IN SPECIFIC FRESHWATER MICROPLANKTON BY ACTIVATION ANALYSIS,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 05A.
W72-11093

ON THE EXPERIMENT ON DESTRATIFICATION OF RESERVOIR WATER BY AIR--BUBBLING, (SECOND REPORT), (IN JAPANESE),
For primary bibliographic entry see Field 05G.
W72-11326

HARVEST AND SURVIVAL OF RAINBOW TROUT INFECTED WITH SANGUINICOLA DAVISI WALES,
California State Dept. of Fish and Game, Sacramento.
K. R. Rawstron.
Calif Fish Game. Vol 57 No 4 p 253-256. 1971.
Identifiers: Fish harvest, *Rainbow trout, Salmo gairdneri, *Sanguinicola davisi, Survival.

Rainbow trout, Salmo gairdneri, heavily infested with the blood fluke, Sanguinicola davisi, showed good annual harvest and survival rates, good growth, and a low cost to the angler's creel in an intermediate type of reservoir with few limnetic predators or competitors.--Copyright 1972, Biological Abstracts, Inc.
W72-11330

COMPARATIVE ASPECTS OF THE BIOLOGY OF PIKE, ESOX LUCIUS L., IN TWO SCOTTISH LOCHS,
Glasgow Univ. (Scotland). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-11331

FACTORS AFFECTING ABUNDANCE OF LAKE HERRING (COREGONUS ARTEDII LEUEUR) IN WESTERN LAKE SUPERIOR,
National Marine Fisheries Service, Woods Hole, Mass. North Atlantic Fisheries Research Center.
E. D. Anderson, and L. L. Smith, Jr.
Trans Am Fish Soc. Vol 100, No 4, p 691-707. 1971. Illus. Map.
Identifiers: *Abundance, *Cisco, Competition, Copepods, Coregonus artedii, Coregonus hoyi, Fisheries, Fish diets, Osmerus mordax, Plankton, Smelt, *Lake Superior.

A field and laboratory study was conducted in 1965-1968 to investigate factors affecting C. artedii abundance in western Lake Superior. Commercial landings in Nov.-Dec. in the Duluth-Superior area dropped from 1,117,000 lb in 1954 to 2000 lb in 1966. Wisconsin catches also declined markedly. Abundance and fishing intensity indices decreased with landings. Commercial catches and abundance of chubs (C. spp.) and smelt (Osmerus mordax) increased simultaneously with the herring reduction. Biological characteristics of Duluth-Superior and Apostle Islands (Wisconsin) herring stocks were examined and compared. Herring eggs were more abundant and viable in the latter area, and laboratory hatching success was significantly greater for Apostle Islands eggs. Herring larvae were generally more abundant and smaller in the Apostle Islands; distribution and growth did not differ between areas. Abundance of larvae in both areas declined sharply in June-July. Average age of adult herring in commercial catches increased from 3.9 yr in 1950-1959 tp 5.1 in 1966-1968 but showed no significant difference between areas. Percentage of females did not show a trend from 1960-1968; however, the 1968 percentage of 85.0 was the greatest since 1962. Percentage of females increased with age. Average length and weight increased from 11.3 inches and 0.33 lb in 1950-1959 to 13.4 in and 0.67 lb in 1966-1968. Average number of eggs/oz of fish increased from 842 in 1950-1954 to 1105 and 1019 in the Duluth-Superior and Apostle Islands areas, respectively, in 1966-1967. Smelt was the most abundant species in both areas and more abundant at Duluth-Superior. Zooplankton were more abundant at Duluth-Superior. Sediment soil in the Duluth-Superior area contained a higher percentage of silt and organic matter than soil in the Apostle Islands and was possibly related to lower egg viability in the former area. Correlations between fishing intensity and herring abundance suggest that overfishing was not the major factor in the decline of the species. Predation was not a serious influence on herring. Food of herring, bloaters (C. hoyi), and smelt was quite similar during early stages. Herring larvae consumed exclusively copepods. Food similarities and highly significant negative correlations between herring and bloater abundance and herring and smelt abundance suggest that competition for food at the critical larval stage was likely the major influence in the lake herring decline.--Copyright 1972, Biological Abstracts, Inc.
W72-11334

DEVELOPMENT OF DOMINANT YEAR CLASSES IN A YELLOW PERCH (PERCA FLAVESCENS) POPULATION,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
J. L. Forney.
Trans Am Fish Soc. Vol 100, No 4, p 739-749. 1971. Illus.
Identifiers: *Dominant year classes, Perca flavescens, Fish populations, Predation, Trawling, *Yellow perch.

Abundance of young-of-the-year yellow perch in Oneida Lake, New York was estimated in 1959 through 1968 by shore seining in July and trawling in late summer. Seine and trawl catches were high in 1960, 1962, 1964, and 1968 and catches of age I+ perch in subsequent yr confirmed that these were dominant yr classes. Variation in numerical size of yr classes was less in the first yr than in the second which indicated a divergence in yr class abundance. Estimates of mortality based on the catch in trawls from Aug. to Oct. confirmed that weak yr classes generally experienced higher mortality than strong yr classes, thus mortality was depensatory. Changes in yr class biomass and estimates of perch consumed by the walleye population were consistent with the assumption that depensatory mortality was caused by predation.--Copyright 1972, Biological Abstracts, Inc.
W72-11341

THE ROLE OF THE GROWTH OF PHYTOPLANKTON UNDER ICE IN PRODUCING ORGANIC MATTER IN LAKE BAIKAL,
For primary bibliographic entry see Field 05C.
W72-11409

IMPROVED METHODS FOR DETERMINING CONTENTS OF CHLOROPHYLL, PROTEIN, RIBONUCLEIC ACID, AND DEOXYRIBONUCLEIC ACID IN PLANKTON POPULATIONS,
Nagoya Univ. (Japan). Research Inst. of Biochemical Regulation.
For primary bibliographic entry see Field 05A.
W72-11410

THE EFFECT OF LIGHT ON THE PHOTOSYNTHESIS RATE OF THE PHYTOPLANKTON OF THE SUPERFICIAL STRATA OF THE WATER,
For primary bibliographic entry see Field 05C.
W72-11411

SURVEY OF THE PLANT ASSOCIATIONS OF THE SOUTHERN PART OF EAST GERMANY: I. THE ASSOCIATIONS OF AQUATIC PLANTS,
For primary bibliographic entry see Field 05C.
W72-11429

FISH OF LAKE VYGONOVSKOE AND FISHERY. II,
Belorussian State Univ., Minsk (USSR).
F. N. Voronin, and V. V. Krylov.
Vestn Zool. Vol 5, No 3, p 40-44. 1971. English summary.
Identifiers: Abramis brama, Carassius auratus gibelio, Carassius carassius, Esox lucius, *Fish populations, Fishery, Perca fluviatilis, Rutilus rutilus, USSR, *Lake Vygonovskoe.

Characteristic morphological characters, growth rate and catch of predatory and some other species of fish in Lake Vygonovskoe are given. Fishery statistics for 1955-1967 show that the following species are of the greatest importance: Carassius auratus gibelio-55.5% , Esox lucius- (19.1%), Rutilus rutilus-5.45%, C. carassius-13%; Abramis brama-0.64% and Perca fluviatilis- (0.39%). As a result of repairs in the Oginsky canal, the water level in the lake became 0.5-0.6 m higher. This created an additional spawning and fattening area, which made it possible to increase acclimatization of C. auratus gibelio and its productivity in the lake from 13.5 kg/ha in 1948-1954 to 62.8 kg/ha in 1955-1967. C. auratus gibelio and E. lucius as well as A. brama, should be considered as promising fishery species for the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-11433

ECOLOGICAL STUDIES ON CHIRONOMIDS IN LAKE SUWA: I. POPULATION DYNAMICS OF TWO LARGE CHIRONOMIDS, CHIRONOMUS PLUMOSUS L. AND SPANIOTOMA AKAMUSI TOKUNAGA,
Shinshu Univ., Matsumoto (Japan). Faculty of Science.
H. Yamagishi, and H. Fukuhara.
Oecologia (Berl). Vol 7, No 4, p 309-327. 1971. Illus. Map.
Identifiers: *Abundance, *Diptera, Chironomus plumosus, Ecology, Japan, Lake Suwa, Population, Seasonal, Spaniotoma akamusi.

Populations dynamics of C. plumosus and S. akamusi in Lake Suwa were studied through a 4-yr period from 1967 to 1970. Based on the daily catches of midge by means of light trap, 3 emergence periods in a year were confirmed in C. plumosus (April-May, June-July and Aug.-Oct.) and only 1 in S. akamusi (Oct.-Nov.). C. plumosus produces 3 generations yearly in the littoral region. In the profundal region, however, it usually lacks the second generation and some part of the larvae of the first generation emerges finally in the third emergence period. Larvae of S. akamusi disappeared from the surface layer of mud bottom in May as the result of their burrowing. Pupation and emergence took place after their reappearance at the surface layer in Sept. In the imagines of C. plumosus trapped through an emergence period, males as a rule predominated over females (males 50-83%). The predominance of males over females was even more expressed in S. akamusi (males 83-93%). Population density of larvae of C. plumosus attained its maximum in June (c. 1200-5400 individuals/m2 in the profundal region) and in Oct. (1500 to 2100/m2 in the same region) with the appearance of newly hatched larvae in the lake bottom. The maximum of biomass appeared either in correspondence to that of population density or a little later, and reached 15-90 and 10-27 g fresh weight/m2 in the above-mentioned periods, respectively. Population density of larvae of S. akamusi reached a maximum (700 to 4800 individuals/m2 in the profundal region) in the period from Dec. to March. The maximum biomass was found in March (10-96 g fresh wt./m2) when the growth of the larvae had been almost completed. Survival rate of wintered larvae of C. plumosus was very low (6-7%) in 1968 and 1969, whereas it amounted to about 70% in 1970, followed by an unusually intensive emergence. The quantity of pupae produced in an emergence period was estimated based on the numbers of larvae before and after emergence. The total amount of pupae produced per year was estimated at 268-354 tons in C. plumosus and at 10-168 tons in S. akamusi for the whole lake. A certain quantitative relationship was found between the total number of trapped imagines and the estimated number of pupae produced in an emergence period in both species.--Copyright 1972, Biological Abstracts, Inc.
W72-11434

AN ANALYSIS OF COLONIZATION OF FRESHWATER MICROORGANISMS: I. COLONIZATION IN 17 STATIONS IN THE 5 LAKES OF MT. FUJI. (IN JAPANESE),
Tokyo Seitoku Coll. (Japan).
M. Suzuki.
Zoll Mag. Vol 80, No 6, p 191-201. 1971. Illus. English summary.
Identifiers: Actinopoda, Arachnomorpha, Ciliata, Colonization, Crustacea, *Mount Fuji, Gastrotricha, Japan, Lakes, *Microorganisms, Oligochaeta, Rhizopoda, Rotatoria, Species, Stations, Tardigrada, Turbellaria.

The individual densities of the community in 10 ml interstitial water at 17 sampling stations, each with 3 habitats at 6 localities, varied with the highest density at the littoral region of Lake Yamanaka and the lowest at the gravel area of Lake Motosu. In every case the most abundant class was Flagellata, followed by Ciliata. The population of Rhizopoda, Gastrotricha, Rotatoria and Nematoda was, without exception, richest in the mosses, and that of Ciliata was richest in the gravels. The composition of 330 spp. was: Rotatoria = 40.1%, Ciliata = 23.1%, Rhizopoda = 22.8%, Gastrotricha = 4.5%, Crustacea = 3.0%, Arachnomorpha = 2.4%, Actinopoda and Tardigrada = 1.2%, and Oligochaeta and Turbellaria = 0.9% (flagellates and nematods undetermined). The total number of species of each community ranged from 19 to 77, the richest in the mosses of Lake Kawaguchi and the fewest in the gravels of Lake Motosu. As to the relationship between the species densities and the habitats the general trend was that the majority of Ciliata, Oligochaeta, Rhizopoda, Turbellaria, Gastrotricha, Tardigrada and Arachnomorpha, especially of the latter 6 classes, evolved towards the xerophilous, while Crustacea towards the hydrophilous. Actinopoda and Rotatoria, however, remained in the hygrophilous biotope. The so-called 'pioneer' species around Mt. Fuji could be considered to fulfill at least the following 5 conditions: marine psammon dweller, smaller than 50 x 50 x 100 microns in size, producer or primary consumer, quick cyst former, and cosmopolitan. They include the following spe cies: Rhizopoda: Thecamoeba verrucosa, Assulina muscorum, Centropyxis aerophila, Corythion dubium, Euglypha laevis, Heleopela rosea, Nebella collaris, Trinema enchelys, Ciliata: Lacrymaria sp., Mesodinium sp., Coleps sp., Lionotus fasciolata, Frontonia sp., Colpoda inflata, Glaucoma sp., Cyclidium elongata, Rotatoria: Proales sp., Monostyla closterocerca, Lepadella patella, Colurella colurus, Cephalodella gibba and Bryceella sp.--Copyright 1972, Biological Abstracts, Inc.
W72-11437

LAKE ERIE--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-210 919, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 72-209, June 1972. 240 p, 221 ref.

Descriptors: *Bibliographies, *Abstracts, *Water resources, *Information retrieval, *Lake Erie, Publications, Documentation, Indexing, Classification, Information exchange, Hydrology, Data storage and retrieval.

This bibliography, containing 221 abstracts is one in a series of planned bibliographies in water resources produced wholly from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 41,521 abstracts covering SWRA through May 15, 1972 (Volume 5, Number 10). Abstracts with full bibliographic details are listed in ascending Accession Number order. A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Another index lists the authors alphabetically and gives page numbers for the abstracts. (Woodard-USGS)
W72-11440

LAKE ONTARIO--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-210 920, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 72-212, June 1972. 200 p, 129 ref.

Descriptors: *Bibliographies, *Abstracts, *Water resources, *Information retrieval, *Lake Ontario, Publications, Documentation, Indexing, Classification, Information exchange, Hydrology, Data storage and retrieval.

This bibliography, containing 129 abstracts is one in a series of planned bibliographies in water resources produced wholly from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 41,521 abstracts covering SWRA through May 15, 1972 (Volume 5, Number 10). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. A comprehensive index represents all of the descriptors and identifiers by which each paper in this bibliography has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Another index lists the authors alphabetically and gives the page numbers for abstracts. Abstracts with full bibliographic details are listed in ascending Accession Number order. (Woodard-USGS)
W72-11441

GLACIER DAMMED LAKES AND OUTBURST FLOODS IN ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11445

WINTER CLIMATOLOGY AND ICE CHARACTERISTICS: ST. MARYS RIVER-WHITEFISH BAY WATERWAY,
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 02C.

W72-11447

NEW DATA ON LAKES IN SOVIET CENTRAL ASIA (NOVYYE SVEDENIYA OB OZERAKH SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. M. Nikitin, and V. N. Reyzvikh.
In: Gornaya gidrologiya; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 54 (69), p 113-116, 1970. 2 tab, 5 ref.

Descriptors: *Hydrography, *Lakes, *Lake morphometry, *Lake morphology, Lake basins, River basins, Mountains, Elevation, Runoff, Bodies of water.
Identifiers: USSR, *Soviet Central Asia, Lowlands.

Tabulation of lakes in Soviet Central Asia was based on surface area, river-basin distribution, and elevation. Excluding the Aral Sea and Lake Balkhash, the total number of lakes is 7,181 and their total surface area is 10,443 sq km. The number of lakes having a surface area of less than 1.0 sq km is 6,782, and the number of lakes with a surface area of more than 100 sq km is 6, their expanse ranging from 719.05 sq km to 7,619 sq km. The number of lowland and mountain lakes is 4,154 and 2,956, respectively, and their total surface areas are 2,921 sq km and 7,517.64 sq km. Lakes cover 0.43% of the land area in Central Asia as compared with 0.86% in the Caucasus, 3.9% in northern Kazakhstan, and 10.7% in Karelia. (See also W72-11450) (Josefson-USGS)
W72-11459

CONDITION FACTORS AND LENGTH--WEIGHT RELATIONSHIPS OF THE FLATHEAD CATFISH, PYLODICTIS OLIVARIS (RAFINESQUE), IN LAKE CARL BLACKWELL,
Okla. State Univ., Stillwater. Okla. Coop. Fish. Unit.
P. R. Turner, and R. C. Summerfelt.
Proc Okla Acad Sci. 51: 36-40, 1971.
Identifiers: *Catfishes, Lakes, Mathematical models, *Oklahoma, Pylodictis olivaris, *Lake Carl Blackwell.

Condition factors are presented for 432 flathead catfish and length-weight relationships for 224 flathead catfish collected in Lake Carl Blackwell in 16 mo., from June 1967 through Sept. 1968. The condition factor (KTL) for flathead catfish varied with total body length. A curvilinear relationship of average K factor and total length gave a better fit than did a linear relationship for fish 20 mm through 519 mm. For fish 518 mm through 879 mm total length, a linear relationship gave a better fit. Females had a larger KTL factor than males, but the KTL varied with season. The greatest KTL values occurred in prespawning females. The average KTL for the 124 female and 90 male fish used for computation of length-weight relationships were 1.30 and 1.25, respectively. The length-weight relationship (logarithmic form) was (Log10 W = a+b Log10 L): Log W =-5.423 + 3.189 Log L.--Copyright 1972, Biological Abstracts, Inc.
W72-11551

EFFECTS OF VOLCANIC ASHFALLS ON CHEMICAL AND SEDIMENT CHARACTERISTICS OF TWO ALASKAN LAKES,
Alaska Univ., College, Inst. of Marine Science; and Washington Univ., Seattle, Dept. of Oceanography.
R. J. Barsdate, and R. C. Dugdale.
Journal Fisheries Research Board of Canada, Vol 29, No 3, p 231-236, 1972. 3 fig, 2 tab, 16 ref. NSF Grant G12169.

Descriptors: *Volcanoes, *Sediments, *Alaska, *Lakes, Chemical properties, Oligotrophy, Diatoms, Productivity, Runoff, Silica, Bottom sediments, Sedimentation rates.
Identifiers: Volcanic ashfalls, Mount Katmai (Alaska), Afognak Island (Alaska), Upper Jennifer Lake (Alaska), Little Kitoi Lake (Alaska).

Nature and extent of changes in sediment composition following volcanic ashfalls and approximate time scale involved in reestablishment of mature, pre-ashfall sediment conditions were evaluated, particularly to determine if modern lake sediments are still influenced by the 1912 Mt. Katmai eruption. Data and information on other southwest Alaskan lakes, were examined for indications of change in chemistry and fertility. At approximately 25 m depths, cores from two lakes on Afognak Island, 150 km southeast of the Aleutian volcanic arc, indicated that several ashfalls have formed continuous layers over the lake basins, at least partially returning the lakes to a juvenile state with respect to their sediments. Primary productivity was measured; results of 24-hour vertical series in situ were integrated, giving rate of carbon fixation per unit surface area. Above each ash layer, abundant diatom remains were found. The transition to mature lake conditions during several hundred years after each ashfall, followed a pattern characterized by decreasing diatom abundance and gradual increases in organic matter and clay-size inorganic particulates. High silica concentrations occurred in lakes within the area covered by the 1912 Mt. Katmai ashfall. (Jones-Wisconsin)
W72-11569

THE LIMNOLOGICAL ROLE OF AQUATIC MACROPHYTES AND THEIR RELATIONSHIP TO RESERVOIR MANAGEMENT,
Atomic Energy Commission, Aiken, S.C. Savannah River Ecology Lab.
For primary bibliographic entry see Field 05C.
W72-11574

PHYTOPLANKTON PRODUCTIVITY IN A WYOMING COOLING-WATER RESERVOIR,
Utah Univ., Salt Lake City. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-11575

EFFECTS OF STORAGE AND MAINSTREAM RESERVOIRS ON BENTHIC MACROINVERTEBRATES IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
For primary bibliographic entry see Field 05C.
W72-11576

PHYTOPLANKTON PRODUCTIVITY RESPONSE TO NUTRIENTS CORRELATED WITH CERTAIN ENVIRONMENTAL FACTORS IN SIX TVA RESERVOIRS,
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
For primary bibliographic entry see Field 05C.
W72-11578

THE DYNAMICS OF DENSITY-STRATIFIED RESERVOIRS,
Tennessee Valley Authority, Norris. Engineering Lab.
W. O. Wunderlich.
In: Reservoir Fisheries and Limnology, p 219-231. Special Publication No. 8, American Fisheries Society, Washington, D.C., 1971. 16 fig, 16 ref.

Descriptors: *Hydrodynamics, *Density stratification, Reservoirs, Water quality, Temperature, Dissolved oxygen, Tennessee Valley Authority, Velocity, Solar radiation, Heat transfer, Conduction, Convection.
Identifiers: *Tennessee Valley reservoirs.

Inflow and outflow play a major role in the development of water quality patterns in most reservoirs. If density stratification is present, water movements inside the reservoir can become complex. If denser layers are encountered, a second impoundment similar to that at the reservoir entrance occurs from which the underflow is lifted into a layer corresponding to its density to become an interflow. The interflow, overflow, or underflow result from the inflow density. The location of the turbine intake determines the zones from which most water is withdrawn. From reservoir to reservoir and even changing with the seasons in the same reservoir, the combination of inflow types and withdrawal patterns are different, resulting in great variety of flow patterns. Solar radiation penetration and free convective water movements are important factors in the water quality development of the surface layer. These reservoir dynamics and their influence on water quality are illustrated by selected data from TVA field investigations. Direct velocity measurements were made on several reservoirs to study flow mechanics; isotopic current analyzer was used to detect very slow velocities under field conditions. (Jones-Wisconsin)
W72-11579

THE ECOLOGY AND PRODUCTION OF COPEPODS, PARTICULARLY THERMOCYCLOPS HYALINUS, IN THE TROPICAL LAKE GEORGE, UGANDA,
Royal Holloway Coll., Englefield Green (England). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-11581

FECUNDITY, AGE AND GROWTH, AND CONDITION OF CHANNEL CATFISH IN AN OKLAHOMA RESERVOIR,
Oklahoma State Univ., Stillwater. Oklahoma Cooperative Fishery Unit.
A. Jearld, Jr., and B. E. Brown.
Proc Okla Acad Sci. 51: 15-22. 1971. Illus. Map.
Identifiers: *Catfishes, Fecundity, Growth, Fish management, *Oklahoma, *Reservoirs, Spawning, *Lake Carl Blackwell.

From Oct., 1967 through Aug., 1968, channel catfish were collected, chiefly by gill nets, from 6 major sites in Lake Carl Blackwell, a 3000 acre, turbid, old (dam completed in 1937) reservoir. Life history information, which can aid in the management of the sport fishery in this and similar bodies of water, was obtained. Data on fecundity, age and growth, length-weight relationships and condition factors are presented. Size at age and condition factors are among the lowest reported in the literature. The evidence indicated a late May into early June spawning period.--Copyright 1972, Biological Abstracts, Inc.
W72-11582

THE ORIGIN OF DYSTROPHIC SWINGING BOGS IN AN ALKALINE LAKE: ECOLOGICAL-CENOLOGICAL STUDIES ON THE LAKE VELENCE (HUNGARY),
Eotvos Lorand Univ., Budapest (Hungary). Botanikus Kertje.
For primary bibliographic entry see Field 05C.
W72-11602

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1970-71 WATER YEARS,
Geological Survey, Austin, Tex.
J. Rawson, H. L. Kunze, and H. J. Davidson.
Geological Survey Basic-data Report, 1972. 92 p, 10 fig, 37 tab, 9 ref.

Descriptors: *Water quality, *Chemical analysis, *Reservoirs, *Texas, *Basic data collections, Water analysis, Chemical properties, Water chemistry, Water temperature, Depth, Sampling, Surface waters, Laboratory tests.

Chemical analyses are tabulated for water samples collected at 64 reservoirs in Texas from October 1969 to September 1971. Comprehensive studies were made at 9 of the reservoirs, and samples were collected periodically from the other 55.

Maps showing locations of data-collection sites are included. (Woodard-USGS)
W72-11670

MANMADE POLLUTION AND AMERICA'S 100,000 LAKES,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05C.
W72-11702

BACTERIOPLANKTON QUANTITY AND BIOMASS IN FLOOD LAKES OF THE AMUR RIVER,
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
For primary bibliographic entry see Field 05C.
W72-11718

ANALYSES OF BENTHIC COMMUNITY STRUCTURE IN A RESERVOIR BY USE OF DIVERSITY INDICES,
Kansas State Teachers Coll., Emporia.
J. D. Ransom, and T. C. Dorris.
The American Midland Naturalist, Vol 87, No 2, p 434-447, April 1972. 4 fig, 3 tab, 9 ref.

Descriptors: *Benthic fauna, *Ecological distribution, *Biological communities, Oligochaetes, Nematodes, Diptera, Caddisflies, Biomass, Standing crops, Annelids, Bays, *Oklahoma, Physicochemical properties, Depth, Density, Water analysis, Animal populations, Distribution patterns, Conductivity, Aquatic insects, Hydrogen ion concentration, Dragonflies, Mayflies, Midges, Mosquitoes, Water beetles, Dissolved oxygen.
Identifiers: *Macroinvertebrates, Species diversity, Coelenterates, Keystone Reservoir, Damselflies, Cordylophora lacustris, Dero, Limnodrilus hoffmeisteri, Caenis, Hexagenia, Octogomphus specularis, Oecetis, Psychomyia, Agraylea, Berosus striatus, Palpomyia tibialis, Chaoborus punctipennis, Calopsectra, Cryptochironomus, Dicrotendipes, Glyptotendipes nr. lobiferus, Harnischia nr. arbortiva, Polypedilum nr. halterale, Procladius poss. bellus, Pseudochironomus fulviventris, Stictochironomus, Chironomus nr. attenuatus, Chironomus plumosus.

Benthic macroinvertebrate collections and physiochemical measurements were made monthly in four bays of Keystone Reservoir, Oklahoma (November 1965 October 1966). A total of 25 benthic macroinvertebrate species were collected. Benthic community structures were subjected to species diversity analysis and the results were related to selected physicochemical estimates. An inverse correlation existed between diversity and conductivity, and between diversity and depth; however, a direct correlation existed between conductivity and depth. There was also an annual diversity difference between bays with different water quality, indicating that diversity indices were an easy and reliable method for determining long term effects of waters of different qualities on the benthic fauna within reservoirs. (Snyder-Battelle)
W72-11729

IDENTIFICATION AND LOCATION OF ACTINOMYCETES IN THE SOUTHERN END OF LAKE MICHIGAN,
Chicago Dept. of Water and Sewers, Ill. Water Purification Div.
For primary bibliographic entry see Field 05A.
W72-11731

2I. Water in Plants

FISH PRODUCTION IN TWO IDAHO STREAMS,
Idaho Dept. of Fish and Game, Kuna.
W. H. Goodnight, and T. C. Bjornn.
Trans Am Fish Soc. Vol 100, No 4, p 769-780. 1971. Illus, Map.
Identifiers: Biomass, *Fish, *Idaho, Production, Rainbow trout, Streams, *Salmon River.

Fish production (tissue elaboration) were estimated in 2 tributaries of the Salmon River in Idaho. Fish in Big Springs Creek produced 11.8 g/m2/yr and in the Lemhi River 13.6 g/m2/yr. In Big Springs Creek juvenile rainbow-steelhead trout comprised most (84-95%) of the biomass present and contributed most of the production (88%). In the Lemhi River, however, a large population of unexploited whitefish made up most (60-80%) of the biomass but they contributed only 52% of the production. The desired yield from Big Springs Creek, an intensively managed stream, was steelhead trout smolts and the weight of the juvenile migrants was 34% of total production in the stream. In the Lemhi River, chinook salmon smolts were the primary desired yield and weight of smolts was probably less than 11% of total production. Virtually no yield was obtained from the whitefish population in the Lemhi River.--Copyright 1972, Biological Abstracts, Inc.
W72-11101

THE INFLUENCE OF TEMPERATURE ON THE PROCESS OF WATER UPTAKE BY DETACHED LEAVES AND LEAF DISCS,
Glasgow Univ. (Scotland). Dept. of Botany.
J. A. Milburn, and P. E. Weatherley.
New Phytol., Vol 70, No 5, p 929-938. 1971. Illus.
Identifiers: Cells, Discs, Expansion, Fractions, Plant growth, *Leaves, Resaturation, Ricinus communis-D, *Temperature, Tissues, *Moisture uptake.

When a water deficit was induced in a mature fuory turgid leaf of Ricinus communis L. the tissues could completely regain full turgidity by absorption of water at around 1C. This was true of large water deficits (40%) which greatly exceeded the cell wall volume (12%). This uptake, therefore, included movement into the protoplasts and was not restricted to the cell walls alone as was previously thought. However, resaturation of leaf tissues taken from plants which had suffered from drought for more prolonged periods, could be separated into 2 fractions. An uptake at 1C was attributable as before to recovery of turgor; an extra uptake at 25C seemed to be a growth phenomenon inhibited at the lower temperature. This represented a rapid cell expansion following a period of growth arrestment due to water stress. The implications of these findings for the measurement of relative water content are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-11247

INFLUENCE OF MIST ON FLORAL INITIATION OF PHARBITIS NIL,
Cornell Univ., Ithaca, N.Y. Dept. of Floriculture and Ornamental Horticulture.
K. Kimura, and H. B. Tukey, Jr.
Ber Ohara Inst Landwirt Biol Okayama Univ., Vol 15, No 2, p 61-67, 1971, Illus.
Identifiers: *Flowering, Light, *Mist, Pharbitis nil D.

Plants of Pharbitis nil 'Violet' were subjected to an atomized water mist treatment before, during and following photoinduction of floral initiation. Mist treatment in the light immediately before photoinduction suppressed flowering responses; treatment during photoinduction promoted floral initiation. Flowering responses were suppressed by a 4-hr or longer mist immediately following photoinduction. On the first and second day following photoinduction, flowering responses seem to be in an unstable state which can be affected by mist. However, on the third day, floral initiation was not inhibited by the mist.--Copyright 1972, Biological Abstracts, Inc.
W72-11253

STOMATAL OPENING QUANTITATIVELY RELATED TO POTASSIUM TRANSPORT: EVIDENCE FROM ELECTRON PROBE ANALYSIS,
Michigan State Univ., East Lansing. AEC Plant Research Lab.
G. D. Humble, and K. Raschke.
Plant Physiol, Vol 48, No 4, p 447-453, 1971, Illus.
Identifiers: Cells, Electron probe analysis, Osmotic pressure, *Potassium solutes, *Stomatal, Transport, Vicia faba D, Volume.

When stomata of Vicia faba opened (from a stomatal aperture of about 2 micro m to 1 of 12 micro m) the solute content of the guard cells increased by 4.8 x 10-12 osmoles/stoma. During the same time an average of 4.0 x 10-12 gram equivalents of K+ were transported into each pair of guard cells. This amount of K+, if associated with dibasic anions, is sufficient to produce the changes in guard cell volume and osmotic pressure associated with stomatal opening. Analysis of Cl, P, and S showed that these elements were not transported in significant amounts during stomatal opening. This finding suggests that the anions balancing K+ were predominantly organic. K+ was specifically required because no other elements, likely to be present as cations, were found to accumulate in appreciable quantities in guard cells of open stomata.--Copyright 1972, Biological Abstracts, Inc.
W72-11254

POTENTIAL SOLAR RADIATION ON PLANT SHAPES,
California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung, and S. S. F. Louie.
Int J Biometeor, Vol. 16, No. 1, p 25-43 1972 12 fig, 6 ref. OWRR B-100-CAL (2) + B-121-CAL (2).

Descriptors: *Latitudinal studies, *Solar radiation, Radiation, Absorption, *Energy budget, Seasonal, Plant growth, Plant physiology.
Identifiers: *Plant shapes, Reflection.

The thesis is presented that most plant-shapes, especially trees, resemble a combination of geometrical shapes which present their non-opaque bodies to incoming radiation, which is partially absorbed by the foliage. Such a hypothesis makes possible the quantification of the budget of energy of the entire plant. Findings are presented in regard to the receipt of direct and diffuse solar radiation from the sky (clear conditions), before reflection and absorption, on a variety of geometries which simulate common plant-shapes. An all-year simulation of potential insolation for such shapes was conducted for latitudes 0 deg to 90 deg. Each shape, latitude and each season exhibited its own characteristic patterns of the various energy cycles. Derived data differed materially from data applicable to horizontal surfaces. The simulated plant-shapes tended to avoid receipt of energy in the low latitudes, whereas the opposite occurred toward higher latitudes.
W72-11315

THE ESSENTIAL NATURE OF VITAMINE A IN THE DIET OF GOLDFISH (CARASSIUS AURATUS),
Pennsylvania Univ., Philadelphia. School of Veterinary Medicine.
J. H. Jones, E. B. Bullard, and A. Rodriguez.
Trans Am Fish Soc. Vol 100 No 4 p 676-681. 1971.
Identifiers: *Carassius auratus, *Fish diets, Goldfish, Pathology, *Vitamins, Nutrient requirements.

In an attempt to determine whether or not fish require dietary sources of vitamin A, commercially reared (C. auratus) were maintained in a darkened animal room in glass tanks with continuously circulating, filtered water which was constantly aerated. The fish, divided into 2 groups, were fed synthetic diets: one of which, the control diet, contained crystalline retinol acetate; the other, the experimental, was the same diet but

without the vitamin A acetate. Periodically a fish from one group or the other was sacrificed and the vitamin A of both liver and eyes determined. The carcasses were fixed in Bouin's fluid and perserved for histological study. The amount of vitamin A in the livers of the deficient fish decreased while that in the livers of the controls increased. At approximately the same time the deficient fish developed patological signs such as hemorrage into the eyes and other sites, exophthalmos, loss of scales, and anorexia followed by death. There was still considerable vitamin A in the eyes of deficient fish. None of these signs appeared in the fish on the complete diet, and the amount of vitamin A in the tissue remained high. Without exception every fish showing pathological changes also developed a severe, generalized infection. Only 1 control fish became infected and that was very slight. Similar results, but fewer in number, were obtained from preliminary experiments. These experiments demonstrate clearly that goldfish cannot synthesize vitamin A from ordinary dietary constituents. They also suggest that the vitamin deficiency increases the susceptibility of the fish to infectious agents.--Copyright 1972, Biological Abstracts, Inc.
W72-11323

SALINITY TOLERANCE OF CATFISH HYBRIDS,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. R. Stickney, and B. A. Simco.
Trans Am Fish Soc. Vol 100 No 4 p 790-794. 1971. Illus.
Identifiers: *Catfishes, Commercial fish, Hybrids, *Salt tolerance.

The salinity tolerance of several hybrids of channel catfish (Ictalurus punctatus) and blue catfish (I. furcatus) are examined since commercial production of these fish in brackish water may be attempted in the future.--Copyright 1972, Biological Abstracts, Inc.
W72-11325

PROGRESS REPORT ON REESTABLISHMENT OF THE MOJAVE CHUB, GILA MOHAVENSIS (SNYDER), AN ENDANGERED SPECIES,
California State Dept. of Fish and Game, Sacramento.
J. A. St. Amant, and S. Sasaki.
Calif Fish Game. Vol 57 No 4 p 307-308. 1971.

Descriptors: *Chubs, Endangered species, Gila mohavensis, *Reestablishment, Fish establishment.

Three localtities were planted with Mojave chubs as follows: Piute Springs and Two Hole Springs in San Bernardino County; and South Coast Botanic Garden Pond at Palo Verdes, California. Further suitable sites for introductions are being searched.--Copyright 1972, Biological Abstracts, Inc.
W72-11329

EFFECTS OF TEMPERATURE ON ELECTROLYTE BALANCE AND OSMOREGULATION IN THE ALEWIFE (ALOSA PSEUDOHARENGUS) IN FRESH AND SEA WATER,
Wisconsin Univ., Milwaukee. Center for Great Lakes Study.
J. G. Stanley, and J. Colby.
Trans Am Fish Soc. Vol 100, No 4, p 624-638. 1971. Illus.
Identifiers: *Alewife, Alosa pseudoharengus, Electrolyte balance, Osmo regulation, *Temperature, *Salinity.

A study of the effects of temperature and salinity on ionoregulation in A. pseudoharengus revealed that concentrations of Na, K, and Ca in plasma and muscle were similar in fish adapted to freshwater and those adapted to sea water. The nonstressed alewife is apparently an excellent ionoregulator in both environments. Acute exposure to cold caused a shift in plasma concentrations of Na and Ca toward environmental concentrations, i.e., these ions decreased in freshwater and increased in sea water. An ionoregulatory failure due to cold is suggested. High temperatures had little effect on plasma electrolyte levels in freshwater whereas in sea water the concentrations of Na, K, and Ca were elevated. Mortalities of the alewife in the Great Lakes may be caused by osmoregulatory failure induced by acute exposure to cold, but are probably not induced by exposure to elevated temperatures. Fish thermally acclimated in the laboratory or in Lake Michigan had essentially normal concentrations of blood electrolytes. In muscle, Na was reduced during exposure to acute cold in both freshwater and sea water. The effect of warm water on ion levels in muscle was, in general, opposite that of cold. These data suggest shifts of ions or water between cellular and extracellular fluids of muscle. Such shifts might affect the function of excitable tissue. Muscle tremors and loss of equilibrium observed in dying alewives during summer mortalities might be brought about when sudden temperature drops (e.g., as a result of upwellings which are common occurrences in the Great Lakes) induce disturbances in cellular or extracellular concentrations of ions. In the laboratory, alewife mortalities caused by increasing or decreasing temperatures were about equal in freshwater and sea water. These findings suggest that salinity does not modify the capacity of alewives to tolerate acute temperature stress.--Copyright 1972, Biological Abstracts, Inc.
W72-11332

REMARKS ON FRESHWATER BRYOZOA IN WESTERN NORWAY,
Bergen Univ. (Norway). Zoological Museum.
G. G. Raddum.
Fauna (Oslo). Vol. 24, No. 2, p 84-95. 1971. Illus. (Engl. summ.).
Identifiers: *Bryozoa, Calcium, Fresh-water, Ions, *Norway, Hydrogen ion concentration.

Very little is known about the freshwater moss animals in Norway and they are presumed to be rare. The 7 known species are mentioned and a list is given of localities where freshwater Bryozoa are found. The hydrogen-ion concentration (pH) and Ca++ for 12 localities are given. A key to the Norwegian species is given.--Copyright 1972, Biological Abstracts, Inc.
W72-11352

GROWTH RESPONSE OF CORN TO CHANGES IN ROOT TEMPERATURE AND SOIL WATER SUCTION MEASURED WITH AN LVDT,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 03F.
W72-11388

SPECIFIC MORPHOLOGICAL AND BIOLOGICAL FEATURES OF AQUATIC ADVENTITIOUS ROOTS IN PHRAGMITES COMMUNIS TRIN,
All-Union Research Inst. for the Paper Industry, Astrakhan (USSR).
A. P. Chuzhova, and L. Y. Arbuzova.
Bot Zh. Vol 55 (No 10): p 1473-1480 1970. Illus. English summary.
Identifiers: *Adventitious roots, Aquatic, Flooding, *Morpholish, Nutrition, Phragmites-Communis-M, *Roots.

The biological significance of the floating adventitious roots formed on the reed shoots in the aquatic medium during the period of inundation was studied in the Volga delta under different conditions of flooding. The floating adventitious roots play an essential role in the life of the reed. On the lower stem nodes they develop a dense network of branching lateral roots with a large absorbing surface and provide the plant with some additional nutrition from the aquatic medium. Both the yield of the aboveground phytomass and the quality of the raw materials obtained there depend on the duration of inundation and on the functioning of the floating adventitious roots. The data obtained may be useful in the reed cultivation.--Copyright 1972, Biological Abstracts, Inc.
W72-11398

SUCTION FORCE AND RESPIRATION RATE OF PICEA ABIES KARSTEN ROOTS IN FORESTS OF THE TAIGA ZONE,
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
M. A. Abrazhko.
Bot Zh. Vol 55, No 6, p 843-847. 1970.
Identifiers: Aeration, Forests, *Soil moisture, Picea abies G, Rates, *Respiration, Roots, Soils, Suction, Taiga zone, Saturated soils, Soil-water-plant relationships.

The intensity of respiration was studied in the roots of Picea abies. During periods of sufficient soil moisture the intensity of physiological processes in the roots of trees in highly productive associations was higher than in less productive swampy associations. During periods of decreased moisture the suction strength of the roots in associations with excess seasonal waterlogging of the soil and poor aeration can appear higher than in phytocoenoses growing on well-drained soils.--Copyright 1972, Biological Abstracts, Inc.
W72-11399

THE VEGETATION OF THE KEM'-LUDSK ARCHIPELAGO,
V. N. Vekhov.
Tr Kandalaksh Gos Zapovednika. 7. p 60-125. 1969.
Identifiers: *Kem'-Ludsk, Archipelago, Aspen D, Bilberry D, Birch D, Bogs, Crowberry D, *Forests, Lichen, Meadows, Moss, Pine G, Shrub, Spruce G, Tundra, USSR, Vegetation.

The archipelago is a part of the Kandalaksha Preserve and is located somewhat south of the Arctic Circle. Most of the area of the archipelago is occupied by forest. The most widespread are pine forests, constituting 68% of all the forested area; 7 types of pine forests are distinguished by moisture supply and edaphic conditions, and the most common of these is the bilberry-crowberry pine forest. Spruce forests occupy 13% of the area and are of 4 types, usually including pine and birch. The birch forests are primary, of 7 types, and often with an admixture of aspen. Aspen forests, which are found in low-lying areas, are rare and consist of 2 types. There are tundra types on most of the islands. Six types of tundra are distinguished: (a) stony Arctic tundra, found under the most extreme conditions; (b) stony lichen tundra, distributed in 6 associations on the upper parts of slopes; (c) shrub-lichen tundra, in 4 associations on steep protected slopes; (d) shrub tundra, occupying the lower parts of the slopes of southern and western exposures on which conditions are favorable for the accumulation of snow (2 associations); (e) moss-lichen tundra, found in the same habitats but with more abundant moisture (3 associations); (f) moss tundra on the southern slopes (2 associations). Bogs occupy 6% of the area; commest are upland and trasitional types, while the lowland types are very rare. Meadows, which occupy less than 1% of the area are of 5 types of which the commonest is the seaside type. Vegetation is of the shore and cliff type. Characterizations are given of the vegetation of each of the islands of the archipelago and profiles are given of the most important ones.--Copyright 1972, Biological Abstracts, Inc.
W72-11400

VEGETATION OF THE BOGS OF THE OKA-ZIMA INTERFLUVE IN IRKUTSK OBLAST,
I. G. Lyakhova.
Izv Biol-Geogr Nauch-Issled Inst Irkutsk Univ Vol 23 No 3 p 135-149. 1969.

Identifiers: *Bogs, *Irkutsk oblast, Oka-Zima interfluve, Peat, Sedges M, Shrubs, Sphagnum magellanicum, Sphagnum wulfianum, USSR, *Vegetation.

Six types of vegetation were distinguished according to the life forms of the plant edificators. Societies of the herbaceous type predominate, with dominance by tufted and other sedges. Herbaceous-hydrophilic-mossy eutrophic societies are also widespread. Less frequent are woody-hydrophilic-mossy societies. An interesting finding was flatmounded bogs in spurs of the eastern Sayan mountains with mounds 1 to 4 m in diameter which were coverdd with Sphagnum magellanicum, S. wulfianum, and shrubs. Two peat-bog areas were distinguished in the region examined: the foothill type with the bogs dominated by a considerable layer of peat (up to 3 m thick) with pronounced moss cover, and valley-type with bogs covered with low herbage associated with fallow land.--Copyright 1972, Biological Abstracts, Inc.
W72-11403

USE OF ECOLOGICAL PROFILE FOR THE INVESTIGATION OF SPATIAL DISTRIBUTION OF VEGETATION,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology.
G. S. Sabardina, and E. B. Vielichko.
Izv Akad Nauk Latv SSR. 5 p 12-19. 1970. Illus. English summary.
Identifiers: *Distribution, Ecology, Profiles, Soils, *Vegetation.

The character of a parcel natural swamp vegetation was not determined by any single ecological factor. Hydrological and edaphic conditions were improtant.--Copyright 1972, Biological Abstract, Inc.
W72-11405

THE ORIGIN AND DISTRIBUTION OF VALLEY GRASSLANDS IN EAST AFRICA,
For primary bibliographic entry see Field 04A.
W72-11408

EFFECT OF MOISTURE DEPLETION IN SEEDLINGS OF THREE PANICUM GRASSES DURING GERMINATION,
Jodhpur Univ. (India). Dept. of Botany.
A. Mukherjee, and U. N. Chatterji.
Bull Bot Soc Bengal. Vol 23, No 2, p 143-148. 1969. Illus.
Identifiers: *Moisture stress, Depletion, *Germination, Grasses M, Moisture, Panicum, Panicum antiodotale M, Panicum coloratum M, Panicum turgidum M, Seedlings, Temperature.

One day old seedlings of Panicum antidotale, P. coloratum and P. turgidum were subjected to moisture stress at different temperatures ranging from 5C to 50C and for 3 durations (1 1/2 to 4 1/2 gr). The seedlings were then placed in moist conditions for revival. In another set of experiments, the moisture loss due to desiccation was noted. The depletion of moisture was gradual and indicated a regular trend; except in P. antidotale where maximum loss was observed in 45C for 1 1/2 hr duration. There was comparatively less loss of moisture in P. turgidum. The temperature and duration interaction played a major role in determining the revival of growth. All species of Panicum studied could tolerate desiccation of the germinated seedlings up to 21% in high temperatures (30C to 45C). But at a low temperature (20C) 7-12% moisture loss from the seedlings might be detrimental to their revival for growth. P. turgidum was comparatively more tolerant to desiccation treatments.--Copyright 1972, Biological Abstracts, Inc.
W72-11414

DESICCATION-TOLERANT FLOWERING PLANTS IN SOUTHERN AFRICA,
Monash Univ., Clayton. (Australia). Dept. of Botany.
D. F. Gaff.
Science, Vol 174, No 4013, p 1033-1034. 1971.
Identifiers: *Drought tolerance, Africa, Desiccation, Flowering, Leaves, *Plants, Resistance.

The S. African flora contains a unique abundance of higher plants which withstand virtualty complete desiccation. Water potentials of field-dry leaves corresponded to 30-40% relative humidity. Mature leaves survived from 15 to approximately 0% relative humidity. Known examples were increased from 4-15 spp., which for the first time included grasses.--Copyright 1972, Biological Abstracts, Inc.
W72-11424

THE PRODUCTIVITY, STORED WATER, AND MINERALS IN SOME ASSOCIATIONS OF THE SOUTHERN TAIGA OF BOL'SHOI USHKAN' I ISLAND,
I. N. Beideman, P. K. Gagarin, and V. N. Pautova.
Tr Limnol Inst Sib Otd Akad Nauk SSSR. Vol 17, No 37: 3. 173-227. 1969.
Identifiers: Bilberry-D, Cycling, Islands, Larch-G, *Minerals, Nutrient, Pine-G, Productivity, Rhododendron-D, *Stored water, *Taiga, Transpiration, Ushkan, USSR, *Plants.

Studies were made of 3 associations: larch groves with mixed herbs, larch groves with mixed herbs and rhododendron, and pine-bilberry-mixed herbs-rhododendron. Determinations were made of the population sizes of the species/ha, stocks of the biomass, water, and minerals, and transpiration. All the variables are given for different stories of the plant association: woody,shrubby, and herbaceous. The amount of fresh matter in the association varied from 165 to 450 metric tons/ha, that of dry matter from 87 to 210. The amount of water stored in the plants of the association varied from 78 to 240 metric tons/ha and the amount of water in transpiration from 1441 to 2536 m3/ha. Ash varied from 0.43 to 0.77 metric tons/ha. Determinations were made of N, Ca, K, Mg, P, Al, Si, Fe, S, and Na. The ratio of the mineral content of the elements in the plants of each species is given. In each biogeocoenosis there is a rhythm of water and mineral exchange between the plant association, the soil, the atmosphere, and the bedrock. The most stable concentrations of elements are in the trees and bedrock. Those in the leaves, roots, and herbage of the association are the most labile. Those in the bedrock, on the one hand, and in the trunks and branches on the other, interact only periodically. The atmosphere interacts principally with the elements in the leaves, roots, and herbage, and with the soil.--Copyright 1972, Biological Abstracts, Inc.
W72-11431

ROLE OF ARTIFICIAL KNICKPOINTS FOR REPRODUCTION OF FORAGE AND TROUT RESERVES IN MOUNTAIN STREAMS OF THE UKRAINIAN CARPATHIANS,
Chernovtsy State Univ. (USSR).
I. D. Shnarevich, and Z. S. Starik.
Gidrobiol Zh, Vol 7, No 2, p 82-89, 1971, Illus, English summary.
Identifiers: Carpathians mountains, Forage, *Knickpoints, Reproduction, Reserves, Streams, *Trout, *Ukrainian, USSR.

Artificial knickpoints in mountain streams of the Ukrainian Carpathians are a rational and effective method of favoring the natural reproduction of Salmonoidei; the O2 conditions of water courses improve, the quantity and biomass of benthic population increase by 24.6% and 11.9-13.6%, respectively. Location and design of the knickpoints should correspond to the hydrological flow of mountain rivers.--Copyright 1972, Biological Abstracts, Inc.
W72-11562

STUDIES ON THE MOSQUITOES OF NORTH ARCOT DISTRICT, MADRAS STATE, INDIA: V. BREEDING PLACES OF THE CULEX VISHNUI GROUP OF SPECIES,
World Health Organization, New Delhi (India).
R. Reuben.
J Med Entomol. Vol 8, No 4, p 363-366. 1971. Illus.
Identifiers: Arcto, *Breeding, Culex-Pseudovishnui, Culex-Tritaeniorhynchus, Culex-Vishnui, *India, Madras, *Mosquitoes, Rice-M, Species.

Culex vishnui larvae were most common in fallow rice fields, C. pseudovishnui and C. tritaeniorhynchus larvae in planted rice fields. Large numbers of C. tritaeniorhynchus were also found in wells, ponds and ditches. In plow, flooded fallow fields and in fields with young paddy, C. vishnui larvae were dominant. By the time the paddy reached about .3 m (1 ft) high, C. pseudovishnui and C. tritaeniorhynchus began to replace C. vishnui. No statistically significant differences could be demonstrated between numbers of larvae from the edges of fields and from the interiors, but individual fields showed larvae to be concentrated in the area of the field furthest from water inlets.--Copyright 1972, Biological Abstracts, Inc.
W72-11577

SEASONAL DIAMETER INCREMENT OF OAK TRUNKS UNDER THE CONDITIONS IN THE VOLGA AREA NEAR GORKI,
K. K. Poluyakhtov, and L. V. Bobyleva.
Uch Zap Gor'K Univ. 84. 255-262. 1968.
Identifiers: Gorki, Humidity, *Oak-D, Precipitation, Quercus-Robur-D, Seasonal, Temperature, USSR, *Volga, *Tree trunks.

The seasonal course of growth in diameter of 3 Quercus robur trees (35, 50 and 100 yr old) was studied. Wood samples were taken during the day between 11 a.m. and 3 p.m. every 12-15 days. Air and soil temperature, precipitation and air humidity were measured. The increment begins in the middle of May when the mean daily air temperature is over 10 deg C, and the temperature at the ground surface is 15-20 deg C, coinciding with the onset of leaf bud opening; it ends at the end of Sept. or the beginning of Oct. when air temperature and soil temperature are below 10 deg C. Growth is maximum during the end of May-beginning of July, stops briefly in June-July, and rapidly increases during the end of July-beginning of Aug. The increment of the southern and western sides of the trunks is higher than on the northern and western sides. No clear relation was discovered between increment and weather conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-11596

PLANTATIONS OF CERTAIN VALUABLE TREE SPECIES UNDER THE VARIOUS FOREST GROWING CONDITIONS OF THE SHEKI-ZAKATALY ZONE,
M. Y. Khalilov.
Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior. 8: 167-174. 1968.
Identifiers: *Castanea-Sativa-D, Diospyros-D, Forest, Growth, Juglans-Regia-D, Oak-D, Pine-G, Plantations, Slopes, Soils, Species, *Trees, USSR, *Sheki-Zakataly zone.

Castanea stiva sativa is suitable for planting on deep, shallow and highly skeletal soils, on slopes of all exposures of steepness up to 20-25 deg C at an altitude of 600-1200 m. Plantations of Juglans regia should be located on rich, moist, soils (river terraces, narrow valleys, ravines, and gentle northern slopes). Combinations of J. regia with C. sativa or with Diospyros are possible on rich soil under moist growing conditions. On steep slopes (over 20-25 deg), pine, oak and shrubs should be utilized.--Copyright 1972, Biological Abstracts, Inc.
W72-11625

INFLUENCE OF CL- ON CHLOROPHYLL CONTENT IN THE LEAVES OF CHENOPODIUM ALBUM L,
Univerzita Pavla Jozefa Safarika, Kosice (Czechoslovakia). Faculty of Natural Science.
S. Kocurik, and A. Vojtun.
Biologia (Bratislava). Vol 26, No 1, p 77-80. 1971. Illus. English summary.
Identifiers: Biosynthesis, *Chenopodium-Album-D, Chenopodium-Strictum-D, Chloride, *Chlorine, *Chlorophyll, C, Ions, Leaves, Soils.

After analyzing leaves of C. album and C. strictum Roth, which grow in the vicinity of a small salt lake on soil with high Cl- contents, the Cl- content in dry leaf matter was directly proportional to Cl- concentration in the soil. The total chlorophyll content in dry leaf matter decreases as the Cl- concentration rises. On the basis of analysis, high Cl- concentrations have an adverse effect on chlorophyll biosynthesis.--Copyright 1972, Biological Abstracts, Inc.
W72-11684

WATER AND SOIL CONDITIONS IN THE DEVASTATED LOW MOOR-LAND,
Wyzsza Szkola Rolnicza, Lubin (Poland).
J. Borowiec.
Ann Univ Mariae Curie Sklodowska Sect E Agric. 24: p 105-123. 1969. Map. English summary.
Identifiers: Fertility, Grass-M, *Low moor-land, Muck, *Peat, Sedge-M, *Soils.

Due to excessive lowering of the ground-water level (80-130 cm) and of changes in the surface of moor-land caused by exploitation for peat, the water relations for the growth of meadow plants were very unfavorable. Under such conditions, the accelerated mineralization of peat mass brought the surface horizon soil (peat) to destruction and pulverization. The soils are characterized by little differentiated, strongly degraded muck soils formed of lowland peat (mainly of sedge peat). Physical and water properties of these soils are of unfavorable character and are dependent upon the method of soil utilization and the distance from post-peat pits. The growth of grasses is very poor.--Copyright 1972, Biological Abstracts, Inc.
W72-11687

THE DYNAMICS OF THE VEGETATION OF THE SOLONETZ-SOLONCHAK COMPLEX OF THE NORTHERN FOREST-STEPPE OF OMSK OBLAST AS RELATED TO CHANGES IN SOIL SALT AND MOISTURE CONTENT,
E. P. Pozdnyakova.
Uch Zap Omsk Gos Pedagog Inst. 51. 91-103. 1970.
Identifiers: Climate, Forests, Moisture, *Omsk Oblast, Soils, *Solonchak-Solonetz, Steppes, USSR, Vegetation, *Saline soils.

Observations were made for 3 yr at a station in the Lake Achikul' depression. An outline profile is given for the ecological series of the complex. The meteorological conditions of the year, changing salt content and soil moisture, influence the vegetation. The degree of this influence is different in different associations because of the water and salt conditions in the soil types. Tables are given of the change in salinity of the 0-20 cm soil horizon and of the change in soil moisture of the upper horizons of the soil under the associations of the ecological series. The soil complex by the lake changed the most during the years of observation. Tables are given of the Jacquard coefficients of floristic community and of the Y. Zlobin coefficients of similarity of phytocoenoses among the component associations; tables are also given for the comparative characterization of the vegetation of some associations of the ecological series of the complex in 1966 and 1967. When selection is made of plant soil-salinity indicators for similar complexes, consideration must be given to the meteorological conditions of the year. For some soil varieties separate indicators must be selected for dry and wet years.--Copyright 1972, Biological Abstracts, Inc.
W72-11716

ON THE MORPHOLOGY AND NATURE OF A LEECH OF THE GENUS PHILOBDELLA (HIRUDINOIDEA: MACROBDELLIDAE),
L. R. Richardson.
The American Midland Naturalist, Vol. 87, No. 2, p 423-433, April 1972. 6 fig, 24 ref.

Descriptors: *Systematics, Aquatic animals, *South Carolina, Invertebrates, Annelids, Worms.
Identifiers: *Leeches, *Philobdella gracile, Morphology, *Turkey Creek (S.C.).

The morphology of the pharnyx and associated structures, and the morphology and morphological relationships of organs on the anterior region of the paired male ducts have aided in the classification of two leeches collected from Turkey Creek, South Carolina, into the genus Philobdella (Hirudinoidea: Macrobdellidae). Distinguishing characteristics include the absence of a male median region, no female atrium or common oviduct, and a caecate vagina occupying the entire female median region. (Synder-Battelle)
W72-11733

2J. Erosion and Sedimentation

VARIATION OF BED FORM AND FLOW RESISTANCE IN ALLUVIAL CHANNELS,
Illinois University, Urbana. Dept. of Civil Engineering.
B. C. Yen.
In: Proceedings of 14th Congress, International Association for Hydraulic Research, Paris, France, 1971, Vol 3, p 83-90, 1971. 2 fig, 20 ref. OWRR A-033-ILL (2) agreement no.

Descriptors: *Channel morphology, *Alluvial channels, *Particle size, *Froude number, *Settling velocity, Sediment transport, Scour, Sedimentary structures, Roughness (Hydraulic), Bed load, Discharge (Water).

The bed form and the hydraulic resistance of alluvial channels are functions of the Froude number, Reynolds number, ratio of width to depth, channel shape, ratio of sediment size to hydraulic radius, standard deviation of sediment particles, and ratio of sediment fall velocity to shear velocity. Hence, any change in flow, channel, or sediment characteristics which would vary the magnitude of any one or more of these dimensionless parameters would cause changes in the bed form and flow resistance. For sediment-laden flow with a large ratio of width to depth and relatively uniform particles, analysis of flume data indicates that as a first approximation the bed form is simply a function of the Froude number and the ratio of sediment size to hydraulic radius. By using this simple relationship, variations of bed form due to changes in channel slope, cross section, discharge, or sediment size can be found. (Knapp-USGS)
W72-11285

SIMULATION TECHNIQUE FOR SUSPENDED AND BED LOAD FOR SILT EJECTOR,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 08A.
W72-11356

AN INVESTIGATION OF RIVER BED DEGRADATION DOWNSTREAM OF A DAM,
Kyoto Univ. (Japan).
K. Ashida, and M. Michiue.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 3, Paris, France, p. 247-255, Aug-Sept 1971. 9 fig, 1 tab, 4 ref.

Descriptors: *Degradation (Stream), *River beds, *Bed load, *Sediment transport, *Sedimentation, Erosion, *Stream erosion, Gradation, Flow rates, Sediments, Grain sizes, Distribution patterns.
Identifiers: Japan, Bed load movement, Critical tractive force.

The results are given of an investigation concerning the degradation of a riverbed composed of graded material downstream of a dam. The investigation was based on the mechanics of bedload transportation for nonuniform sediment. The effect of nonuniformity of the material on the bedload transportation can be expressed by the difference of the threshold condition of movement for each grain size. Riverbed degradation can be treated by using a representative diameter for the sediment mixture when the material of every grain size is in the moving state. When some parts of the bed material are under the threshold condition of movement, an armor coat is formed. A method is proposed to predict the grain size frequency distribution of the armor coat and to estimate the amount of riverbed degradation based on an analytical model. (USBR)
W72-11361

TURBIDITY MEASUREMENT,
Florida State Game Freshwater Fish Commission, Eustis.
R. M. Dughrow, and W. H. Everhart.
Trans Am Fish Soc. Vol 100, No 4, p 682-690. 1971. Illus. Map.
Identifiers: *Suspended solids, *Measurement, Streams, *Turbidity, Water properties, Water measurement, Analytical techniques.

A quick and reliable method of measurement is necessary to set standard limits on the amount of suspended sediment to be tolerated in streams near land-use operations. Turbidity measurements may be useful if a major portion of the total turbidity is contributed by settleable solids, if a relationship exists between turbidity readings and weight per unit of volume of suspended sediment, and if a reliable meter is available. Water with turbidity readings greater than one JTU (Jackson Turbidity Unit) is generally composed mostly of settleable solids unless distorted by color. Non-filterable and total dissolved solids contribute variable amounts of light penetration reduction. Percentage contribution to turbidity of settleable solids is highly variable from sample to sample and from station to station. A high correlation exists between turbidity readings and weight for individual sediment types of suspension, but a poor relationship exists when sediment type is varied. Experiments conducted on the Hach model 2100, the Hellige, and the Jackson Candle turbidimeters resulted in a highly significant difference (alpha = 0.01) between readings on the same sample of suspended sediment. Turbidity is a questionable measure of suspended solids in water. A more accurate index would be suspended solids measured gravimetrically.--Copyright 1972, Biological Abstracts, Inc.
W72-11432

POSTGLACIAL LAHARS FROM MOUNT RAINIER VOLCANO, WASHINGTON,
Geological Survey, Washington, D.C.
D. R. Crandell.
Available from GPO, Washington, D.C. 20402, Price $2.00. Geological Survey, Washington Professional Paper 677, 1971. 75 p, 37 fig, 3 plate, 12 tab, 71 ref.

Descriptors: *Sedimentation, *Mudflows, *Volcanoes, *Washington, Landslides, Sediment transport, Debris avalanches, Avalanches, Floods.
Identifiers: *Lahars, *Mt. Rainier.

More than 55 lahars (mudflows and debris flows from a volcano) originated at Mount Rainier during Holocene time. These ranged in length from a few miles to 70 miles and in volume from a few million cubic yards to more than half a cubic mile. Many lahars have been triggered either by strong earthquakes or by volcanic explosions, or possibly by swelling that accompanied the ascent of molten rock into the volcano. Other lahars were created by the eruption of hot volcanic bombs, dense rock

fragments, and ash onto ice and snow at the summit of the volcano. Rapid melting of snow created floods down the volcano's flanks which carried down rock debris and also picked up loose detritus on valley floors to form lahars. Still other lahars resulted from precipitation of cloudburst proportions and by glacier outburst floods. Some outburst floods may have been caused by excessive melting of ice around subglacial steam vents. If future eruptions of Mount Rainier were to be similar in scale and type to those of the last 10,000 years, the greatest hazard would be that of lahars. Because of the restriction of lahars to the lower parts of valleys away from the immediate flanks of the volcano, valley floors would be especially hazardous. In view of the increased probability of lahar formation during an eruption, valley floors should be evacuated immediately within a radius of at least 25 miles from the volcano if an eruption should begin. (Knapp-USGS)
W72-11473

EFFECTS OF VOLCANIC ASHFALLS ON CHEMICAL AND SEDIMENT CHARACTERISTICS OF TWO ALASKAN LAKES,
Alaska Univ., College, Inst. of Marine Science; and Washington Univ., Seattle, Dept. of Oceanography.
For primary bibliographic entry see Field 02H.
W72-11569

FIELD OBSERVATIONS OF SAND TRANSPORT BY SHOALING WAVES,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
D. O. Cook, and D. S. Gorsline.
Marine Geology, Vol 13, No 1, p 31-55, June 1972. 16 fig, 1 tab, 38 ref. NOOO14-67-A-0269-0002.

Descriptors: *Sediment transport, *Beaches, *Littoral drift, *Waves (Water), *Surf, Rip currents, Coasts, Ripple marks, Ocean waves, California, Particle size, Sands.

Wave-generated currents and associated sand transport were studied in the offshore zone of southern California. A set of passing waves generates oscillating currents at the sea floor which have a spectrum of velocities whose average strengths over broad shelves are predicted accurately by classical wave theory. Long period swells and offshore breezes cause a net transport of bottom water towards the beach, while short period waves and onshore winds are associated with neutral or seaward flow. Ripple marks on the shallow sea floor, whose dimensions are a function of sediment size and current velocity, allow all available sand sizes to be moved with equal ease. A ripple remains in the same position even though sediment and water may be differentially transported. Most bottom sand transport occurs in the lowest few centimeters of the water column at a rate which varies with the square of current strength. Fine sand-grain size populations migrate in the direction of the greatest current velocities as a unit without being sorted. During winter in southern California, rip currents transport beach sand to the offshore where it is confined by predominant seaward oscillations caused by steep waves and strong winds. Rips are not active in calm summer months, and long period swells produce shoreward surge asymmetry which replenishes the beach with sediment. (Knapp-USGS)
W72-11662

VOLUMETRIC COMPONENT ANALYSIS OF UNCONSOLIDATED SEDIMENTS USING SLIT SIEVES,
Bristol Univ. (England). Dept. of Geology.
R. D. Channon, and A. T. Buller.
Marine Geology, Vol 13, No 1, p M7-M13, June 1972. 1 fig, 4 tab, 10 ref.

Descriptors: *Sieve analysis, *Particle size, *Particle shape, *Sieves, *Screens, Sedimentology, Sediments, Equipment.
Identifiers: *Slit sieves.

Slit sieves differ from conventional sieves because the apertures are elongate rather than square. Slit sieves size unconsolidated sediments according to maximum grain thicknesses. Conventional point-count procedures used in conjunction with grain thicknesses enable percentage volumes of sediment components to be determined. (Knapp-USGS)
W72-11664

SEDIMENTARY DYNAMICS UNDER TIDAL INFLUENCES, BIG GRASS ISLAND, TAYLOR COUNTY, FLORIDA,
Florida State Univ. Tallahassee. Dept. of Geology and Oceanography.
F. D. Walton, and H. G. Goodell.
Marine Geology, Vol 13, No 1, p 1-29, June 1972. 17 fig, 5 tab, 38 ref.

Descriptors: *Erosion, *Sediment transport, *Tides, *Sand bars, *Florida, Currents (Water), Ocean currents, Littoral drift, Coastal marshes, Tidal marshes.
Identifiers: Taylor County (Fla).

Tidal currents augmented by a general rise in sea level of about 0.5 ft since 1910 have reworked and redistributed relict Pleistocene and Holocene sediments in the low-wave energy environment around Big Grass Island, Florida. Alterations in the textural parameters of sediments from the storm berm, and tidal channels, deltas and flats are a result of local hydraulic energy regimes. The position of inflection points on cumulative grain-size distributions from all of the environments represents winnowing at specific levels of wave and current power. Forced tidal flow concentrated by barrier has initiated channel erosion, sediment transport and tidal delta deposition. Better channels facilitate more effective current concentrations, and enhance erosion. Flood-current velocities are controlled by tidal range, amount of tidal-flat exposure during the previous low tide, and equalization of head differential. Highest flood velocities occur at the beginning of the cycle. Tidal range and depth of minimum low water control the velocities of the tidal ebb currents. Highest ebb velocities occur in the latter part of each cycle. Tidal erosion is greatest when mean seasonal sea level is lowest. (Knapp-USGS)
W72-11665

ORIENTATION AND GROWTH FORM OF SEA FANS,
Hawaii Univ. Honolulu. Inst. of Marine Biology.
R. W. Grigg.
Limnology and Oceanography, Vol 17, No 2, p 185-192, March 1972. 4 fig, 2 tab, 18 ref.

Descriptors: *Coral, *Currents (Water), *Sedimentary structures, Paleohydrology, Sedimentology, Stratigraphy, Sedimentation, Benthic fauna.
Identifiers: Sea fans (Coral).

Comparison of field measurements of the orientation of branching planes of several species of sea fans with the magnitude and direction of currents indicates that fan-shaped gorgonians orient at right angles to dominant current flow and may be useful as indicators of the average direction of water motion. The mechanism by which orientation is achieved may be related to mechanical forces associated with water movement. Fans were transplanted to various flow regimes and subsequently studied for signs of damage and reorientation. Differences in branchlet diameter and spicule length in Muricea appear to be associated with water motion, in ways that may represent structural adaptations enabling the organisms to withstand large forces caused by waves in shallow water. (Knapp-USGS)
W72-11667

TECHNIQUES FOR ASSESSING WATER RESOURCE POTENTIALS IN THE DEVELOPING COUNTRIES WITH EMPHASIS ON STREAMFLOW, EROSION AND SEDIMENT TRANSPORT, WATER MOVEMENT IN UNSATURATED SOILS, GROUND WATER, AND REMOTE SENSING IN HY DROLOGIC APPLICATIONS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11672

NATIONAL SHORELINE STUDY--TEXAS COAST SHORES REGIONAL INVENTORY REPORT.
Army Engineer District, Galveston, Tex.

Available from NTIS, Springfield, Va 22151 as AD-730 691, Price: $3.00 paper copy; 95 cents microfiche. Army Corps of Engineers National Shoreline Study, 1971. 44 p, 7 plate, 28 photo, 4 tab.

Descriptors: *Beach erosion, *Shore protection, *Gulf of Mexico, *Estuaries, *Texas, Coasts, Reviews, Ocean waves, Beaches, Tidal effects, Hurricanes, Winds, Littoral drift, Currents (Water), Sands, Dunes, Breakwaters, Engineering structures, Costs, Deposition (Sediments).
Identifiers: Beach erosion inventory.

A general inventory is presented of shoreline erosion on the Gulf, bays and estuaries of the Texas coast, with possible remedial measures and approximate costs. Shore use, ownership, and other information pertinent to an overall appraisal of erosion problems are discussed. More than 200 persons were interviewed to obtain data pertinent to the study. Those interviewed were Federal, state, county, and city officials and private land owners. The shorelines were divided into three general types according to physical characteristics: Gulf shore beaches, comprising mostly fine sand, shell and shell fragments, which slope gently upward from the water to the sand dunes with heights ranging from 5 to 40 feet; coastal bay marshes of alluvial sand, clay and silt subject to frequent inundation by tides higher than normal; and bluffs, ranging from a few feet to more than 40 feet in height, which are a result of erosion from waves generated by prevailing winds. (Woodard-USGS)
W72-11674

RANDOM-WALK MODEL OF STREAM NETWORK DEVELOPMENT,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
J. S. Smart, and V. L. Moruzzi.
IBM Research Report RC 3108, October 14, 1970. 19 p, 5 fig, 4 tab, 16 ref.

Descriptors: *Simulation analysis, *Drainage patterns (Geologic), *Mathematical models, *Statistical models, Stochastic process, Networks, Computer models.
Identifiers: *Random walk models.

A random-walk, headward-growth model describes stream network development in a region of uniform lithology and uniform slope. The principal difference from previous models is that the probability of growth is dependent on the area contributing runoff to the stream tip. Two versions of the model were studied in detail and shown to give satisfactory results. A major advantage is that all of the important network variables, including drainage density and outlet density, come naturally out of the simulation processes. (Knapp-USGS)
W72-11676

THE DISTRIBUTION OF CO, CR, CU, FE, MN, NI AND ZN IN FRAMVAREN, A NORWEGIAN ANOXIC FJORD,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02K.
W72-11680

2K. Chemical Processes

FORMATION AND DISTRIBUTION OF MAGNESIUM BICARBONATE WATERS IN MESOZOIC BASINS OF EASTERN TRANSBAYKAL (NEKOTORYYE VOPROSY RASPROSTRANENIYA I FORMIROVANIYA GIDROKARBONATNYKH MAGNIYEVYKH VOD V MEZOZOYSKIKH VPADINAKH VOSTOCHNOGO ZABAYKAL'Y A),
Irkutskii Gosudarstvennyi Universitet (USSR).
T. N. Yas'ko, and V. G. Yas'ko.
Geokhimiya, No 7, p 866-872, July 1971. 2 fig, 2 tab.

Descriptors: Water chemistry, *Carbonates, *Bicarbonates, *Magnesium, *Sedimentary basins (Geologic), Aquifers, Groundwater, Wells, Springs, Streams, Permafrost, Ice, Freezing, Melting, Salinity, *Mesozoic era.
Identifiers:USSR, *Transbaykal, *Chita Oblast, Mineralization, Aureoles.

Local distribution of magnesium bicarbonate waters in the Olovskaya, Zyul'zinskaya, Arbagar, Shilka, and Unda-Dainskaya Mesozoic sedimentary basins in south Chita Oblast shows no clear lithologic association, but is related to areas of permafrost. Experimental freezing and gradual melting of 2 liters of Na-Ca-Mg bicarbonate waters with a mineralization of 300 mg/liter reveal that magnesium bicarbonates are the first salts released into solution. Initial melting of ice at near-zero temperatures increases the salinity of water in aquifers. (Josefson-USGS)
W72-11117

MODES OF OCCURRENCE OF LEAD AND ZINC IN CHELEKEN THERMAL BRINES (O FORMAKH NAKHOZHDENIYA SVINTSA I TSINKA V TERMAL'NYKH RASSOLAKH CHELEKENA),
Akademiya Nauk SSSR, Moscow. Institut Geologii Rudnykh Mestorozhdenii Petrografii, Mineralogii i Geokhimii.
L. M. Lebedev, N. N. Baranova, and I. B. Nikitina.
Geokhimiya, No 7, p 823-829, July 1971. 1 fig, 2 tab, 20 ref.

Descriptors: *Geochemistry, *Brines, *Lead, *Zinc, Ion exchange, Ions, Anions, Cations, Resins, Inorganic compounds, Chlorides, Carbonates, Sorption, Adsorption, Drill holes, Aquifers.
Identifiers: USSR, *Turkmen SSR, *Cheleken Peninsula, Ore deposits, Desorption.

Modes of migration of lead and zinc in hot brines of the Cheleken ore deposit off the west coast of the Turkmen SSR are investigated. On the basis of ion exchange, most of the lead and zinc in brines occurs as chloride complexes in the form of PbC13, PbC14, and ZnC13. Variation in desorption of lead from anion resins for samples from mouths of drill holes and aquifers in sandy-clay Neogene red deposits suggests the presence of carbonate-chloride Pb complexes in deep-seated brines. (Josefson-USGS)
W72-11118

ISOTOPIC COMPOSITION OF SULFATES IN NATURAL WATERS FROM SULFIDE DEPOSITS IN THE MIDDLE URALS (O VOZMOZHNOSTI ISPOL'ZOVANIYA IZOTOPNOGO SOSTAVA SUL'FATNOY SERY PRIRODNYKH VOD V KACHESTVE POISKOVOGO PRIZNAKA KOLCHEDANNOGO ORUDENENIYA NA SR EDNEM URALE),
Uralskoe Geologicheskoe Upravlenie, Sverdlovsk (USSR).
A. I. Gavrishin, and A. L. Rabinovich.
Geokhimiya, No 7, p 873-875, July 1971. 1 tab, 3 ref.

Descriptors: *Water chemistry, *Water analysis, *Isotope studies, *Sulfates, *Sulfides, Pyrite, Sulfur, Water types, Meteoric water, Groundwater, Mine water, Exploration.
Identifiers: USSR, *Ural Mountains, Hydrogeochemistry, Aureoles, Dispersion halos, Ores.

Hydrochemical prospecting is becoming increasingly important in searching for sulfide deposits, but complex and ambiguous interpretations of hydrochemical anomalies reduce the effectiveness of techniques. The purpose of investigations in the Middle Urals in 1968 was to find a reliable means of recognizing the character of sulfate anomalies by examining the sulfur isotopic composition of different types of natural waters. The values of S-34 in sulfates of meteoric water and groundwater were +5.4% and +6.3%, respectively. In mine waters of the Lomovskoye and Levikha pyrite deposits, the average value of S-34 was +1.65% or 4 times lower than its background value. Low values of S-34 in sulfates of natural waters of the Middle Urals can be used as a hydrogeochemical indicator of the presence of sulfide ores. (Josefson-USGS)
W72-11119

STOMATAL OPENING QUANTITATIVELY RELATED TO POTASSIUM TRANSPORT: EVIDENCE FROM ELECTRON PROBE ANALYSIS,
Michigan State Univ., East Lansing. AEC Plant Research Lab.
For primary bibliographic entry see Field 02I.
W72-11254

WATER WELL AND GROUND-WATER CHEMICAL ANALYSIS DATA, SUTTON COUNTY, TEXAS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 04B.
W72-11290

THE VAPOR PRESSURE ISOTOPE EFFECT IN AQUEOUS SYSTEMS. I. H2O-D2O (-64 TO 100 DEG) AND H216O-H218O (-17 TO 16 DEG); ICE AND LIQUID. II. ALKALI METAL CHLORIDE SOLUTION IN H2O AND D2O (-5 TO 100 DEG),
Tennessee Univ., Knoxville. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W72-11310

DEEP THERMAL STREAM IN THE DAGESTAN TERRITORY,
Scientific Council for Geothermal Studies, Moscow (USSR).
For primary bibliographic entry see Field 02F.
W72-11444

GEOHYDROLOGY OF JEFFERSON COUNTY, NORTHEASTERN KANSAS,
Kansas State Geological Survey, Lawrence.
For primary bibliographic entry see Field 04B.
W72-11464

ELECTRICAL PROPERTIES OF ICE--ANNUAL REPORT FOR THE PERIOD NOVEMBER 1970 TO OCTOBER 1971,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 02C.
W72-11471

SPECIFIC ACTIVATION ANALYSIS TECHNIQUES AND METHODS FOR THE ASSAY OF TRACE SUBSTANCES IN AQUATIC AND TERRESTRIAL ENVIRONMENTS,
Missouri Univ., Columbia. Dept. of Nuclear Engineering and Radiological Sciences.
For primary bibliographic entry see Field 05A.
W72-11612

COPPER, MANGANESE AND ZINC CONCENTRATIONS IN GULF OF MEXICO WATERS,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 05A.
W72-11656

EFFECTS OF VOLCANISM ON WATER CHEMISTRY, DECEPTION ISLAND, ANTARCTICA,
Leeds Univ. (England). Dept. of Earth Sciences.
H. Elderfield.
Marine Geology, Vol 13, No 1, p M1-M6, June 1972. 1 fig, 2 tab, 19 ref.

Descriptors: *Water chemistry, *Sea water, *Volcanoes, Silica, Manganese, Trace elements, Magmatic water, *Antarctic.
Identifiers: *Deception Island.

Waters from crater lakes on Deception Island and from coastal sea waters were collected and analyzed during a period of intense fumarolic activity and modified sea waters. The coastal seawater samples have salinities and major element levels typical of normal sea water in near-shore regions, and are only slightly modified as a result of marine weathering and runoff from melting of glaciers on the island. Samples from enclosed craters have salinities over 35%, but otherwise have major ion concentrations at normal levels. There is no evidence in any sample of fluoride enrichment. Concentrations of Al, Cu, Pb, Co, N and Zn showed no significant enrichment compared to averages for freshwater and seawater. Silicon and manganese, however, showed considerable variation from their levels in average sea water. Water samples from enclosed crater lakes are considerably enriched in both Si and Mn. (Knapp-USGS)
W72-11663

THE DISTRIBUTION OF CO, CR, CU, FE, MN NI AND ZN IN FRAMVAREN, A NORWEGIAN ANOXIC FJORD,
Scripps Institution of Oceanography, La Jolla Calif.
D. Z. Piper.
Geochimica et Cosmochimica Acta, Vol 35, No 2 p 531-550, February 1971. 8 fig, 6 tab, 35 ref.

Descriptors: *Chemical analysis, *Sediments *Chemical properties, *Fjords, *Trace elements Cobalt, Copper, Chromium, Iron, Manganese Nickel, Zinc, Mineralogy, Organic matter Suspension, Distribution, Dissolved oxygen, Environmental effects.
Identifiers: Norway.

Sediments collected from a Norwegian anoxic fjord were analyzed for Fe, Co, Cr, Cu, Mn, Ni and Zn. With the exception of Zn, the dominant factors affecting their distribution are the mineralogy of the land-derived lithogenic material and the abundance of organic matter. The importance of the chemical properties of the sedimentary environment upon the distribution of Zn and to a lesser extent Fe and Co, was evaluated by comparing their distributions in the fraction of sediment soluble in dilute acid with their suspension distributions in the water. Within suspended matter filtered from the water, Fe and Co exhibit fivefold and zinc a sevenfold increase in abundance to a depth of 20 m. Below 40 m, Co decreases in abundance in both suspended phase and sediments. Chromium is relatively abundant in suspended phases from the upper 20 m, but decreases sharply below this depth. The concentrations of Fe, Co and Cr, in filtered water samples, roughly parallel that of PO4, a decomposition product of organic matter. This supports analysis of the sediments which showed Fe and Co to be partially dependent upon the abundance of organic matter. (Woodard-USGS)
W72-11680

SIMULTANEOUS DETERMINATION OF COPPER AND MANGANESE WITH SODIUM DIETHYL DITHIOCARBAMATE,
Bridgeport Univ., Conn. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-11696

TITRIMETRIC MICRODETERMINATION OF YTTRIUM AND SCANDIUM: DISODIUM SALT OF RHODIZONIC ACID AS COMPLEXING AGENT,
Allahabad Univ., (India). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-11699

SENSITIVITY OF DETECTION OF THE ELEMENTS BY PHOTOELECTRON SPECTROMETRY,
Shell Development Co., Emeryville, Calif.
For primary bibliographic entry see Field 05A.
W72-11705

STANDARD SOLUTION FOR REDOX POTENTIAL MEASUREMENTS,
Foxboro Co., Mass. Research Center.
T. S. Light.
Analytical Chemistry, Vol. 44, No. 6, p 1038-1039, May 1972. 2 tab, 5 ref.

Descriptors: *Oxidation-reduction potential, *Electrodes, *Measurement, *Chemical analysis, Potentiometers, Quality control, Evaluation, Calibrations, Electrolytes.
Identifiers: Instrument development, Potentiometric titrations, Platinum electrode, Ion selective electrodes, Precision, Accuracy.

A ferrous-ferric solution has been formulated as a reasonably stable solution for calibrating or checking redox electrode systems. Experiments were conducted to measure the potentials of the platinum electrode against various reference electrodes in this solution. In closed glass and suitable plastic storage vessels the solution is stable for an indefinite period and increased in emf by less than 3 mV after a week of stirring in an open breaker and constant monitoring. It has been used at ambient conditions in the field with emf's within plus or minus 10 mV of those obtained experimentally. The solution permits a quantitative check on redox systems and provides a reference point for control data for a given process. (Mortland-Battelle)
W72-11707

TURBIDIMETRY VIA PARALLEL PHOTOMETRIC ANALYSIS-DETERMINATION OF SULFATE,
Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
For primary bibliographic entry see Field 05A.
W72-11708

THIN LIQUID INFRARED CELL FOR QUANTITATIVE STUDIES USING AQUEOUS SOLUTIONS,
General Technologies Corp., Reston, Va.
For primary bibliographic entry see Field 05A.
W72-11715

THE CONTRIBUTION OF GAS CHROMATOGRAPHY TO THE IDENTIFICATION OF SUBSTANCES,
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
V. G. Arakelyan, and K. I. Sakodynskii.
Chromatographic Reviews, Vol 15, No 2-3, p 93-110, December 1971. 1 tab, 182 ref.

Descriptors: *Gas chromatography, *Chemical analysis, Pollutant identification, Evaluation, Mathematical studies, Retention, Reliability, Equations, Organic compounds, Efficiencies, Methodology, Graphical analysis, *Analytical techniques, *Chromatography.
Identifiers: Column chromatography.

The problems of gas chromatographic identifications are reviewed in three parts: identification by means of one column or stationary phase, identification using several columns, and calculation methods. The investigation of the possible applications of the known methods of analytical, graphical and calculation identification indicates the considerable contribution of GC to the qualitative analysis of chemical compounds. During a short period, GC has developed from an analytical method for the separation of Substances into a powerful tool for physicochemical analysis, while remaining a simple, reliable, rapid and convenient method for the qualitative and quantitative analysis of mixtures of compounds. The approach to chromatographic identification has improved along with the development of GC. From simple methods, measurements by plotting graphs and empirical observations have evolved the application of correlations between characteristic values to the study of equations, which has led to the development of a number of complex methods and to putting the whole process on a scientific basis. (Mackan-Battelle)
W72-11725

FLAME IONISATION DETECTION (FLAME IONISATION PHENOMENA),
Ceskoslovenska Akademia Ved, Brno. Ustav Instrumentalni Analyticke Chemie.
P. Bocek, and J. Janak.
Chromatographic Reviews, Vol 15, No 2-3, p 111-150, December 1971. 10 fig, 323 ref.

Descriptors: Chemical reactions, Ionization, *Gas chromatography, *Chemical analysis, Oxygen, Nitrogen compounds, Organic compounds, Halogens, Metals, Ions, Temperature, Pressure, Electric currents, Electric fields, Mathematics, Physical properties, Hydrogen, *Reviews.
Identifiers: *Flame ionization gas chromatography, Flame ionization detector, Soot, Stoichiometry, Combustion, Hydrocarbons.

A review is given of flame ionization detection, an important principle in the detection of substances in gas chromatographic analysis. Those areas considered are: (1) mechanisms of flame ionization: flame types, the ionization of metals and oxygen-, nitrogen-, and halogen-containing substances; (2) the relation of ionization to characteristics of the flame system: ion profiles, the effects of sample introduction rates and physical variables such as pressure and temperature upon the flame system; and (3) the interaction between the electric field and the flame: currents, the combustion process. (Mackan-Battelle)
W72-11726

2L. Estuaries

JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-11131

ON THE OCEANOGRAPHY OF JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-11132

THE TIDES IN JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-11133

CIRCULATION IN JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-11134

PUGET SOUND OCEANOGRAPHIC RESOURCES.
Committee on Commerce (U.S. Senate). Subcommittee on Oceans and Atmosphere.
For primary bibliographic entry see Field 06G.
W72-11187

AN ANNUAL REPRODUCTIVE CYCLE OF THE GAPER CLAM, TRESUS CAPAX (GOULD), IN SOUTH HUMBOLDT BAY, CALIFORNIA,
Department of Fisheries and Forestry, Halifax (Nova Scotia).
J. R. Machell, and J. D. De Martini.
Calif Fish Game. Vol 57 No 4 p 274-282. 1971.
Identifiers: Annual, California, *Clams, Humboldt Bay (Calif), *Reproduction, Seasonal, Tresus capax.

A gaper clam bed in south Humboldt Bay was sampled from April, 1966, through April, 1967, to determine an annual reproductive cycle of the clams. Phases of gonad development are described. Ripe gonads were found from Nov. through Jan. Spawning occurred from Jan. through March and began at the time of the seasonal minimums in water temperature and salinity. Spent specimens first appeared at the end of Feb. and were present through April. Leucocytes were common in spent gonads and were associated with cytolysis of residual gametes. An inactive phase followed beginning in May and ending in July. Sex was not discernible during this latter phase. An active phase started in Aug. and continued into Nov. Gonia apparently are derived from follicular cells of the gonad. Sex is discernible from the active phase into the spent phase. The sex ratio was 1:1. The relationship of gonadal glycogen content, as determined by Reid (1969), and phases of gonad development are disscussed.--Copyright 1972, Biological Abstracts, Inc.
W72-11318

THE 1965-1967 MIGRATIONS OF THE SACRAMENTO-SAN JOAQUIN ESTUARY STRIPED BASS POPULATION,
California State Dept. of Fish and Game, Sacramento.
J. J. Orsi.
Calif Fish Game. Vol 57 No 4 p 257-267. 1971.
Identifiers: *Bass, California, *Fish migration, Morone saxatilis, Sacramento-San Joaquin Estuary (Calif).

Striped bass (Morone saxatilis) migrations are described based on tag returns from the third in a series of tagging programs dating back to 1950. In 1965-66 the general migration pattern was essentially the same as it was in 1958-61. No return to the pattern of the early 1950's in which few bass entered San Francisco Bay or the Pacific Ocean occurred. In general, larger fish moved farther downstream. Only medium-sized and large fish went to sea, and then only in the summer and fall. Small fish were the only ones common in freshwater during the summer. Major differences between 1958-61 and 1965-66 were a population shift from San Francisco Bay to San Pablo Bay during the winter, a downstream movement of small and medium-sized fish into San Francisco Bay during the fall, a shorter residence time in the ocean during the summer and a reduced oceanic range. All are difficult to explain. Fish length seemed to influence migration pattern more than sex did.--Copyright 1972, Biological Abstracts, Inc.
W72-11327

LIFE HISTORY AND ECOLOGY OF THE CYPRINID FISH NOTROPIS PETERSONI IN NORTH CAROLINA WATERS,
North Carolina Wildlife Resources Commission, Raleigh.
J. R. Davis, and D. E. Louder.
Trans Am Fish Soc. Vol 100, No 4, p 726-733. 1971. Illus.

Identifiers: *Shiners, *Life history studies, Crustaceans, Ecology, Fish diets, North Carolina, Notropis petersoni.

This study was designed to expand the knowledge of the life history and ecology of N. petersoni Fowler. N. petersoni, commonly called the coastal shiner, is found along the Coastal Plains from North Carolina to Mississippi. In North Carolina its range is confined to a few streams in the lower Cape Fear River Basin, in the Waccamaw River, and in Lake Waccamaw. The food of the coastal shiner is principally crustaceans with plant material being taken incidental to feeding. Observation of N. petersoni in aquaria indicated that their diet depends on available food, however, they prefer zooplankton. The lotic population of N. petersoni appears to feed on the same type of material as the lentic populations. The pH range found in the habitat of N. petersoni was 5.3 to 6.9 with the minimum pH tolerance limit obtained for N. petersoni under laboratory conditions being 4.9. Dissolved O2 ranged from 1.4 to 7.0 ppm under field conditions with a minimum tolerance limit of 0.9 ppm under laboratory conditions. The highest water temperature associated with N. petersoni was 84F in lotic environments and 89F in Lake Waccamaw. When water temperatures declined below 52F, N. petersoni moved to deeper water. Growth comparisons were made between lentic and lotic environments by the 't' test with the data indicating no significant difference between Lake Waccamaw, the lotic environment, and Livingston, Town, and Six Runs Creeks for age I and II fish. However, there was a significant difference between the Lake Waccamaw and the Northeast Cape Fear River populations.--Copyright 1972, Biological Abstracts, Inc.
W72-11333

A COMPUTER MODEL OF THE TIDAL PHENOMENA IN COOK INLET, ALASKA,
Alaska Univ., Fairbanks, Inst. of Water Resources.
R. F. Carlson, and C. E. Behlke.
Report IWR-17, 1972. 69 p., 14 fig, 11 ref, 4 append. OWRR A-028-ALAS (1).

Descriptors: *Tidal hydraulics, *Computer Models, *Finite Difference Method, *Inlets, Tides, Estuaries, Open Channel Flow Tidal Waters, Mathematical Models, Numerical Analysis, Translatory waves, *Alaska, *Model studies.
Identifiers: *Cook Inlet, *Knik Arm, Anchorage (Alas).

Cook Inlet, especially Knik Arm, Alaska, because of its strategic location represents an important but little understood resource to the State of Alaska. Its dominant hydraulic characteristics are the 30 foot tidal range, large (up to 8 knots) tidal currents, an unusual geometric configuration, and a large glacial sediment load. A one-dimensional finite difference computer model of the Inlet and Arm which calculates the flows and water surface elevations was constructed as a beginning effort in understanding the nature of the tidal hydraulic phenomena. Along with several simple analytic methods, the computer generated data indicated that the hydraulic regime may be adequately represented by one dimension, the high tides are not explained by the Inlet's length being close to that of one quarter-wave length, the existing data base does not justify a very complex modeling effort, and because of the importance of the Inlet, a great deal of additional studies are needed.
W72-11355

THE SEASONAL DYNAMICS OF VITAMIN B12 AND PHYTOPLANKTON VARIABILITY IN THE DALNEZELENETSKAYA GUBA (INLET) OF THE BARENTS SEA,
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 05C.
W72-11421

GENERAL STUDY OF CHEMICAL POLLUTANTS THROWN INTO SEA WATER: INVENTORY AND TOXICITY STUDIES,
Institut National de la Sante et de la Recherche Medicale, Nice (France). Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale.
For primary bibliographic entry see Field 05B.
W72-11428

WATER MEASUREMENTS OF COASTAL LOUISIANA,
Louisiana Wild Life and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
B. Barrett.
Available from NTIS, Springfield, Va 22151 as COM-72-10085, $3.00 in paper copy, $0.95 in microfiche. 1970. 196 p. BCF Project 2-22-R.

Descriptors: *Water measurement, *Coasts, *Estuaries, *Louisiana, Water yield, Volume, Surface waters, Water pollution control, Ecology, Ecosystems, Water pollution sources, Basic data collections, Lakes, Rivers, Gulf of Mexico, Water levels, Depth.
Identifiers: *Coastal waters (La), *Water area.

Water measurements of coastal Louisiana were made from the most recent maps available. Total water surface area, water volume, and number of surface acres at different water depths were determined. The increased use of Louisiana's coastal area during recent years by industry and municipalities, the exploitation of the region for natural gas, oil, and sulphur, and a growing fishing industry have created an immediate need for more information about the State's estuaries. Water pollution, future needs for greater food production from the sea, preservation of the estuaries, and the critical reduction of water table levels are a few of the problems which have recently instigated a great deal of research in Louisiana's coastal area. Water area and water volume data are essential to much of this research. The total water area in coastal Louisiana is 3,378,924 acres, and the total water volume is 23,140,497 acre-feet. (Woodard-USGS)
W72-11446

MAGNUSON COASTAL ZONE MANAGEMENT ACT OF 1972.
For primary bibliographic entry see Field 06E.
W72-11528

SOME RELATIONS OF LAND DRAINAGE, NUTRIENTS, PARTICULATE MATERIAL, AND FISH CATCH IN TWO EASTERN CANADIAN BAYS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05C.
W72-11566

ACID-IRON WASTE DISPOSAL AND THE SUMMER DISTRIBUTION OF STANDING CROPS IN THE NEW YORK BIGHT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W72-11570

MACROBENTHOS OF THE PAMLICO RIVER ESTUARY, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-11580

SEDIMENTARY DYNAMICS UNDER TIDAL INFLUENCES, BIG GRASS ISLAND, TAYLOR COUNTY, FLORIDA,
Florida State Univ. Tallahassee. Dept. of Geology and Oceanography.
For primary bibliographic entry see Field 02J.
W72-11665

A WATER BUDGET STUDY OF PUGET SOUND AND ITS SUBREGIONS,
Washington Univ., Seattle. Dept. of ceanography.
M. A. Friebertshauser, and A. C. Duxbury.
Limnology and Oceanography, Vol 17, No 2, p 237-247, March 1972. 6 fig, 6 tab, 7 ref.

Descriptors: *Water balance, *Hydrologic budget, *Sounds, *Washington, *Salinity, Estuaries, Straits, Bays, Streamflow, Water quality, Water chemistry, Water circulation.
Identifiers: *Puget Sound.

A water budget study for Puget Sound and its principal subregions, based on the freshwater, seawater, and total water budgets, determines the mean fluxes of water into and out of these regions, the freshwater content, and the change in freshwater content by month and by year. Data used to calculate the budgets include monthly mean values of precipitation, evaporation, runoff, changes in sea level, mean salt content, and the salinities of inflowing and outflowing waters for each subregion. The fluxes of water calculated in the budget analysis yield an approximation of flushing efficiency and replacement time for Puget Sound and its subregions. The monthly freshwater content, along with the fluxes of water and their salt load, indicates that river runoff does not by itself control the freshwater content of a particular subregion; considerable freshwater is added by the inflow of water from an adjacent embayment. (Knapp-USGS)
W72-11666

THE MEASUREMENT OF CONDUCTIVITY AND TEMPERATURE IN THE SEA FOR SALINITY DETERMINATION,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 07B.
W72-11669

NATIONAL SHORELINE STUDY--TEXAS COAST SHORES REGIONAL INVENTORY REPORT.
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 02J.
W72-11674

USE OF CONTINUOUS RECORDING SALINITY-TEMPERATURE-PRESSURE INSTRUMENTATION AT OCEAN STATION P (50N, 145W),
Fisheries Research Board of Canada, Nanaimo (British Columbia). Pacific Oceanographic Group.
For primary bibliographic entry see Field 07B.
W72-11722

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INCREASING PERMEABILITY OF REVERSE OSMOSIS MEMBRANES,
Canadian Patents and Development Limited, Canada (assignee).
J. Kopecek, and S. Sourirajan.
U. S. Patent No 3,536,612, 7 p, 5 fig, 4 tab, 1 ref; Official Gazette of the United States Patent Office Vol 879, No 4, p 1232, October 27, 1970.

Descriptors: *Patents, *Reverse osmosis, *Membranes, Separation techniques, Water purification *Permeability, Equipment, Water treatment Water quality.

This invention provides a method of altering the pore structure and increasing the permeability of reverse osmosis asymmetric membrane withou

reducing its separation factor. The side having the larger pore openings is contacted with a liquid at a pressure causing a significant back-flow of liquid and enlargement of the smaller pore openings on the opposite side of the membrane. (Sinha-OEIS)
W72-11150

PRODUCTION OF CHLORINE FROM SEA WATER,
K. Yanagase, T. Yanagase, and Y. Suginohara.
U. S. Patent No 3,536,598, 5 p, 12 fig, 2 ref; Official Gazette of the United States Patent Office Vol 879, No 4, p 1228, October 27, 1970.

Descriptors: *Patents, Sea water, *Electrolysis, *Chlorine, Water quality.

A method is provided for producing effective chlorine by direct electrolysis of sea water. Sea water is caused to flow steadily and simultaneously in parallel anodic and cathodic flow paths respectively on opposite sides of a porous diaphragm placed in parallel position between them. Deposition of impurities on the diaphragm is prevented by controlling the pH of the electrolyte. (Sinha-OEIS)
W72-11151

MULTIPLE EFFECT DISTILLATION APPARATUS,
General Electric Co., Schenectady, N.Y.
C. W. Lotz.
U. S. Patent No 3,536,591, 3 p, 3 fig, 11 ref; Official Gazette of the United States Patent Office Vol 879, No 4, p 1227, October 27, 1970.

Descriptors: *Patents, *Distillation, Equipment, Treatment, Separation techniques, Saline water, *Desalination, Water treatment, Water purification, *Heat transfer, Water quality.

Distillation compartments are constructed within a chamber. Each has a lower heat transfer wall which is inclined with respect to the local vertical at some angle such as 70 degrees and which has a top surface constituting an evaporation surface. Each compartment also has an upper heat transfer wall having a bottom surface which constitutes a condensing surface for the vapors that are produced. (Sinha-OEIS)
W72-11152

VALVE ASSEMBLY AND SELF-CLEANSING BRINE WELL SCREEN,
For primary bibliographic entry see Field 05G.
W72-11158

DISTILLATION APPARATUS HAVING CONCENTRIC RISER, EXPANSION AND CONDENSING CHAMBERS,
Vaponics, Inc., Waltham, Mass.
V. C. Smith.
U. S. Patent No 3,660,246, 3 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 898, No 1, p 237, May 2, 1972.

Descriptors: *Patents, Water purification, *Distillation, *Condensation, Equipment, Separation techniques, Water quality, Potable water, *Desalination.

Impure water is heated in a distillation zone to form steam. The steam passes through a riser which is constructed to cause the steam to move in a circular path. The steam passes through an expansion zone and then into a condensation zone. A filter may be provided between the riser and the distillation zone to entrain impurities. (Sinha-OEIS)
W72-11164

REVERSE OSMOSIS DEMINERALIZATION OF ACID MINE DRAINAGE.
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.
For primary bibliographic entry see Field 05D.
W72-11598

RECYCLE OF PAPERMILL WASTE WATERS AND APPLICATION OF REVERSE OSMOSIS,
Green Bay Packaging, Inc., Wis.
For primary bibliographic entry see Field 05D.
W72-11599

AMENABILITY OF REVERSE OSMOSIS CONCENTRATE TO ACTIVATED SLUDGE TREATMENT,
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.
For primary bibliographic entry see Field 05D.
W72-11606

REVERSE OSMOSIS FOR WATER RECLAMATION,
General Dynamics, San Diego, Calif. General Atomic Div.
For primary bibliographic entry see Field 05D.
W72-11647

VIRUS REJECTION BY THE REVERSE OSMOSIS-ULTRAFILTRATION PROCESSES,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05D.
W72-11650

3B. Water Yield Improvement

PROJECT COLD RAIN,
Air Weather Service, Scott AFB, Ill.
R. I. Sax, and T. S. Cress.
Available from the National Technical Information Service as AD-736 004, $3.00 in paper copy, $0.95 in microfiche. Technical Report 245, December 1971. 45 p, 41 fig, 2 tab, 5 ref.

Descriptors: *Cloud seeding, *Texas, *Weather modification, *Droughts, Meteorology, Rain, Water shortage, Cloud physics, Storms, Precipitation (Atmospheric).

An Air Force and Bureau of Reclamation rain-augmentation project was designed to help alleviate severe drought conditions in south-central Texas. From June 6, 1971 until June 30, 1971, three Air Weather Service WC-130B aircraft, specially equipped to deliver pyrotechnic flares, carried out a total of 35 cloud-seeding missions. More than 1000 seeding penetrations were made into more than 250 individual cumulus towers and 2671 flares, each emitting 25 grams of nucleating silver-iodide smoke, were expended. The operations encompassed a geographical area of approximately 75,000 square miles. On at least 25% of the operating days, significant localized increases in rainfall were observed following seeding. However, natural rainshower activity during the month was intensive and widespread enough to mask any large-scale contribution directly attributable to the seeding operations. Instrumentation was not sufficiently adequate to attempt an accurate analysis of seeding effectiveness. (Knapp-USGS)
W72-11286

THE EFFECT OF THE INADEQUATE MOISTURE AND LOW TEMPERATURES OF THE TRANSBAIKAL STEPPES ON THE MORPHOPHYSIOLOGICAL PROPERTIES OF HERBACEOUS PLANTS,
A. A. Gorshkova, L. D. Kopytova, and A. I. Spivak.
Izv Biol-Geogr Nauch-Issled Inst Irkutsk Univ. Vol 23 No 3 p 67-79. 1969.
Identifiers: Drought, Growth, *Herbaceous plants, *Moisture stress, Plant physiology, Plants, Steppes, *Temperature, *Transbaikal steppes, USSR, Xerophytes.

The continental conditions of the steppe raions of the southeastern Transbaikal have made possible the formation of a series of unique morphological traits of the herbaceous vegetation: low stature, predominance of rosette, semi-rosette, and cushion-shaped growth forms, polycephalous vertical rhizomes, shoots of the polycyclic type, etc. The phases of development of the plants studied are very similar during the growing period. With respect to water balance and its changes during drought, the following types are distinguished smong the herbaceous plants: euxerophytes, cryoxerophytes, and hemixerophytes. The most favorable water balance during drought is found in the hemixerophytes and cryoxerophytes.--Copyright 1972, Biological Abstracts, Inc.
W72-11404

ODROP--OKLAHOMA DROUGHT RELIEF OPERATIONAL PROGRAM,
Weather Science, Inc., Norman, Okla.
J. L. Sutherland, L. W. Cooper, and D. R. Booker.
Available from NTIS Springfield, Va 22152 as PB-207 043, $3.00 in paper copy, $0.95 in microfiche. Final Contract Report December 1971. 43 p, 6 fig, 5 tab, 16 ref, append. USBR Contract No 14-06-D-7192.

Descriptors: *Artificial precipitation, *Cloud seeding, *Oklahoma, *Silver iodide, Aircraft, Clouds, Radar, Data collections, Rainfall, Evaluation, Weather modification, Droughts.

Cloud seeding was conducted to augment precipitation in drought-stricken areas of Oklahoma during the two-month period beginning August 15, 1971. Over 175 clouds were seeded with about 42,000 grams of silver iodide released pyrotechnically by aircraft at cloud base. Digitized radar data from the National Severe Storms Laboratory WSR-57 radar showed that the seeding-related rainfall amount on 11 of the 19 seeding days was about 50,000 acre-feet or 16 billion gallons. Average rainfall intensity on five selected days was higher for seeded clouds than for non-seeded clouds. (Woodard-USGS)
W72-11657

3C. Use of Water of Impaired Quality

METHODS FOR EFFECTIVE RECLAMATION OF SALINE CALCAREOUS PEAT SOILS IN THE UKRAINE (PRIYEMY EFFEKTIVNOGO OSVOYENIYA ZASOLENNYKH KARBONATNYKH TORFYANYKH POCHV USSR),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11126

GENESIS OF GYPSUM SOLONCHAKS OF SOUTHERN KIRGHIZIA,
For primary bibliographic entry see Field 02G.
W72-11335

EFFECT OF GROUNDWATER TABLES ON THE WATER--SALT REGIME OF SOILS AND THEIR EVAPORATION CAPACITY IN THE VOLGA-AKHTUBA FLOODPLAIN,
V. V. Kolpakov, and S. A. Abdil'Din.
Dokl Mosk S-Kh Akad Im K A Timiryazev. 149. p 151-156. 1969.
Identifiers: Corn -M, *Evaporation, *Floodplains, Groundwater tables, Irrigation, Plant, *Saline soils, Soils, *Volga-Akhtuba (USSR).

With high (1-3 m) groundwater tables (WT), the loss of water was chiefly dependent upon the thermal conditions, height of WT and the plant cover. The maximum total loss of water by the field occurred in June-Aug., (57-63% of the total loss of water in May-Sept. on a field without plant cover, 62-80% on a corn field). Supply of water from the

WT was 54-63% when the WT lay at 1 m, 15-19% and 4%, respectively, when it lay at 2 and 3 m. High WT (0.5-1 m) increased the contents of solid residue and Cl. Irrigation with 800 cu m/ha desalinated the top layer but caused some accumulation of salts in the underlying layer.--Copyright 1972, Biological Abstracts, Inc.
W72-11346

DYNAMICS OF THE WATER-SALT REGIME OF THE MAJOR SOIL TYPES ON THE LEFT BANK OF KZYL ORDA IRRIGATED MASSIF,
Y. M. Popov.
Tr Inst Pochvoved Akad Nauk Kaz SSR. 17. 66-74. 1969.
Identifiers: Bank, Bog, *Irrigation, *Kzyl orda, Massif, Meadow, Paddy-M, Salt, *Soil types, Woodland, *Salinity.

The prevailing soils are alluvial-meadow ('tugai'-riparian woodland in Central Asia) soils of low salinity, 70-90 tons/ha. Depressions between channels contain meadow bog soils undergoing desertization with widely varying moisture contents (1500-5000 t/ha) and salinity (43-230 tons/ha). Paddy bog soils are distinguished by constant moisture contents (4000-5000 tons/ha) salinity (50-60 tons/ha). The water-salt regime of the soils is described.--Copyright 1972, Biological Abstracts, Inc.
W72-11420

TOTAL EVAPORATION DURING LEACHING OF SALINE SOIL (SUMMARNOYE ISPARENIYE PRI PROMYVKAKH ZASOLENNYKH ZEMEL'),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W72-11455

DETERMINATION OF EVAPORATION FROM FREE-WATER SURFACES DURING LEACHING OF SALINE SOIL (RASCHET ISPARENIYA S VODNOY POVERKHNOSTI PRI PROMYVKAKH ZASOLENNYKH ZEMEL'),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W72-11456

CERTAIN AGRICULTURAL TECHNIQUE PROBLEMS OF RAISING FOREST PLANTATIONS IN SALINE LANDS OF THE KURA--ARAKS LOWLAND,
S. M. Mamedov.
Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior. 8: 231-243. 1968.
Identifiers: Agriculture, Forests, *Irrigation, *Kura-Araks lowlands, Minerals, Plantations, *Saline soils.

In 1951-1962 the salt resistance of 43 tree and shrub species was studied; their scale showing the soil division into 5 agricultural forest salinity categories is given. Satisfactory conditions for the growth of roots of the tree and shrub species were found when the stable level of slightly mineralized groundwaters occurred deeper than 150 cm and intensely mineralized groundwaters deeper than 200 cm. Two methods of the establishment of forest plantations are recommended: plantations with wide interrows with planting along the irrigation furrows on 2 sides (ribbon planting) and dense plantations by 'coulisses' with wide interrows between the 'coulisses.' Irrigation standards are given for forest stands, as well as time and number of vegetation irrigations and the main types for mixing of tree and shrub species.--Copyright 1972, Biological Abstracts, Inc.
W72-11611

THE DYNAMICS OF THE VEGETATION OF THE SOLONETZ-SOLONCHAK COMPLEX OF THE NORTHERN FOREST-STEPPE OF OMSK OBLAST AS RELATED TO CHANGES IN SOIL SALT AND MOISTURE CONTENT,
For primary bibliographic entry see Field 02I.
W72-11716

3D. Conservation in Domestic and Municipal Use

WHY METERING MAKES SENSE.

The American City, Vol. 87, No. 4, p 72-75, 128-129, April, 1972.

Descriptors: *Water utilization, *Use rates, *Economic impact, Economic efficiency, Water demand, Water supply.
Identifiers: *Metering, *Water meters, Flat rates.

Water rates based on metering offer several advantages. First, since fair rates must be based on the amount of water used, metering provides the community with an opportunity to establish an equitable rate system. Second, metering prevents waste. With the ever-increasing demand for water and the spiraling processing costs, waste can no longer be tolerated. Third, meters pay for themselves in reduced plant requirements, postponement of plant additions, and the development of new water sources. Fourth, metering results in a permanent reduction in water use, although the percentage of reduction usually decreases slightly after several years. Fifth, remote-read meters have eliminated the need for meter readers to enter the premises, and have consequently ended the lock-out and call-back problems. The experience of Kingston, N.Y., offers an excellent example of metering's advantages. In 1958, Kingston began a universal metering program that resulted in a 27 per cent drop in average use--from 5.45 mgd in 1957 to approximately 4.0 mgd for the years 1960 through 1963. The peak day has never exceeded 6.7 mgd since metering began, whereas in 1957 it reached a record 8.3 mgd. Consequently, no increases in supply have been needed. (Settle-Wisconsin)
W72-11221

FEASIBILITY OF UTILITY TUNNELS,
Chicago City Dept. of Water and Sewers, Ill.
J. B. W. Corey.
Journal of the American Water Works Association, Vol 64, No 4, p 226-229, April 1972. 2 photo, 4 fig.

Descriptors: *Feasibility studies, *City planning, *Utilities, Legal aspects, Regulation, Management, Coordination, Economic feasibility, Engineering, Aesthetics.
Identifiers: *Utility tunnels.

The American Public Works Association Research Foundation concluded an eighteen month investigation on the feasibility of utility tunnels in urban areas in February, 1971. The following conclusions were made. (1) The advantages of utility tunnels undoubtedly outweigh the disadvantages in applicable urban situations, although some of the important advantages require quantification in monetary terms. (2 No general conclusion can be stated as to the feasibility of utility tunnels, since the feasibility will depend on the conditions present in each project. (3) Economic feasibility is expected to be found primarily in the high-density districts. (4) Gas, electric power distribution, telephone, water, steam, and other utilities found in the urban street right-of-way can be safely and dependably accommodated in a utility-tunnel system if proper precautions are taken and coordination among the utilities is effected. (5) Legal, regulatory, and management problems, although complex, can be resolved. (6) The provision of customer services leading from the utility-tunnel will be one of the more difficult engineering problems. (7) It can be expected that the utilities industry will be reluctant to move into utility-tunnel systems until they can be proved economically feasible and of general benefit to the public. (8) Engineering-economic analysis of the feasibility of utility-tunnel systems will be influenced by the values placed on aesthetics. (Strachan-Chicago)
W72-11474

7 PRINCIPLES FOR AN URBAN LAND POLICY,
E. N. Bacon.
Urban Land, Vol 30, No 4, p 3-8, April 1971. 6 fig.

Descriptors: *Planning, *Decision making, *City planning, *Land use, Ecology, Political aspects, Technology, Growth rates.
Identifiers: *Urban land policy, *Policy making.

Orderly, desirable growth can be achieved by developing a new combination of political and technological forces. An effective urban land policy is necessary if the U.S. is to make progress in the fight against urban chaos. Three elements in juxtaposition become the force in shaping the direction and character of city growth: (1) concern for ecology, (2) a clarification of the effect this new policy will have on both the rights of land owners and developers, along with the responsibilities of government, and (3) a national program of coordinated and purposeful public service facility delivery systems. Seven principles are proposed as a foundation for a more effective urban land policy. They are: land division, efficient land use, sewage limitations, public service system, growth management, rebuilding of the central city, and skillful interaction. (Strachan-Chicago)
W72-11475

CREATIVE WATERFRONT DEVELOPMENT,
Metropolitan Toronto and Region Conservation Authority, Woodbridge (Ontario). Waterfront Task Force.
K. G. Higgs, and W. A. McLean.
Journal of Soil and Water Conservation, Vol 27, No 2, p 62-65, March-April 1972. 3 photo.

Descriptors: *Planning, *Decision making, *Land use, *Lakes, Transportation, Jurisdiction, Control.
Identifiers: *Waterfronts, *Implementation, *Toronto.

The waterfront plan for the Metropolitan Toronto planning area represents a major attempt at creative waterfront development over a significant stretch of the Lake Ontario shoreline. The objectives of the plan are achievable and implementation is provided for by an agency which is both politically and technically qualified for the job, i.e., the Metropolitan Toronto and Region Conservation Authority. Preparation of the waterfront plan initially involved setting objectives for the plan based on an inventory of physical characteristics, existing development, development potential, and development constraints. Early in the planning process, studies were conducted to examine existing land use, waterfront access, transportation patterns, ownership and land values, and the relationships of municipal and agency jurisdictions within the planning area. Unique natural areas, viable marshes, quality beaches, and patterns of erosion and accretion were identified. (Strachan-Chicago)
W72-11485

SOLVING THE COMBINED SEWER OVERFLOW PROBLEM OF A MAJOR CITY,
Weston (Roy F.), Inc., Westchester, Pa.
For primary bibliographic entry see Field 05G.
W72-11488

A MODEL ON MUNICIPAL WATER DEMAND: A CASE STUDY OF NORTHEASTERN ILLINOIS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 06D.
W72-11489

CHICAGO'S LAKEFRONT PARKLAND: A GREAT LEGACY UP FOR GRABS,
For primary bibliographic entry see Field 06B.
W72-11491

COUNTY-WIDE STUDY FORECASTS WATER USE,
North Carolina State Dept. of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 06D.
W72-11492

POWER STRUCTURE STUDIES AND ENVIRONMENTAL MANAGEMENT: THE STUDY OF POWERFUL URBAN PROBLEM-ORIENTED LEADERS IN NORTHEASTERN MEGALOPOLIS,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 05G.
W72-11505

QUALITY OF STORMWATER DRAINAGE FROM URBAN LAND,
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.
For primary bibliographic entry see Field 05B.
W72-11651

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1970,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 02E.
W72-11661

3E. Conservation in Industry

EFFECT OF WATER AVAILABILITY ON MANUFACTURING EMPLOYMENT IN THE TENNESSEE VALLEY REGION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
For primary bibliographic entry see Field 06B.
W72-11208

AN ECONOMIC ANALYSIS OF WATER RESOURCE USE AND USE CONFLICTS OF SELECTED INDUSTRY GROUPS IN ALABAMA WITH RESPECT TO AREA DEVELOPMENT,
Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-11218

3F. Conservation in Agriculture

RECLAMATION AND WATER MANAGEMENT (MELIORATSIYA I VODNOYE KHOZYAYSTVO).
Ministerstvo Melioratsii i Vodnogo Khozyaistva Ukrainskoi, Kiev (USSR).
For primary bibliographic entry see Field 05D.
W72-11120

EFFECTS OF FERTILIZERS AND WASTE WATERS OF THE BORTNICHI IRRIGATION SYSTEM ON QUALITY OF WINTER WHEAT (VLIYANIYE UDOBRENIY I STOCHNYKH VOD BORTNICHSKOY OROSITEL'NOY SISTEMY NA KACHESTVO ZERNA OZIMOY PSHENITSY),
Ukrainskii Nauchno-Issledovatelskii Institut Fisiologii Rastenii, Kiev (USSR).
For primary bibliographic entry see Field 05D.
W72-11121

EFFECTS OF WETTING ON NITROGEN REGIME OF OLD-PLOWED PEAT SOIL, BASED ON POT TESTS (VLIYANIYE STEPENI UVLAZHNENIYA NA AZOTNYY REZHIM STAROPAKHOTNOY TORFYANOY POCHVY (PO DANNYM VEGETATSIONNOGO OPYTA)),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11125

THE MINIMUM SOIL MOISTURE AS AN INDICATION FOR IRRIGATION,
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
R. Boyanov, V. Tatarova-Krusteva, and S. Koleva.
Pochvozn Agrokhim. Vol 5, No 2, p 9-17. 1970. Illus. English summary.
Identifiers: Constants, Hydrology, *Irrigation, Meteorology, Minimum, *Soil moisture, Physiology, Plants.

Pre-watering soil moisture should be determined on the basis of pedological, phytoecological and meteorological considerations: the relationship between the soil and hydrological constants (the maximum water holding capacity, wilting points and moisture at which capillaries break) is different among soil types in horizons of a given profile; the water potential in different soil types with similar moisture content varies; the physiological features of the individual crops are different, and meteorological conditions vary throughout the growth period.--Copyright 1972, Biological Abstracts, Inc.
W72-11217

THE EFFECTS OF DROUGHT STRESS ON RESPIRATION OF ISOLATED CORN MITOCHONDRIA,
Illinois Univ., Urbana. Dept. of Agronomy.
D. T. Bell, D. E. Koeppe, and R. J. Miller.
Plant Physiol, Vol 48, No 4, p 413-415, 1971, Illus.
Identifiers: ADP, Corn M, Drought, Malate, *Mitochondria, NAD, Oxygen, Pyruvate, *Respiration, *Moisture stress, Succinate, Zea mays M.

Mitochondria were isolated from etiolated corn shoots (Zea mays L.) that were stressed to a measured water potential. The rates of mitochondrial respiration in state III, state IV, and without phosphate or ADP on a mg protein basis decreased as water stress increased with succinate, malatepyruvate, or reduced NAD as substrates. Coupling (as determined by respiratory control and ADP/O ratios) did not decrease with increasing water stress. At water potentials greater than -35 bars all respiration had ceased.--Copyright 1972, Biological Abstracts, Inc.
W72-11255

IRRIGATION AND ITS EFFECTS ON PRODUCTION,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
D. S. Rickard.
New Zealand Journal of Agriculture, Vol 124, p 18, January 1972. 2 fig.

Descriptors: *Irrigation, *Irrigation effects, *Pastures, *Crop response, Foreign countries, Soil properties, Grasses, Data collections, Perennial ryegrass, White clover, Crop production, Irrigation practices, Soil-water-plant relationships.
Identifiers: *New Zealand, Winchmore Irrigation Research Station.

The effect of dry soil conditions on pasture production and the results obtained with irrigation at Winchmore, New Zealand are presented. Production, in lb dry matter per acre, was measured at Winchmore over a 16-year period from both nonirrigated pasture and from pastures receiving a variety of irrigation treatments. Over this period the average rainfall from September to May was 23.4 inches, ranging from 17.09 inches in 1963-64 to 38.12 inches in 1952-53. The average production of the nonirrigated pasture (which is predominantly perennial ryegrass and subterranean clover) was 5400 lb dry matter/acre. Over the same period, a well-irrigated pasture (predominantly perennial ryegrass and white clover) gave an average yield of 10,600 lb dry matter/acre. (Woodard-USGS)
W72-11299

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, CATRON COUNTY,
New Mexico State Univ., University Park, Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W72-11311

THE EFFECT OF THE SUBSTRATE MOISTURE CONTENT ON THE GERMINATIVE CAPACITY OF BEECH SEEDS,
B. B. Mirzoev.
Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior, Vol 8, p 106-109. 1968.
Identifiers: Beech D, *Germination, Humidity, Litter, *Moisture content, Seeds, Substrates, *Soil-water-plant relationships.

The best conditions for germination are found at a litter humidity of 60-70% of its maximum water holding capacity and at 50-60% soil moisture. With the reduction of the substrate moisture, seedlings begin to appear later and on more widely scattered dates.--Copyright 1972, Biological Abstracts, Inc.
W72-11336

WATER REGIME OF SOIL UNDER PROLONGED IRRIGATION AND FERTILIZATION,
R. M. Khachetlov.
Uch Zap Kabard-Balkar Univ. 41. p 83-85. 1969.
Identifiers: *Fertilization, *Irrigation, *Calcareous soils, Soil moisture, *Chernozems.

The productive moisture content in the upper 1-m layer of calcareous chernozems exceeded 140 mm throughout the growing season with prolonged irrigation, but was only 60 mm, decreasing to zero toward the end of the growing season, without irrigation. Data are given of determinations of productive moisture in soils.--Copyright 1972, Biological Abstracts, Inc.
W72-11338

NUTRIENT REGIME OF CALCAREOUS CHERNOZEMS UNDER PROLONGED IRRIGATION AND MANURING,
R. M. Khachetlov.
Uch Zap Kabard-Balkar Univ. Vol 41. p 80-82. 1969.
Identifiers: *Chernozems, *Irrigation, *Manuring, Nutrients, *Calcareous soils.

The investigations were carried out in 2 10-field rotations, with and without irrigation. Results of studies made of the nitrates, phosphates and exchangeable K in the soil are presented.--Copyright 1972, Biological Abstracts, Inc.
W72-11340

THE EFFECT OF TIME AND RATE OF N APPLICATION ON THE PRODUCTIVITY OF GRASS SWARDS IN TWO ENVIRONMENTS,
North Wyke Experiment Station (England).
K. M. Wolton, J. S. Brockman, and P. G. Shaw.
J Br Grassl Soc. Vol 26, No 3, p 123-131. 1971. Illus.

Identifiers: *Application methods, *Crop response, *Fertilization, Dry matter, England, Environment, Grass M, *Nitrogen, Productivity, Rainfall, Rates, Rye, Sunshine, Swards, Time.

Six identical experiments (3 in Devon and 3 in Suffolk) investigated the effect of 200, 300 and 400 lb N/ac (224, 336 and 448 kg/ha), given in 1, 2, 4 or 8 equal applications, on the yield and seasonal production of perennial ryegrass swards cut every 25 days. Each rate of N increased DM (dry matter) and N yields. Giving the N in 4 or 8 dressings gave higher DM, but rather lower N yields, than applying the N in 1 or 2 dressings. The effect on DM yield of splitting the N was most marked at 400 lb N/ac (488 kg/ha). Seasonal production was closely related to the time of N application and most uniform where N was given in 8 dressings. Differences between Devon and Suffolk were most evident where the N was given in 4 or 8 dressings and occurred in the 2nd half of the season when the low rainfall in Suffolk apparently restricted N uptake and DM yield. The efficiency with which N taken up by the plant was used for DM production was affected by sunshine. It is concluded that rainfall and sunshine will limit the extent to which fertilizer N can be used to control herbage production.--Copyright 1972, Biological Abstracts, Inc.
W72-11347

WASTEWATER MANAGEMENT PROJECT MUSKEGON COUNTY, MICHIGAN,
Illinois Univ., Chicago. Center for Urban Studies.
G. W. Davis, and A. Dunham.
Available from the National Technical Information Service as PB-208 310, $6.00 in paper copy, $0.95 in microfiche. National Water Commission Report SBS-72-038, Nov. 1971, 322 p. Contract NWC 71-006.

Descriptors: *Sewage disposal, *Waste disposal, *Irrigation systems, *Waste treatment.
Identifiers: *Waste water management, *Institutional arrangements, *Muskegon County (Mich), Regional planning, *Spray irrigation.

A case study is presented of the regional planning effort which led to the adoption of a spray irrigation system for wastewater management in Muskegon County, Michigan. A general overview of the problems encountered by Muskegon County is given and the past exploitation of the environmental resources and the degradation which had taken place are described. Earlier attempts to provide areawide water resource management are described, and the recommended solution is explained, together with the steps leading to its implementation, which is now under way. The reasons for the success of the effort are analyzed, and factors which could prove useful to other communities in attempting to execute regional water management projects are outlined. It will be five, six or more years before the success of the wastewater management system can be evaluated. Appendices by David H. Walborn and Thomas Vitullo-Martin provide back-up. (NWC)
W72-11381

THE HYDRAULICS OF SPATIALLY VARIED FLOW IN AN IRRIGATION DISTRIBUTION CHANNEL WITH FURROW OUTLETS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. E. Garton, J. M. Sweeten, V. W. Uhl, Jr., and J. H. Edwards.
Available from the National Technical Information Service as PB-210 917, $3.00 in paper copy, $0.95 in microfiche. Completion Report (1971), 65 p. OWRR A-015-OKLA (5).

Descriptors: *Energy equation, *Hydraulic design, *Flow resistance, *Discharge, *Channel flow, Hydraulic properties, Mannings equation, Irrigation canals.
Identifiers: *Irrigation distribution channels.

This project consisted of three phases; I. The hydraulics of a concrete lined trapezoidal channel with rectangular side weir outlets; II. The hydraulics of a semi-portable sheet metal flume with circular outlets, and III. Field tests of a semi-portable sheet metal flume with circular outlets. For Phase I, discharge relationships were determined for different sizes of rectangular weirs with 45 deg slope. The channel hydraulic properties were defined and a method derived for directly computing water surface profiles. The variations in individual furrow discharge resulting from various flow, depths, weir spacing and size were determined. For phase II, a galvanized sheet metal flume was designed for structural stability and hydraulic efficiency. This flume was tested in the outdoor Hydraulic Laboratory to determine the Manning's roughness coefficients for spatially varied flow. Tests were run on circular orifices with full flow and with weir flow. Uniformity of discharge was determined for a two bay system. For phase III, the sheet metal flume design was revised, 710 feet of channel was built, and two years of field tests were conducted to determine its performance under field conditions. The stability tests of the system indicate a need for improved supports.
W72-11384

GROWTH RESPONSE OF CORN TO CHANGES IN ROOT TEMPERATURE AND SOIL WATER SUCTION MEASURED WITH AN LVDT,
Oregon State Univ., Corvallis.
E. W. R. Barlow, and L. Boersma.
Crop Science, Vol 12, p 251-252, March-April 1972. OWRR B-009-ORE (4).

Descriptors: *Temperature, *Soil temperature, *Heat flow, *Crop response, Corn (Field), Moisture stress, Soil-water-plant relationships.

The rate of corn (Zea mays L.) leaf elongation was continuously monitored with a Linear Variable Differential Transducer (LVDT) which accurately measures the rapid changes in leaf elongation rate that occur after a plant is released from stress. Short-term measurements of leaf elongation rate at varying root temperatures gave qualitatively similar results to those obtained by other workers in long-term experiments. The leaf elongation rate increased rapidly when plant roots were released from low temperature or water stress. The maximum leaf elongation rate achieved after the release from stress was higher than the maximum rate of unstressed plants.
W72-11388

INFLUENCE OF THE VOLUME OF WATER APPLICATIONS ON GROWTH AND DEVELOPMENT OF SPRINKLER IRRIGATED MAIZE, (IN BULGARIAN),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
J. Delibaltov.
Rastnivod Nauki. Vol 8, No 3, p 17-30, 1971, Illus. English summary.
Identifiers: *Crop response, *Rates of application, Bulgaria, Grains, *Irrigation, Maize M, Moisture, Protein, Quantity, Roots, Soil, Sprinkler irrigation, Volume.

Experiments were conducted in order to establish the influence of the volume of water application on growth, development, quantity and quality of yield of sprinkler irrigated maize grown for grain. The experiment was planted in a Latin square design with 4 replications on cinnamon forest soils, using the cultivar 'Wisconsin 641 AA' at a rate of 4080 and 5100 plants per 0.190 ha (70 x 28 and 70 x 35 cm). Eight treatments were tested at 2 preirrigation moistures of the active soil layer. In 3 of the treatments in which maize was grown at preirrigation moisture of 85-85-70% of the field capacity, the volume of the water application was 23.5, 40 and 56.4 m3/0.10 ha, respectively, and in 2 of the treatments using the same preirrigation moisture, the mean volume of water applications was 35.8 and 43.5 m3/0.10 ha. Preirrigation moisture in the other 3 treatments was 70-75-70% of field capacity, the volume of the applications was 34.0, 55.0 and 74.3 m3/0.10 ha. Sprinkler irrigation of maize at different volumes of water application affected plant growth and development. Plants grown at preirrigation moisture of 85-85-70% of field capacity and volume of water application of 23.5 and 40 m3/0.10 ha developed best. Yield slightly decreased with the increase in the volume of water application to 56.4 m3/0.10 ha. When preirrigation moisture was maintained at 70-75-70% of the field capacity and the volume of water applications was kept at 34, 55 and 74.3 m3/0.10 ha, the yields were slightly lower, compared with those obtained at the higher preirrigation moisture, but they showed the same trend. Root system volume and weight of plans grown at higher preirrigation moisture were greater compared with those of plants grown at 70-75-70% of field capacity. Largest quantity of roots were formed in the soil layer of 0-30 cm. The root system was smallest for both preirrigation moistures in the active soil layer (top 30 cm). Sprinkler irrigation of maize at various volumes of water application affected grain quality. There existed a tendency toward increased crude protein and fats with an increase in the volumes of water application and in the number of plants per 0.10 ha. Yields in nearly all treatments rose with the increase in the number of plants from 4080 tp 5100 per 0.10 ha. This was largely due to the greater number of ears per unit of area. The number of applications for the different treatments varied on the average for the period from 4 to 8 at preirrigation moisture of 85-85-70% of the field capacity and from 3 to 6 for preirrigation moisture of 70-75-70% of the field capacity and amount of water applications-from 23.5 to 56.4 and from 34 to 74.3 m3/0.10 ha at the same volume of irrigation requirement.--Copyright 1972, Biological Abstracts, Inc.
W72-11427

ACCURACY OF MEASURING EVAPORATION FROM SOIL SURFACES USING SMALL EVAPORATION PANS (O TOCHNOSTI NABLYUDENIY ZA ISPARENIYEM S POVERKHNOSTI POCHVY PO MIKROISPARITELYAM),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W72-11457

EFFECT OF TWO NONIONIC SURFACTANTS ON PENETRABILITY AND DIFFUSIVITY OF SOILS,
California Univ., Riverside.
For primary bibliographic entry see Field 02G.
W72-11658

IMMEDIATE AND SUBSEQUENT GROWTH RESPONSES OF MAIZE LEAVES TO CHANGES IN WATER STATUS,
Chile Univ., Santiago. Dept. of Agriculture.
E. Acevedo, T. C. Hsiao, and D. W. Henderson.
Plant Physiol. Vol 48, No 5, p 631-636. 1971. Illus.
Identifiers: Assimilation, Carbon, Cells, Elongation, *Growth rate, Leaves, *Maize-M, Oxide, Stress, Water, *Zea-Mays-M.

Elongation of intact young leaves of maize (Zea mays) was found to be dynamically dependent on soil water supply. With adequate water, elongation was remarkably constant but slowed when the water potential of the soil in pots dropped from -0.1 to -0.2 bar and stopped when it dropped to -2.5 bars. The corresponding range of leaf water potential was -2.8 to -7 bars. Elongation resumed in less than a few sec. after a mildly water-stressed plant was rewatered. The effects on leaf elongation of step-wise changes in water potential of the root solution were determined. When the water potential of the root medium suddenly decreased below 0 bar, growth stopped initially and then resumed at

a lower rate. When the water potential was suddenly increased back to 0 bar, growth accelerated transitorily to a high rate before slowing to the steady state rate. These results suggest an increase in cell extensibility during water stress. Leaves stressed for 1 or more days attained after rewatering almost the length of the control leaves. Growth rate after rewatering did not exceed that of the control at the corresponding developmental state except during the short transitory rapid phase lasting only a fraction of an hour. As stress developed, growth stopped before CO2 assimilation decreased noticeably. Upon the release of mild and short stress, the transitory rapid growth completely made up for the reduced elongation during stress, suggesting that metabolic processes for cell expansion might have proceeded unchecked during the stress period. The sensitivity and rapidity of response to changes in water status all point to the direct role of water in growth; its uptake provides the physical force for cell enlargement.--Copyright 1972, Biological Abstracts, Inc.
W72-11685

DEHYDRATION, WATER FLUXES, AND PERMEABILITY OF TOBACCO LEAF TISSUE,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
Y. Graziani, and A. Livne.
Plant Physiol. Vol 48, No 5, p 575-579. 1971. Illus.
Identifiers: Absorption, Age, *Dehydration, Efflux, Energy, Epidermis, Fluxes, Hydration, Ion, Leaf, Lower, *Nicotiana-Rustica-D, *Permeability, Photosynthesis, Tissue, *Tobacco-D.

Removal of the lower epidermis from a tobacco (Nicotiana rustica) leaf allows a faster and wider range of water fluxes, without damaging the mesophyll. It also permits a more direct examination of the photosynthetic potential of the tissue at various levels of hydration. The rehydration rate of leaf discs is essentially linear. It decreases with leaf age and is correlated with the rate of dehydration, but it is independent of the tissue's water potential, as estimated by the isopiestic method. The hydraulic permeability coefficient of water influx is directly related to water potential of the tissue, suggesting a mechanism for the regulation of the hydration level of the leaf tissue. The 'energy of activation' of rehydration amounts to about 9 kcal/ml at intermediate dehydration, but it greatly declines following water loss in excess of 600 mg/g fresh weight. The excessive dehydration is also characterized by a major increase in permeability (monitored by efflux of ions and materials absorbing UV light) and by a parallel decrease in photosynthetic activity. The interrelationship of these effects of excessive dehydration is discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-11686

EFFECT OF SOIL DROUGHT, MICROELEMENTS AND PHOSPHORUS ON THE PHYSIOLOGICAL ASPECTS OF CASTOR--BEAN DEVELOPMENT,
Gosudarstvennyi Pedagogicheskii Institut, Rostov-na-Donu (USSR).
F. V. Shatilov, and L. M. Kudinova.
Fiziol Rast. Vol 17, No 6, p 1147-1151. 1970. English summary.
Identifiers: *Castor-Bean-D, *Drought, *Microelements, Fruit, Growth, Oil, Organogenesis, *Phosphorus, Photosynthesis, Pollen, Soils, Vitality.

The effect of drought during different stages of organogenesis as well as of foliar application of microelements and P on the intensity of photosynthesis, growth and crop was studied in castor-bean plants. The effect of drought during the VI-IX stages of organogenesis inhibited the growth processes, the intensity of photosynthesis and the vitality of pollen, during the IX-XII stages of organogenesis, reduced the period of fruit formation and during the IX-XI stages, decreased the oil percentage of seeds. Foliar application of microelements and P diminished the depressing effect of drought on the plant vital processes and increased the vitality of pollen and the oil percentage of seeds. The period within the VI-X stages of organogenesis is concluded to be the most sensitive one with regard to soil drought.--Copyright 1972, Biological Abstracts, Inc.
W72-11688

WHEAT YIELDS AND CHANGE IN CATIONS AFTER LEACHING SOIL WITH WATER CONTAINING INCREASING RATES OF POTASSIUM REFINERY DUST,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
A. K. Ballantyne.
Can J Soil Sci. Vol 51, No 3, p 405-410. 1971. Illus.
Identifiers: *Cations, Dolomite, Fertilizer, *Leaching, *Potassium, Refinery dust, Soils, *Wheat-M yields.

Leaching a silt loam soil (cation exchange capacity 23 meq/100 g) with water containing increasing rates of K dust (KC1) indicated that high levels adversely affected germination and yields of wheat as well as response to fertilizer. Germination was greatly reduced by the treatment with 22.4 metric tons/ha and nearly eliminated by 44.8 tons. The 44.8-ton/ha treatment also greatly reduced the yield of grain, but straw weights were affected very little by increasing rates of potassium dust. Response to fertilizer was also reduced by 22.4 and 44.8 tons. The exchangeable Ca and Mg decreased and K increased as increasing amounts of K dust were leached through the soil. The 44.8-ton treatment decreased the exchangeable Ca from 56.0 to 24.9% and the Mg from 21.2-4.9%, and increased the K from 7.2-51.9%. K salts can probably be added to the soil, without any adverse effects, until the exchangeable K is increased to about 30%. With the Soil under study this took more than 11.2 tons/ha (5 short tons/acre). The applications of dolomite ameliorated the effect of excess K.--Copyright 1972, Biological Abstracts, Inc.
W72-11693

RELATIVE EFFICIENCY OF NITROGEN FERTILIZERS FOR 'GANGA 101' MAIZE (ZEA MAYS L.) AS INFLUENCED BY RAINFALL,
Indian Agricultural Research Inst., New Delhi.
R. Prasad, and B. B. Trukhede.
Indian J Agric Sci, Vol 41, No 5, p 485-489. 1971. Illus.
Identifiers: Ammonium, Calcium, Chloro-6-Trichloromethyl, *Fertilizers, Ganga 101, Maize-M, Nitrates, *Nitrogen fertilizers, Pyridine, Rainfall, Sodium, Sulfates, Urea, *Zea-Mays-M.

Ammonium sulfate, calcium ammonium nitrate, urea and sodium nitrate were equally effective in the relatively dry year 1965, but in the wet year 1967 ammonium sulfate was the best source, followed by urea, calcium ammonium nitrate and sodium nitrate-urea and calcium ammonium nitrate being equally effective. In 1967, 2-chloro-6 (trichloromethyl) pyridine treatment of N fertilizers was beneficial when the leaching losses of applied N were heavy.--Copyright 1972, Biological Abstracts, Inc.
W72-11694

EFFECT OF TIME AND DEPTH OF NITROGEN APPLICATION ON GROWTH AND YIELD OF RICE,
Institute of Agricultural Sciences, Hanoi (North Vietnam).
Van Uyen Nguyen.
Acta Agron Acad Sci Hung. Vol 20, No 3/4, p 311-317. 1971.
Identifiers: Depth, Growth, *Nitrogen, *Rice-M, *Yield, Soils.

The N requirement of the rice plant has a continuous character. Deep placement of N, besides preventing effect on the loss of N from waterlogged-soil following Pearsall-Mitsui mechanism, also satisfies the N requirement of the rice plant in the later phase of growth. A 20-25% increase in yield was obtained as compared to the shallow surface placement method.--Copyright 1972, Biological Abstracts, Inc.
W72-11695

WATER, THERMAL AND AIR REGIME OF SOIL IN A PICEETUM OXALIDOSUM FOREST AND UNDER CROPS,
K. Roostalu, R. Tupits, and M. Tsirk.
Sb Nauchn Tr Est S-Kh Akad. 65. 291-314. 1970. English summary.
Identifiers: Air, *Crops, Forests, Grain, Piceetum-Oxalidosum, Potato-D, Regime, *Soils, Thermal, *Soil moisture.

The moisture content of pseudopodzolic soil is somewhat higher under Piceetum oxalidosum than in plowland. The latter suffers from lack of moisture in dry months, especially under grain crops. Evapotranspiration decreases considerably under grain crops during drought. Moisture conditions are better for potato, which requires more water at a later date than the grain crops. Moisture deficiency under forest occurs in Sept. The warming and cooling of the deeper horizons of forest soil are considerably slower than in the plowland. The CO2 concentration in the air of forest soils rarely exceeds 0.4% throughout the growing season, and is higher in plowlands, sometimes even exceeding 1.5%. The more intensive release of CO2 by soils occurs during the development of vegetation and vigorous microbiological activity in May-June and in Aug., when the decomposition of fresh organic matter begins. Maximum respiration under potatoes occurs at a later date than under grain crops.--Copyright 1972, Biological Abstracts, Inc.
W72-11697

EFFECT OF THE CROP DENSITY ON THE GROWTH, DEVELOPMENT AND YIELD OF IRRIGATED MAIZE IN THE REGION OF THE SOUTH BULGARIAN CHERNOZEM SMOLNITZA SOILS,
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.
G. Nikolov.
Rastenievod Nauki, Vol 7, No 9, p 69-81, 1970, Illus, English summary.
Identifiers: *Crop density, Bulgaria, Chernozem, *Crop response, Development, Growth, Irrigation, Maize-M, Smolnitza, Soils.

Five crop densities were tested in field experiments (32,000, 38,000, 44,000, 50,000 and 58,000 plants/ha), as were 2 interrow spaces, 70 and 90 cm, and 2 levels of fertilization N10P8K4 and N20P16K8. The leaf area increased with the crop density and the level of the mineral fertilization. The photosynthetic potential increased, as a result of which the biologic and economic yield also increased. The reduced nutritive area at increased crop densities decreased the weight of the root mass of individual plants but the total root weight/ha increased considerably due to the larger number of plants, since the roots mass increased at the expense of the soil layer from 0-50 cm. Due to better developed photosynthetic and root system potentials, the best yield of late maize varieties of the 'Kansas 1859' type is 44,000 plant/ha and the fertilization level N10P8K4 and 44,000-50,000 plants/ha and N20P16K8. Maize responds more actively to the increased number of plants/ha at a higher level of fertilization as the yield increases by 14-16%, while at low level of fertilization as a result of the increased number of plants the yield increases by 7.3-9%. The interaction between crop density and fertilization was strongly manifested. One way differences between the 2 interrow spaces, 70 and 90 cm, were not observed both in the growth and development of the plants and in the grain yield.--Copyright 1972, Biological Abstracts, Inc.
W72-11717

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

METHODS FOR EFFECTIVE RECLAMATION OF SALINE CALCAREOUS PEAT SOILS IN THE UKRAINE (PRIYEMY EFFEKTIVNOGO OSVOYENIYA ZASOLENNYKH KARBONATNYKH TORFYANYKH POCHV USSR),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11126

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08A.
W72-11173

GREAT LAKES CONNECTING CHANNELS, WIDENING AND DEEPENING BENDS IN ST. MARY'S RIVER, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.

Available from the National Technical Information Service as PB-199 855D, $3.00 in paper copy, $0.95 in microfiche. May 1971. 17 p, 1 illus.

Descriptors: *Environmental effects, *Great Lakes, *Michigan, *Channel improvement, Navigable waters, Navigation, Ships, Safety factors, Spoil banks, Dredging, Turbidity, Silts, Fishkill, Recreation, Aquatic environment, Explosions, Nutrient removal.
Identifiers: *Environmental impact statments, St. Mary's River (Mich).

Project plans call for widening six channel bends on the St. Mary's River in Chippewa County, Michigan, to accomodate larger vessels. The project would include a spoil disposal island which would cover about six acres of river bottom. Dredging operations will cause temporary increases in turbidity and siltation. Fish kills and nutrient releases may occur during blasting and dredging. Recreational activities would be disrupted in the immediate work areas for the duration of the project. The alternative of 'no improvement' would not alleviate potential safety hazards to large ships. Alternate disposal sites were investigated, but were rejected as too costly or environmentally undesirable. (Waldron-Florida)
W72-11175

SMITHVILLE LAKE, LITTLE PLATTE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-11177

OCONTO HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 08A.
W72-11179

DETAILED PROJECT STUDY OF FLOOD CONTROL IMPROVEMENTS FOR WAIMANO STREAM, OAHU, HAWAII (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 08F.
W72-11182

CEDAR BAYOU, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-198 855D, $3.00 in paper copy, $0.95 in microfiche. February 1971. 10 p.

Descriptors: *Texas, *Environmental effects, *Channel improvement, *Dredging, Stream improvement, Water management (Applied), Hydraulics, Multiple-purpose projects, Excavation, Navigation, Marshes, Wildlife habitats, Disposal, Spoil banks, Ships, Streams.
Identifiers: *Environmental impact statements.

The project would consist of constructing a navigation channel in Cedar Bayou, Texas, including minor bend easings, and relocating an 0.8 mile section of the existing channel to improve the navigation alignment from the bay into the mouth of the bayou. Except for the bend easings, the proposed alignment in Cedar Bayou essentially follows the natural stream channel and most of the excavation would be from the stream bed. The total amount of material to be excavated by hydraulic dredging is estimated to be about 580,000 cubic yards. The improved channel will effect savings in transportation costs and reduce the probability of marine accidents. Dredging operations and disposal of excavated materials will cause temporary increases in turbidity in the bay section of the project. A small acreage of marsh habitat will be excavated, and spoil deposition will cover some wildlife habitat in the inland section. The only available alternative is to forego improvement of the stream, and to perpetuate the hazardous and restrictive conditions affecting existing navigation. The only irreversible and irretrievable commitments of resources would be a loss of ecologically valuable marshland and the labor and material resources associated with construction. (Widman-Florida)
W72-11183

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA-PERMIT APPLICATION FOR SNAG REMOVAL BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-203 770-D, $3.00 in paper copy, $0.95 in microfiche. October 1971. 30 p, 1 map, 1 tab.

Descriptors: *Alabama, *Florida, *Environmental effects, *Channel improvement, Administration, Multiple-purpose projects, Project planning, Water management (Applied), Water law, Boating, Non-consumptive use, Recreation facilities, Recreation, Aquatic habitats, River regulation, River flow, Turbidity, Navigation.
Identifiers: *Environmental Impact Statements.

The project will remove snags and stumps from the Choctawhatchee River and Holmes Creek. The snagging would be accomplished from the mouth of the Choctawhatchee to the Alabama state line, and on Holmes Creek from Vernon, Florida, to the confluence with the Choctawhatchee River. The project would clear a 30-foot channel by using chain saws, pneumatic saws, winches, other light equipment, and a limited use of dynamite. The objective is safe navigation for small pleasure boats. Environmental impacts will include a reduction of aquatic habits for invertebrates and algae and an increase in opportunity for safe usage of the resource for boating, fishing and general recreation. Adverse environmental effects include a reduction of aquatic habitat, temporary increase in turbidity, and insignificant effects on biota. Alternatives are use of larger equipment and no action. The energy expended as manpower and fossil fuels in implementing and maintaining the project will be irretrievable. (Widman-Florida)
W72-11194

BENEFIT-ACCURACY RELATIONSHIP FOR SMALL STRUCTURE DESIGN FLOODS,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-11215

SYSTEMS ANALYSIS OF THE PANAMA CANAL WATER SUPPLY,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
D. C. Lewis, and L. R. Beard.
Water Resources Research, Vol. 8, No. 3, p 769-773, June, 1972. 3 fig.

Descriptors: *Panama Canal, *Water supply, *Water requirements, *Optimum development plans, Simulation analysis, Economic analysis, Potential water supply, Water storage, Municipal water, Lakes, Reservoirs, Runoff, Pumping, Water conveyance, Operations research.
Identifiers: Supplemental water supply, Gatun Lake, Madden Lake, Gaillard cut, Power plants, Capacities, Power generation, Lockage water, Evaporation loss, Shipping.

Simulation analysis is employed to represent Panama Canal operation and to evaluate economically the existing and potential supplemental water supplies at ever increasing levels of shipping. The ultimate planning goal is to implement the most efficient canal operating policies to obtain the maximum revenue minus the costs of supplemental water for lockage. The study purposes are to determine the most effective way to operate the canal for different levels of projected traffic and different depths of supply water and to develop optimum operation rule curves for generating power and pumping water to increase lockage water supply. The simulated canal operation is based on the assumption of a repeat of historical runoff to determine the optimal operation for existing and potentially deeper channels. Inputs into the model consist of the monthly runoff into two major reservoirs corrected for evaporation losses, average daily lockage rate, and the stochastic fluctuation of each month's lockage rate from the average for the entire 54 years of historical operation. For simplification, the dominant factors are examined as to their impact on the operation, and operation rule curves are derived by studying critical periods of water shortage and successively adjusting rule curves to maximize benefits subject to constraints. (See also W72-11224) (Bell-Cornell)
W72-11223

SYSTEM RELATIONSHIPS FOR A PANAMA CANAL WATER SUPPLY STUDY,
Atomic Energy Commission, Washington, D.C.
L. G. Hulman.
Water Resources Research, Vol. 8, No. 3, p 774-778, June, 1972. 3 fig, 1 ref.

Descriptors: *Panama Canal, *Water supply, *Water requirements, *Optimum development plans, Simulation analysis, Operations research, Economic analysis, Water storage, Lakes, Reservoirs, Runoff, Municipal water, Pumping, Water conveyance, Power plants.
Identifiers: Hydropower, Shipping revenues, Lockage water, Supplemental water supply.

The Panama Canal and its operational characteristics are described and a detailed summary is presented of the system relationships. Increased shipping through the canal has begun to tax the capability of the water supply system to provide lockage water. Since January, 1914, ship passage through the canal has grown from an average of less than one ship per day to a maximum of 39 per day in 1968. To investigate the use of existing and supplemental water supplies, the operation of the canal is simulated by using detailed data on the water used during ship transits, the storage capability of the reservoir system serving the canal, the hydropower capability of each reservoir, the operating constraints for shipping, the anticipated municipal water supply diversion, the historical

shipping use, the economics of shipping, the hydropower production, and the supplemental water supplies. Canal operation for different operation criteria and different shipping levels is used with chronological runoff data for simulation. Two major undertakings are considered for providing additional lockage water: (1) deepening the Gaillard Cut channel to increase the range of operating storage in a principal reservoir, Gatun Lake; and (2) providing pumps below Gatun Lake to allow recirculation of lockage releases. (See also W72-11223) (Bell-Cornell)
W72-11224

INLAND WATERWAY FROM DELAWARE RIVER TO CHESAPEAKE BAY, DELAWARE AND MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.

Available from the National Technical Information Service as PB-202 586D, $3.00 in paper copy, $0.95 in microfiche. September 15, 1971. 28 p, 18 tab.

Descriptors: *Chesapeake Bay, *Maryland, *Canals, *Environmental effects, *Dredging, Channel improvements, Multiple-purpose projects, Water management (Applied), Planning, Comprehensive planning, Environmental engineering, Administrative agencies, Coordination, Navigation, Project benefits, Bridges, Railroads, Highways.
Identifiers: *Environmental Impact Statements.

The project will provide for widening and deepening the existing waterway and includes reconstruction of existing highway and railroad bridges. Work on the project has been in progress for a number of years and is currently approximately 85% completed. The project is located in New Castle County, Delaware, and Cecil County, Maryland. This project will provide safer passage for marine traffic. Recreational facilities will be provided. The increased net flow could produce ecological ramifications in Chesapeake Bay and the canal. A three year study has been started to determine the impact and produce suggestions for mitigating any adverse ecological conditions resultant from the widening and deepening of the canal. Adverse environmental effects resulting from the widening and deepening cannot be determined until the ecological study is completed. If adverse biological effects are encountered, flow controlling devices could be installed to mitigate the environmental stress resulting from too great a net flow from Chesapeake Bay. The alternatives of no project or temporary suspension of dredging are not considered feasible. (Widman-Florida)
W72-11260

VANDALIA DRAINAGE AND LEVEE DISTRICT (DISTRICT 21), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 08D.
W72-11263

NAHUNTA SWAMP BASIN, WAYNE AND GREENE COUNTIES, NORTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 08A.
W72-11267

SCAPPOOSE DRAINAGE DISTRICT, OREGON, PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IMPAC STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08A.
W72-11268

CALCULATION OF EXPECTED VALUES OF OBSERVABLES IN SOME PROBLEMS OF STATISTICAL GEOMORPHOLOGY,
Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
For primary bibliographic entry see Field 02A.
W72-11294

SOME THOUGHTS ON ESTIMATING SPILLWAY DESIGN FLOOD,
Resources Research Centre, Ottawa (Ontario).
For primary bibliographic entry see Field 02A.
W72-11295

A GEOGRAPHIC ANALYSIS OF HYDROLOGIC RESPONSE IN THE SOUTHEASTERN UNITED STATES,
Franklin Coll. of Arts and Sciences, Athens, Ga. School of Forest Resources.
For primary bibliographic entry see Field 02A.
W72-11312

DRAINAGE TILE LOCATION USING AERIAL PHOTOGRAPHY,
Army Topographic Command, Washington, D.C.; and Ohio State Univ., Columbus.
A. E. Krusinger, G. O. Schwab, and O. W. Mintzer.
Paper 71-178, 1971 Winter Meeting American Society of Agricultural Engineers, Chicago, Ill., Dec 1971. 6 p, 3 ref.

Descriptors: *Subsurface drains, *Aerial photography, *Photogrammetry, Locating, Surfaces, Effects, Detection.
Identifiers: Aerial interpretation, Color film, Photointerpretation, Infrared photography, Color photography.

Locating underground drainage tile is extremely difficult, particularly when records are scarce, sketchy, or nonexistent. A study on 3 test locations in Ohio ascertained whether 35 mm aerial photography could be used. Locating subsurface draintile involves recognizing surface effects of the drain. Most obvious is soil drying, which produces a lighter tone than surrounding soil in early spring, when the land is bare and rainfall is plentiful. Tests indicated that aerial photography may be the best method for locating tile. The 35 mm photography produced good images of the tile line surface effects and correlated with tile maps, owner sketches, and physical probing. The optimum film is color infrared; color film is a close second choice. To ensure against unacceptable imagery, panchromatic film should be used in conjunction with color infrared or color film. Infrared black and white film is inferior to the other 3 films considered. (USBR)
W72-11374

DRAIN SYSTEM DESIGN FOR MAINTENANCE,
Soil Conservation Service, El Centro, Calif.
P. K. Koluvek, and W. Simpson.
Paper 71-719, 1971 Winter Meeting, American Society of Agricultural Engineers, Chicago, Ill., Dec 1971. 10 p, 7 fig.

Descriptors: *Drainage systems, *Maintenance, *Subsurface drains, *Structures, *Observation wells, Drainage engineering, Drains, Tile drains, Drainage wells, Installation costs, Cleaning, Manholes.
Identifiers: Flushing.

The function of tile drains is adversely affected by siltation, plugging, and sealing of the joints; therefore, the drainage system design should include observation and maintenance structures. Several types of structures have been developed for these purposes. Tile inspection wells located at various points in the system can be used to observe flow conditions in the tile lines. When placed at the upstream end of a lateral, the wells can be used to introduce water into a system to assure a given rate of flow. Similarly, wells at the downstream end of the system can be used to introduce water or chemicals for flushing or removal of dioxides. To eliminate the need for pumping or hauling water to a well, the end of the tile drainline should be located in an irrigation head ditch with a flush valve attached to the drain. When a farmer irrigates, water can be easily diverted into the line to flush the drain. Estimated costs, advantages, and disadvantages are given for the typical maintenance structures shown. (USBR)
W72-11376

DETERMINATION OF OPTIMUM STORAGE IN DISTRIBUTION SYSTEM DESIGN,
Dallas, City Water Utilities, Tex.
D. A. Brock.
Journal of the American Water Works Association, Vol. 55, No. 8, p. 1027-1037, August 1963, 2 fig, 4 tab, 5 ref.

Descriptors: *Storage capacity, *Reservoirs, *Distribution systems, Design, Storage, *Water storage, *Reservoir storage, Storage requirements, *Texas.
Identifiers: Peak hour demand, Ground storage, Elevated storage, In-system storage, Transmission mains, Replenishment, *Dallas (Tex).

Storage reservoirs in a distribution system provide operational aids in meeting peak-hour demands and emergency reserves needs. Storage provided is either within a pressure system or upstream of the system on the ground. In-system storage is generally elevated. Hydraulic and economic considerations govern the proportioning of storage to either ground or elevated storage. The cost of transmission mains is the only significant economic factor dictating in-system storage. From examining the Dallas water system, it was found that electric-power demand charges were not a factor in sizing the in-system elevated storage. A certain amount of elevated storage can always be justified because of its need in the operation of a pressure system. The determination of the capacities of all storage facilities is not complete until due consideration is given to the cycle of discharge and replenishment. (Andrew-AWWARF)
W72-11395

A MERIDIONAL GEOBOTANICAL PROFILE OF THE WESTERN ISSYK-KUL' FORELAND (IN THE BASINS OF THE TORU-AIGYR AND ULAKHOL RIVERS),
R. R. Krinitskaya, and N. D. Kozhevnikova.
Izv Kirg Geogr O-Va. 8. p 31-38. 1970.
Identifiers: Alpine, Altitude, Basins, Desert, *Issyk-Kul (USSR), Meadows, Rivers, Species, Steppe, Toru-Aigyr River, Ulakhol River, USSR, Zonation, *vertical zonality, *Geobotanical profiles.

In May and June, 1967, a study was made of the vertical zonality of a concrete meridional geobotanical profile through the southern slope Kungei-Ala-Too (I; in the basin of the Toru-Aigyr River) and the northern slope of the Terskei-Ala-Too (II; in the basin of the Ulakhol River). Three vegetation zones were distinguished in both mountain ranges: (1) desert (from the foothill talus slopes and the lacustrine belts to an absolute altitude of 2100-2200 m); 2) the steppe-intermediate mountain belt (from 2100-2200 to 2450-2500 m above sea level in II and up to 2700 m in I); 3) alpine pasture (from 2450-2700 to 3300-3600 m above sea level). The vegetation differs with respect to disposition with altitude, ratio of xerophilic and mesophilic associations, and species composition. The desert portions of II go up to an altitude of 2200 m; here the lower boundary of the steppe is 200 m lower than in I. In II the dry steppe is dominant throughout the entire zone, but in I the lower half of the zone is represented by deserts and only in the upper half by dry stepp. The greatest floristic and phytocoenotic differences are observed in the alpine meadow zone; this is caused

by temperature inversions in the Ulakhol River Valley. Turkestan juniper is completely lacking on both slopes.--Copyright 1972, Biological Abstracts, Inc.
W72-11402

MASS AND AGE STRUCTURE OF PICEA ABIES (L.) KARST NEEDLES UNDER DIFFERENT ECOLOGICAL AND PHYTOCENOLOGICAL CONDITIONS OF MONTE-NEGRO,
Akademiya Nauk USSR, Kiev. Instytut Botaniki.
M. A. Holubets', and L. I. Polovnikov.
Ukr Bot Zh. Vol 27 No 3 p 335-342. 1970. Illus. (English summary).
Identifiers: Age, Climate, Ecology, Elevation, Mass, *Montenegro, *Karst needles, Phytocenology, *Picea abies G, Structure.

The quantity, age composition and square of needles were investigated in fir phytocenoses in dependence on the type of the forest-growing conditions, height above sea level and stand age. Increases in elevation and moisture are correlated with increases in the total mass, needle square and needles/unit of stem wood mass. Increases in needle mass in the poorest types of forest are mainly a result of longer longevity. The weather conditions affect to a considerable degree the year increase of needle. The average square of a gram of absolutely dry needle in thick stands of the Carpathian fir is 133 + 1.6 cm sq and does not depend on ecological and community conditions, elevation or stand age.--Copyright 1972, Biological Abstracts, Inc.
W72-11407

THE ORIGIN AND DISTRIBUTION OF VALLEY GRASSLANDS IN EAST AFRICA,
D. F. Vesey-Fitzgerald.
J Ecol. Vol 58 No 1 p 51-75. 1970. Maps.
Identifiers: *Africa, Distribution, Drainage, Burning, *Grasslands, Nomadacris, Origin, Valleys.

The valley grasslands of the Congo and Zambezi drainage in East Africa are intrinsically related to the drainage. The grassland habitat has developed as an integral part of the plant catena during the course of the cyclic changes that have accompanied the erosion of the land surface. The occupying fauna has also become modified and adapted to the progressive changes that have occurred. More recently, and more obviously, devastating man-induced changes have influenced most natural habitats, and in East Africa have frequently degraded woody vegetation towards grasslands of a secondary nature. Natural grasslands are among the types of vegetation least affected by these changes, though their inherent productivity is often wasted owing to the depletion of the indigenous fauna and the consequent ravages of fire. Grasslands are among the most productive types of vegetation as demonstrated by the number and variety of animals dependent on them. The interrelationship between pasture and grazing animals can only be fully analyzed by taking cognizance of the effect that utilization has on the herbage. Hence the derivation of grasslands cannot be divorced from the effects of their occupation by animals. Compared with secondary habitats, relatively few genera and species occur in the natural grasslands of the drainage lines, but many of the associations are excellent indicators of the prevailing ecological conditions in different types of drainage. At the present time grassland is the most prominent type of vegetation in East Africa, and its expanse is increasing continually as a result of burning. The valley grassland communities are a natural type of vegetation of long establishment and they provide the essential habitat for a complex fauna that has shared their evolutionary history. This attribute is in striking contrast to that of fire-induced grasslands which are regarded as a degraded type of vegetation. A spectrum of interrelated but discrete types of valley grasslands is described which are primarily dependent on the drainage, but subject to modifications by climatic fluctuations and by biological pressure, the latter an important consideration. It is in such a seasonally varying and cyclically changing environment that a great variety and abundance of herbivorous animals have evolved and become adapted to the changing conditions. But occupation by man and his stock has been rendered difficult by the instability of the environment which suits the indigenous fauna. The same fluctuations cause the extreme population explosions and recessions of such 'annual' insects as the red locust (Nomadacris).--Copyright 1972, Biological Abstracts, Inc.
W72-11408

FOREST TYPES IN THE VARIOUS ALTITUDINAL AND CLIMATIC BELTS OF THE LESSER CAUCASUS,
P. P. Posokhov, and K. S. Asadov.
Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior. 8. p 49-56. 1968.
Identifiers: Altitude, Beech D, Birch D, Carpinus orientalis D, *Caucasus, Climate, Elm D, *Forests, Hornbeam D, Juniper G, Oak D, Pine G, Quercus iberica D, Soils, USSR.

Forest vegetation is found at 500-2300 m above sea level. The typological composition of forest is determined to a considerable degree by the climatic conditions. Very dry juniper forests on transitional, relatively poor soils (subor') and mixed forests on transitional, relatively fertile soils as well as dry juniper forests on fertile loamy soils are particularly characteristic of the dry belt of the reasonably warm climate (665-885 m); in the process of digression a very dry oak-Carpinus orientalis subor' is formed. In the fresh, lukewarm climatic belt (960-1200 m) are formed fresh Carpinus orientalis-oak forests on fertile soils and oak forests on transitional fertile soils with Quercus iberica, as well as dry hornbeam forests on fertile soils and oak-pine subor', in the wet moderate climatic belt, moist oak-hornbeam and hornbeam-beech forests are formed, as well as fresh hornbeam-oak forests and several other forest types. For the wet, reasonably moderate climatic belt (1560-1840 m), moist oak-hornbeam-beech forests are found, on the stony taluses, moist hornbeam-beech-pine subor' and moist pine forest. In the wet, cold climatic belt (1850-2150 m) moist oak-birch-subor' and hornbeam-elm-beech forests were found as well as other forest types.--Copyright 1972, Biological Abstracts, Inc.
W72-11413

MOLE DRAIN FAILURE DUE TO DRAWING MOLES DOWNHILL,
Foras Taluntais, Drumboylan (Ireland).
J. Mulqueen.
Ir J Agric Res. Vol 10, No 2, p 241-244. 1971. Illus.
Identifiers: *Drains, *Mole drainage, *Silting, Drainage, Subsurface drainage.

A mole drainage project, installed in mid-Oct. 1969, was examined in late Nov. 1970. Mole drains drawn downhill were found to be silted up along their length and partly or completely blocked. Mole drains drawn uphill were flowing, although some were point blocked. A tongue or plug of plastic soil drawn through the porous gravel of the collector drain was responsible for the silting up of the downhill moles.--Copyright 1972, Biological Abstracts, Inc.
W72-11418

LAND DRAINAGE SURVEY: III. MAPS OF IRELAND SHOWING THE GENERAL DISTRIBUTION OF DRAINAGE PROBLEMS AND OF DRAINAGE SCHEMES,
Foras Taluntais, Dublin (Ireland).
L. F. Galvin.
Ir J Agric Res. Vol 10, No 2, p 213-221. 1971. Maps.
Identifiers: Distribution, *Surface drainage, *Ireland, Land, Maps, Schemes, Survey.

Two maps, based on an analysis of the results of a 4-yr drainage survey were prepared. The Drainage Problem map shows the drainage problem most frequently found in the regions indicated. For the production of the Size of Scheme map, the data were analyzed on a county basis and regions incorporating 'large,' 'medium' and 'small' schemes are delineated.--Copyright 1972, Biological Abstracts, Inc.
W72-11419

GARDENS ON SWAMPS,
State Univ. of New York, Stony Brook.
P. Armillas.
Science, Vol 174, No 4010, p 653-661, 1971, Illus, Maps.
Identifiers: *Aztec, Gardens, *Land reclamation, Swamps, Valley of Mexico, *Archaeology.

Archaeological research verifies historical data on Aztec land reclamation in the Valley of Mexico.--Copyright 1972, Biological Abstracts, Inc.
W72-11425

KALAMAZOO RIVER FLOOD CONTROL PROPOSAL: A CASE STUDY,
Western Michigan Univ., Kalamazoo.
M. H. Ross.
Land Economics, Vol 48, No 1, p 57-61, February 1972. 3 tab, 10 ref.

Descriptors: *Cost-benefit analysis, *Flood control, *Estimation, *Planning, Project feasibility, Project benefits, Evaluation, Benefits, Costs.
Identifiers: *Kalamazoo River Flood Control Proposal, *Corps of Engineers.

The calculations of the Army Corps of Engineers' proposed project for controlling floods on the Kalamazoo River are examined. The benefit-cost calculations of the Corps have not been examined to determine their validity. The benefit-cost ratio is placed significantly below one-far below the Corps value which exceeded one. The Corps concludes that the Kalamazoo River flood control project is worthwhile because the annual benefits exceed the annual costs. Evidence is presented which indicates that the benefits are grossly overestimated, with the 1969 benefit-cost ratio being no more than .040 rather than 1.30 as the Corps states. Other factors are considered to supplement the basic argument. The factors are: an excessively low interest rate assumption, an overestimate of the life of the projects, and a declining trend of flooding. (Strachan-Chicago)
W72-11490

VENTURA MARINA, VENTURA COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 08A.
W72-11507

BETHEL SMALL-BOAT HARBOR, BETHEL, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-199 620D, $3.00 in paper copy, $0.95 in microfiche. May 28, 1971. 13 p, 1 map.

Descriptors: *Alaska, *Channel improvement, *Environmental effects, *Navigation, Dredging, Sediment control, Channel morphology, Excavation, Desilting, Wildlife habitats, Aquatic habitats, Fisheries, Turbidity, Water quality, Water pollution sources, Waterfowl, Retaining walls, Drainage effects, Spoil banks, Disposal.
Identifiers: *Environmental Impact Statements, *Bethel (Alas).

The project involves improvement of Brown's Slough at Bethel, Alaska, to provide a dependable,

all tide access to a housing project. The channel will be 6,700 feet long and 20 feet wide. Dredged material will be pumped to existing low areas adjacent to the channel. Dikes and sills will be incorporated to reduce siltation. Environmental impacts of the proposed project would include excavation of 166,500 cubic yards of unfrozen material and 17,750 cubic yards of permafrost, increased water turbidity, refuse removal from the banks of the slough, and from drainage out of spoil areas if retaining structures are not built. Adverse environmental effects would include destruction of some waterfowl habitats, disturbance of fish nursery grounds and water quality from drainage out of spoil areas if retaining structures are not built. Habitat losses, although permanent, will be small in proportion to the total habitat available. Alternatives include use of a boat lifting device to eliminate the need for some dredging, blasting, dragline construction, and no improvement. (Grant-Florida)
W72-11508

FALMOUTH LAKE, LICKING RIVER, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-11509

KANAWHA RIVER COMPREHENSIVE BASIN STUDY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Kanawha River Basin Coordinating Committee, Huntington, W. Va.

Available from the National Technical Information Service as PB-203 616D, $3.00 in paper copy, $0.95 in microfiche. June 1971. 18 p.

Descriptors: *Basins, *Environmental effects, *Interstate commissions, Project planning, Social aspects, Flood control, Environmental control, Governments, Ecology, *North Carolina, *Virginia, *West Virginia, Watersheds (Basins), Hydroelectric power, Waste disposal, Land management, Flow augmentation.
Identifiers: *Environmental impact statements, *Kanawha River basin.

The Kanawha Basin contains parts of three states, three physiographic provinces, two ecological regions, and varied economic activity. The Kanawha Basin Coordinating Committee Plan provides a framework for continuing development and management of water and related land resources in the basin. The plan reflects consideration of alternative means and objectives including National Income Efficiency and Regional Development and Environmental Quality Preservation. This development will include an expanded program for hydrological data collection, flood prevention and control, and waste disposal projects. Environmental impacts would include flood damage prevention, augmentation of low stream flows, hydroelectric power production, land treatment, and nonstructural measures for the protection and preservation of unique and scenic environmental areas. Adverse effects include loss of free-flowing streams, loss of wildlife habitat, family relocation, and changes in stream fishery. Irreversible and irretrievable commitments of resources will include labor, materials, wildlife habitat and land productivity. (Widman-Florida)
W72-11511

BUFFALO HARBOR, NEW YORK--MAINTENANCE (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-204 670D, $3.00 in paper copy, $0.95 in microfiche. November 10, 1971. 6 p, 3 fig.

Descriptors: *New York, *Lake Erie, *Environmental effects, *Dredging, *Harbors, *Sedimentation, Water quality, Turbidity, Project benefits, Project purposes, Channels, Inland waterways, Navigation, Water pollution, Deposition (Sediments), Sediment distribution, Sediments, Excavation, Great Lakes, Disposal, Eutrophication.
Identifiers: *Environmental impact statements, *Buffalo Harbor (N.Y.).

The project consists of the maintenance of completed channels and structures in Buffalo Harbor by dredging. Water quality of the harbor is not conducive to development of public use areas. The maintenance is repeated annually and affects the same area. The dredging would result in short-term increases in turbidity and sedimentation, both in dredging and disposal areas. The dredging will have a favorable impact by removing polluted material and introducing oxygen. In the Lake Erie disposal area, the greater availability of oxygen permits nutrients in the spoil to encourage eutrophication. Alternatives considered are no maintenance, which would result in structure deterioration, and alternative spoil disposal sites. The only long-term ecological effect would be the creation of unnaturally shallow areas from spoil disposal. (Brackins-Florida)
W72-11512

PEARL RIVER, MISSISSIPPI AND LOUISIANA--NAVIGATION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 08A.
W72-11513

BUFFALO CREEK AT MEADOW GROVE, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.

Available from the National Technical Information Service as PB-202 081D, $3.00 in paper copy, $0.95 in microfiche. July 1971. 13 p, 1 map.

Descriptors: *Flood protection, *Nebraska, *Environmental effects, *Channel improvement, Dredging, Excavation, Stream improvement, Stream stabilization, Flood control, Water management (Applied), Project planning, Wildlife habitats, Natural streams, Flood plains, Waste disposal, Spoil banks.
Identifiers: *Environmental Impact Statements, *Buffalo Creek (Neb).

The project for channel improvement of Buffalo Creek at Meadow Grove, Nebraska, would consist of channel enlargement and realignment to protect against a flood having a 4% or less annual chance of occurrence. The current benefit cost ratio is 1.1. The proposed action will provide flood proofing of unprotected flood plains and loss of natural stream section and natural vegetation. The improved channel will replace the natural stream with some initial loss of wildlife habitat and stream fishery due to construction. Alternatives considered include flood plain zoning, flood proofing, excavation, reservoirs, levees, channel diversion, and no development. Irreversible and irretrievable commitments of resources will include labor and materials associated with construction, land used for the new channel construction and the land which has been designated as waste fill areas. (Widman-Florida)
W72-11529

WILLAPA RIVER AND HARBOR NAVIGATION PROJECT, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-202 174D, $3.00 in paper copy, $0.95 in microfiche. August 27, 1971. 18 p, 3 plate.

Descriptors: *Washington, *Environmental effects, *Dredging, *Channel improvement, Excavation, Disposal, Desilting, Stream improvement, Navigation, Multiple-purpose projects, Project planning, Oceans, Aquatic habitats, Tides, Marshes, Economic impact, Control structures, Sediment control.
Identifiers: *Environmental Impact Statements, *Willapa River (Wash).

The Willapa River and Harbor Navigation Project in Pacific County, Washington, includes annual operation and maintenance dredging of navigation channels to maintain authorized depths. This project will contribute toward preserving the economic level of the region by maintaining the navigation channels. Disposing in the ocean removes all hopper-dredged material from the estuary, preventing any redeposition. Using different disposal areas on the ebb and flood tides reduces the amount of material available for redeposition within the estuary. Disposing of dredged material near the mouth of the estuary may adversely affect aquatic organisms occupying the bottom habitat of the disposal areas. Some lowland and marshland will be filled as a result of diking disposal sites. Alternatives considered include hopper dredging with disposal on all tides, hopper dredging with disposal on the ebb tide only, hopper dredging with direct pumpout capability, hopper dredging with ocean disposal only, clamshell dredging with ocean disposal by bottom-dump barge, pipeline dredging with disposal on diked tidelands or lowlands, controlling works, and sedimentation management. (Widman-Florida)
W72-11530

LITTLE CEDAR CREEK, COOSA RIVER BASIN, GEORGIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-202 739D, $3.00 in paper copy, $0.95 in microfiche. June 1, 1971. 18 p, 1 plate, 6 tab.

Descriptors: *Georgia, *Dredging, *Environmental effects, *Channel improvement, *Channel flow, Administrative decisions, Flood control, Flood protection, Environmental control, Water management (Applied), Environmental engineering, Coordination, Project planning, Project benefits, Sedimentation, Sedimentation rates.
Identifiers: *Environmental Impact Statements, *Coosa River Basin (Ga).

This project will provide flood protection by increasing the discharge capacity of Little Cedar Creek at Cave Spring, Georgia. The improvement will be accomplished by enlarging, snagging, and clearing 3.2 miles of channel to reduce flood stage. Removed materials and debris will be disposed of in designated areas, after which appropriate landscaping will be applied. The project will generally upgrade areas adjacent to the channel and provide stabilization of property values. Water temperatures may be somewhat increased due to greater sun exposure. Higher flow rates may result in more sediment deposition downstream. The aquatic habitat will be adversely affected during construction byt these conditions will be temporary. Alternatives considered include a system of levees, a flood control reservoir, stream diversion, paved channel, and no development. (Widman-Florida)
W72-11537

LONGBOAT PASS, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-202 643D, $3.00 in paper copy, $0.95 in microfiche. September 10, 1971. 26 p, 1 fig, 1 map, 2 photo, 3 tab.

Descriptors: *Florida, *Environmental effects, *Dredging, *Channel improvement, Comprehensive planning, Desilting, Coordination, Decision making, Water management (Applied), Disposal, Beaches, Hydraulic machinery, Navigation, Turbidity, Safety.
Identifiers: *Environmental Impact Statements, *Longboat Pass (Fla).

This project will provide safe and adequate passage of commercial fishing boats and recreational craft through Longboat Pass in Manatee County, Florida. Channelization will be by hydraulic dredge and acceptable dredge material will be placed on gulf beaches. If material is encountered which is unsuitable for beach fill, diked upland areas will be provided for disposal. Construction and maintenance dredging will cause temporary turbidity and the loss of minor amounts of bottom biota. Alternatives considered include no improvement, alternative channel alignments and dimensions, and alternative disposal methods and areas. (Widman-Florida)
W72-11539

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK, AT AND IN THE VICINITY OF BREWSTER, OHIO (DRAFT ENVIROMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-11541

ST. FRANCIS BASIN, MISSOURI AND ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 08A.
W72-11542

TRANTERS CREEK, BEAUFORT, MARTIN AND PITT COUNTIES, NORTH CAROLINA FLOOD CONTROL (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.

Available from the National Technical Information Service as PB-200 338D, $3.00 in paper copy, $0.95 in microfiche. May 26, 1971. 13 p, 1 map.

Descriptors: *North Carolina, *Environmental effects, *Channel improvement, *Flood control, *Dredging, Bank stability, Spoil banks, Flood protection, Stream improvement, Multiple-purpose projects, Seed treatment, Vegetation effects, Natural streams, Drainage, Agriculture, Fisheries.
Identifiers: *Environmental Impact Statements, *Tranters Creek (N.C.).

The action will initiate construction of a flood control project consisting of clearing and snagging and channel excavation of Tranters Creek in Martin, Beaufort, and Pitt Counties, North Carolina. Spoil material would be placed along both sides of the banks and shaped to minimize erosion. The berm adjacent to the creek, the front face of the spoil, and a 16-foot wide strip on top of the spoil will be seeded. The project will provide reduction in flood stages, increased drainage, more intense agricultural practices, and loss of natural stream section and adjacent natural vegetation. Adverse environmental effects will include loss of fishery and other aquatic resources in the section of stream and the loss of trees and other natural vegetation within cleared right of way. Alternatives considered include reservoir storage, other variations of channelization, and no development. (Widman-Florida)
W72-11543

JACKSONVILLE HARBOR, FLORIDA (SECTION 2) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-199 457D, $3.00 in paper copy, $0.95 in microfiche. April 1, 1971. 16 p, 1 map.

Descriptors: *Channel improvement, *Florida, *Navigable rivers, *Monetary benefits, *Environmental effects, Atlantic Ocean, Industries, Economic feasibility, Navigation, Recreation, Wildlife habitats, Aquatic habitats, Freshwater marshes, Economic impact, Ships, Turbidity, Economic justification, Disposal.
Identifiers: *Environmental Impact Statements, *Jacksonville (Fla).

The project is located at Jacksonville, Florida, and would consist of enlarging the channel in the St. Johns River from the Atlantic Ocean to the municipal terminals. The construction and maintenance of the project will enhance the commercial cargo industry with a much needed navigation improvement. The project will provide opportunities for water related sports, picnicking, camping, and hiking. There will be temporary displacement of surface lands now serving as a habitat for animal and plant life. Approximately 107 acres of submarginal marsh will be destroyed, and project construction will cause a temporary increase in turbidity. The project will benefit the area's commercial and industrial enterprises and this will result in assuring continued economic growth in the community. Alternatives considered including varying the design dimensions of the channel, alternative methods of disposal of dredged material, and no project modifications. (Waldron-Florida)
W72-11546

KAUNAKAKAI HARBOR MAINTENANCE DREDGING, MOLOKAI, HAWAII (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.

Available from the National Technical Information Service as PB-199 613D, $3.00 in paper copy, $0.95 in microfiche. May 28, 1971. 8 p, 2 plate.

Descriptors: *Hawaii, *Environmental effects, *Harbors, *Channel improvement, Islands, Pacific Ocean, Dredging, Excavation, Fisheries, Turbidity, Aquatic habitats, Landfills, Marine animals, Marine fish, Vegetation effects, Vegetation regrowth, Disposal, Project planning.
Identifiers: *Environmental Impact Statements, *Molokai (Haiwaii).

The project involves maintenance dredging of Kaunakakai Harbor on the south-central coast of the island of Molokai, Hawaii. Approximately 48,000 cubic yards of material will be dredged and deposited on land or at a sea disposal area. The dredging will restore the harbor to the authorized federal depth of 23 feet. The land disposal area is situated in a low-lying area. The dredging will alter the physical condition of the harbor bottom by restoring about 8 acres to a 23 foot depth. No archaeological sites are known to be endangered. No rare animal or plant species are endangered. The dredging will create some temporary turbidity and some temporary destruction of the vegetative brush and cover in the land disposal area. Adverse environmental effects are limited to disturbance of the harbor fish population through habitat destruction and turbidity in the seaward disposal area. The only alternatives are to forego dredging or to construct a new harbor. (Grant-Florida)
W72-11548

LEWIS AND CLARK CONNECTING CHANNEL, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08A.
W72-11549

CHANNEL SNAGGING AND CLEARING PAINT CREEK, SOUTH OF CHILLICOTHE, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 341D, $3.00 in paper copy, $0.95 in microfiche. April 30, 1971. 6 p.

Descriptors: *Ohio, *Environmental effects, *Flood protection, *Channel improvement, Flood control, Stream improvement, Flow characteristics, Erosion, Silting, Multiple-purpose projects, Project planning, Banks, Bank protection, Wildlife habitats, Levees, Floodproofing, Flood plain zoning, Turbidity.
Identifiers: *Environmental Impact Statements, *Chillicothe (Ohio).

The project consists of snagging and clearing, removal of trash and logs, bar removal, and bank shaping and associated work beginning in an area 23 miles south of Chillicothe, Ohio. The project will reduce flood stages along a 2.7 mile reach of Paint Creek by improving flow characteristics of the channel. The clearing of the streambanks and change in flow patterns will cause a temporary increase in erosion and siltation. Some low-value fish and wildlife habitat will be lost. Alternatives considered include channel widening and levees, zoning and floodproofing, and 'no action'. Irreversible and irretrievable commitments of resources would include labor and material required for construction and maintenance, and farmland which would be converted to urban development. (Widman-Florida)
W72-11554

FISH THAT WEED THE WATER.

Agricultural Research, p 6-7, May 1972.

Descriptors: *Aquatic weed control, *Fish, *Biocontrol, Fish diets, Carp, Weed control, Proteins, Aquatic plants, Sport fish, Submerged plants, Chara, Water hyacinth, Stocking, Spawning.
Identifiers: White amur, Hydrilla, Southern naiad, Duckweed.

The white amur, of the carp family, native to China, Manchuria, and Siberia, and used in the Soviet Union, Poland, Czechoslovakia, India, and China for both aquatic weed control and food is being studied by the Agricultural Research Service in Florida. It can tolerate wide temperature extremes making it adaptable to many parts of the United States; it will not spawn in U.S. waters unless artificially injected with hormones, providing a check against exploding populations. The amur has potential for an effective biological control agent, a source of dietary protein, and a challenging sport fish. Under ideal conditions, it can gain a half pound/month and exceed 60 pounds. Diets, stocking rates, and effects of the amur on environment are under study. During a 12-week study, the amur thrived on weeds as opposed to commercial fish foods. A weight gain of 60% was made on southern naiad but only 20% on commercial catfish food in indoor aquaria. Weight increased 294% on hydrilla and 83% on commercial trout chow in outdoor concrete tanks. Effect on water quality of its habitat was studied for 5 months in outdoor concrete tanks, indoor aquaria, and plastic pools. (Auen-Wisconsin)
W72-11568

COOPERATIVE COMMUNITY-UNIVERSITY WATER RESOURCE PLANNING: AN INTERDISCIPLINARY APPROACH,
Wisconsin Univ., Green Bay.
A. J. Bedrosian, W. O. Bennett, J. E. Berry, R. B. Ditton, and W. J. Johnson.
Paper presented at Seventh Annual American Water Resources Conference, October 25, 1971, Washington, D.C. 23 p. OWRR B-046-WIS (6), and B-065-WIS (1).

Descriptors: *Weed control, *Lakes, *Water resources development, Planning, Political constraints, Management, Recreation demand, Universities.
Identifiers: *Interdisciplinary approach.

An approach to planning and management of a lake heavily used for recreation and of substantial importance to the tourist economy of Northeastern Wisconsin is developed. Data requirements created a need for an interdisciplinary approach to the problems posed by this study. These requirements included determining (1) the actual biological, chemical, and physical problems existing in Lake Noquebay, the lake studied; (2) the problems perceived by Noquebay's public; (3) the impacts of the weed problem on the lake's users; (4) the existing and potential economic consequences of the public's behavioral response to the weed problem; (5) which factors underlay and gave rise to the weed problem; (6) what legal and political avenues are available to prevent intensification of the weed problem; and (7) which governmental agency was responsible for carrying out remedial programs. A framework, utilizing a three-dimensional matrix, is developed to analyze levels of public concern, management alternatives, and action agencies. Several structural and non-structural alternatives are evaluated on the basis of social and economic criteria, long- and short-term environmental impact, and legal-political feasibility. The role of universities in assisting communities with resource planning is also examined. (Settle-Wisconsin)
W72-11590

WATER AND URBAN DECENTRALIZATION IN NEW SOUTH WALES,
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 06D.
W72-11591

PUBLIC DOMAIN ADMINISTRATION--A SCIENTIFIC BASIS FOR WATERSHED MANAGEMENT,
Utah Univ., Salt Lake City, Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-11595

WATER QUALITY PREDICTION WITHIN AN INTERBASIN TRANSFER SYSTEM,
Texas Water Devleopment Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 05B.
W72-11652

RANDOM-WALK MODEL OF STREAM NETWORK DEVELOPMENT,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02J.
W72-11676

4B. Groundwater Management

CONJUNCTIVE USE OF WATER IN WEST TEXAS-BENEFITS TO NONCOOPERATORS,
Texas Tech Univ., Lubbock. Water Resources Center.
M. J. Mocek, B. J. Claborn, and D. M. Wells.
Available from the National Technical Information Service as PB-210 786, $3.00 in paper copy, $0.95 in microfiche. Texas Water Resources Center Report WRC 71-6 ICASALS Special Report No 49, September 1971. 83 p, 13 fig, 8 tab, 28 ref, append. OWRR C-1537 (No. 1993) (4).

Descriptors: *Water supply, *Irrigation, *Water storage, *Injection wells, *Texas, Methodology, Water wells, Aquifers, Model studies, Artificial recharge, Conveyance structures, Canals, Evaporation, Drought tolerance, Water conservation, Planning, Computer models, Groundwater, Hydrologic data.
Identifiers: *West Texas.

Utilization of the partially depleted Ogallala formation in the High Plains as a terminal underground storage reservoir for irrigation water in that area is described. The primary advantage would be reduction of the requirement for surface storage of water in West Texas. Water could be delivered to West Texas by the Trans-Texas Canal on an eleven-month basis. From a small regulating reservoir, the water could then be delivered to West Texas irrigators on a 12-month uniform flow basis with only short interruptions for maintenance of the distribution system. When the farmers were not irrigating, they could recharge this delivered water into the underground formation for storage through their irrigation wells. During irrigation seasons the farmers could combine pumpage from their wells with the imported water concurrently being delivered to them for application to their crops. Utilization of the underground formation as a storage reservoir in this manner would eliminate the necessity for holding delivered irrigation water in large surface reservoirs until needed at the farms; consequently, evaporation losses would be greatly reduced. (See also W71-04931, W71-08356 and W71-08357) (Woodard-USGS)
W72-11116

MODES OF OCCURRENCE OF LEAD AND ZINC IN CHELEKEN THERMAL BRINES (O FORMAKH NAKHOZHDENIYA SVINTSA I TSINKA V TERMAL'NYKH RASSOLAKH CHELEKENA),
Akademiya Nauk SSSR, Moscow. Institut Geologii Rudnykh Mestorozhdenii Petrografii, Mineralogii i Geokhimii.
For primary bibliographic entry see Field 02K.
W72-11118

ISOTOPIC COMPOSITION OF SULFATES IN NATURAL WATERS FROM SULFIDE DEPOSITS IN THE MIDDLE URALS (O VOZMOZHNOSTI ISPOL'ZOVANIYA IZOTOPNOGO SOSTAVA SUL'FATNOY SERY PRIRODNYKH VOD V KACHESTVE POISKOVOGO PRIZNAKA KOLCHEDANNOGO ORUDENENIYA NA SR EDNEM URALE),
Uralskoe Geologicheskoe Upravlenie, Sverdlovsk (USSR).
For primary bibliographic entry see Field 02K.
W72-11119

PALATLAKAHA RIVER WATERSHED, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11201

ANALOG SIMULATION OF WATER-LEVEL DECLINES IN THE SPARTA SAND, MISSISSIPPI EMBAYMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11279

WATER WELL AND GROUND-WATER CHEMICAL ANALYSIS DATA, SUTTON COUNTY, TEXAS,
Texas Water Development Board, Austin.
D. A. Muller, and J. R. Pool.
Texas Water Development Board Report 147, May 1972. 37 p, 3 fig, 2 tab.

Descriptors: *Groundwater resources, *Water wells, *Well data, *Chemical analysis, *Texas, Water quality, Aquifer characteristics, Water levels, Water utilization, Basic data collections.
Identifiers: *Sutton County (Tex.), Well inventory.

Basic groundwater data are tabulated from studies made in Sutton County from December 1968 to March 1969. Pertinent historical records are included. The investigation is part of an overall regional investigation of the groundwater resources of the Edwards Plateau, a study encompassing all or parts of 26 counties. Springs and wells, including domestic and livestock, irrigation, industrial, and public supply wells, were visited. Public officials and individual landowners and lessees were contacted in order to obtain information on each well. Where possible, the static water level and depth of each well were measured, and water samples for chemical analysis were taken from representative wells. The altitude of the land surface at each well location was determined from topographic maps. A total of 494 wells were inventoried, and 234 water samples were collected for chemical analysis. (Woodard-USGS)
W72-11290

THE GROUNDWATER FLOW SYSTEM IN THE DELMARVA PENINSULA,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 02A.
W72-11309

SUBSURFACE SITE CONDITIONS AND GEOLOGY IN THE SAN FERNANDO EARTHQUAKE AREA,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 02F.
W72-11316

ON THE SIGNIFICANCE OF THE HOERNER WALDORF WELL FIELD WATER-TABLE FLUCTUATIONS,
Montana Univ., Missoula. Water Resources Research Center.
R. L. Konizeski.
Available from the National Technical Information Service as PB-210 913, $3.00 in paper copy, $0.95 in microfiche. Report No. 25, Montana University Joint Water Resources Research Center, Bozeman, (1972), 17 p. OWRR B-024-MONT (2).

Descriptors: *Water wells, *Observation wells, *Water table, *Drawdown, *Montana, *Recharge, *Groundwater, Aquifers, Pulp and paper industry.

This report is concerned primarily with the observation well logs that were established in the Hoerner Waldorf Pulp and Paper Mill water well field. A new well field was developed in 1967. It consists of four production wells and four observation wells. All penetrate the same 25-35 foot thick aquifer which underlies the entire area at about 110-115 feet below land surface. Continuous and/or weekly records of water level fluctuations in the observation wells have been kept for the period January 1967 to September 1970 and have been correlated with records of the original Danforth well collected during the course of a USGS study. The consistent recovery over the years to/or closely approaching original static head in the various production wells apparently relates to recharge from the river. Hydrographs of some observation wells show less extreme water-level fluctuations because those wells are farther from the production wells and the river. A comparison of hydrographs of all four observation wells for the period January, 1967 - September, 1970, and the Danforth well for the period 1958 - 1963, shows that recharge-discharge has approached long term (annual) equilibrium.
W72-11383

TRITIUM AND RADIOCARBON IN HAWAIIAN NATURAL WATERS: PART I,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W72-11438

GROUND-WATER INVESTIGATIONS IN OKLAHOMA,
Geological Survey, Oklahoma City. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-11448

DRILLERS' LOGS OF WELLS IN HARRIS COUNTY, TEXAS, 1905-71,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W72-11449

GROUNDWATER IN LAKE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W72-11462

GEOHYDROLOGY OF JEFFERSON COUNTY, NORTHEASTERN KANSAS,
Kansas State Geological Survey, Lawrence.
J. D. Winslow.
Kansas Geological Survey Bulletin 202, Part 4, April 1972. 20 p, 2 fig, 1 plate, 3 tab, 15 ref.

Descriptors: *Hydrogeology, *Water wells, *Aquifer characteristics, *Water quality, *Kansas, Chemical analysis, Geology, Water analysis, Groundwater, Water yield, Water utilization, Groundwater recharge, Basic data collections, Water supply, Irrigation, Hydrologic data.
Identifiers: *Jefferson County (Kans).

Geohydrologic data for Jefferson County, Kansas, are based on geologic mapping, geologic interpretation of aerial photographs, test-hole logs and drillers' logs, inventory of selected wells, and analyses of water samples from selected wells. The largest quantities of groundwater are available from wells in alluvium in the Kansas River valley with yields of as much as 1,350 gpm. Because the use of groundwater for irrigation is seasonal, and because pumping for municipal or public-supply use is small compared with the amount of groundwater available, the natural slope of the water table in the area essentially is unaffected. The concentration of dissolved solids ranges from 125 to 1,190 mg/liter, with most values ranging from 300 to 600 mg/liter. Data pertaining to 231 water wells and test holes are tabulated. (Woodard-USGS)
W72-11464

THE AQUEOUS UNDERGROUND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-11466

A NEW STEAM WELL IN THE TRAVALE GEOTHERMAL AREA (TUSCANY, ITALY).

Geothermics (Italy), Vol 1, No 1, p 41, March 1972. 1 fig.

Descriptors: *Geothermal studies, *Thermal water, *Steam, *Wells, *Drilling, Thermal stress, Temperature, Pressure, Gases, Chemical properties.
Identifiers: *Italy (Travale geothermal area).

On January 7, 1972, Travale 22 well blew out with an enormous output of fluid (about 450 tons/hr). The well was drilled in a geothermal basin located to the east of the geothermal basin of Larderello (Italy). Drilling started on October 28, 1971 and finished on January 4, 1972. The total depth of the well is 688 m; the well reached the main reservoir (Triassic anhydrites and brecciated magnesian limestones) at a depth of 642 m. After drilling, pressure and temperature measurements were carried out in the well with an Amerada apparatus. At the well bottom the pressure was 64.7 ata (kg/sq cm absolute) and the temperature rose to 245 deg C in 52 hours, while it was 135 deg C just two hours after the end of drilling. The blow-out occurred 15 hours later. (Woodard-USGS)
W72-11467

SOME CONSIDERATIONS ON THE FLOW--RATE/PRESSURE CURVE OF THE STEAM WELLS OF LARDERELLO,
Politecnico di Milano (Italy). Instituto di Fisica Tecnica.
O. Rumi.
Geothermics (Italy), Vol 1, No 1, p 13-23, March 1972. 12 fig, 1 tab, 4 ref.

Descriptors: *Geothermal studies, *Thermal water, *Steam, *Wells, *Flow rates, Pressure, Borehole geophysics, Investigations, Mathematical studies, Theoretical analysis, Data collections, Equations, Curves.
Identifiers: *Italy (Larderello), Relationship curves.

The flow-rate/pressure relation for the geothermal wells of the Larderello area (Italy) is considered. After an examination of the experimental results recorded for many years, and after the discussion of the experimental flow-rate/pressure curve, the theoretic link between pressure and flow-rate at the mouth of the borehole was studied. The results of the experimental and theoretical approach were then compared, and a best fit curve proposed. The flow-rate/well bottom pressure curve as the true characteristic of the whole system of flow is suggested. (Woodard-USGS)
W72-11468

SUBSURFACE POLLUTION PROBLEMS IN THE UNITED STATES,
Environmental Protection Agency, Washington, D.C. Fresh Water Pollution Control Section.
For primary bibliographic entry see Field 05B.
W72-11472

DEEP GEOTHERMAL TEST WELL, GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Region 3 Office.

Available from the National Technical Information Service as PB-206 161D, $3.00 in paper copy, $0.95 in microfiche. January 31, 1972. 19 p.

Descriptors: *Environmental effects, *California, *Geothermal studies, *Wells, Alternate planning, Multiple-purpose projects, Desalination, Deserts, Investigations, Administrative agencies, Information retrieval, Research and development, Exploration, Testing, Water resources development, Electricity.
Identifiers: *Environmental Impact Statements, *Imperial Valley (Calif).

A deep geothermal test well would be drilled to a depth between 4,000 and 8,000 feet in the East Mesa area of Imperial Valley, California. The well would have a slight impact on the underground strata due to the comparatively small amounts of fluid withdrawn for testing. It would provide information of value to a determination of the potential for geothermal resources to provide large quantities of desalted water in conjunction with relatively pollution-free production of electric energy for the water and power short Southwest. Drilling would require that approximately 10 acres of now barren desert be cleared for drilling operations. Impact on fish and wildlife, the air, plant life, and area aesthetics would be minimal. Alternatives considered include other methods of investigation and no testing. (Widman-Florida)
W72-11559

PHOTOSYNTHESIS--POLICIES AND PROGRAMS FOR GREAT POTENTIALS, BEGINNING STAGES FOR EFFECTIVE WATER MANAGEMENT,
Utah Univ., Salt Lake City, Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-11594

TECHNIQUES FOR ASSESSING WATER RESOURCE POTENTIALS IN THE DEVELOPING COUNTRIES WITH EMPHASIS ON STREAMFLOW, EROSION AND SEDIMENT TRANSPORT, WATER MOVEMENT IN UNSATURATED SOILS, GROUND WATER, AND REMOTE SENSING IN HY DROLOGIC APPLICATIONS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11672

GEOHYDROLOGY OF THE LOWER VERDIGRIS RIVER VALLEY BETWEEN MUSKOGEE AND CATOOSA, OKLAHOMA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-11677

PRELIMINARY APPRAISAL OF GROUND WATER IN STORAGE WITH REFERENCE TO GEOTHERMAL RESOURCES IN THE IMPERIAL VALLEY AREA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
L. C. Dutcher, W. F. Hardt, and W. R. Moyle, Jr.
Geological Survey Circular 649, 1972. 57 p, 20 fig, 4 tab, 109 ref.

Descriptors: *Groundwater resources, *Geothermal studies, *Thermal water, *Usable storage, *California, Water costs, Water quality, Salinity, Groundwater, Water wells, Aquifer characteristics, Water yield, Pumping, Water utilization, Groundwater recharge, Thermal pollution.
Identifiers: *Imperial Valley (Calif), Recoverable groundwater.

Imperial Valley, California, occupies part of a deep sediment-filled structural basin that extends south from the Coachella Valley in California to the Gulf of California. Because of the extremely high temperatures at depth throughout the basin and at relatively shallow depth in areas of anomalously high heat flow, the deposits are undergoing metamorphism. The active metamorphism has caused changes in the original porosity and permeability of the rocks and deposits. The total usable and recoverable water is estimated to be 1.1 billion acre-feet, of which about 200 million acre-feet is at a temperature of 150 C or greater. The combination of low well yields, energy costs in excess of $100 per acre-foot for lifts greater than 5,000 feet, and very high costs of wells will probably prevent pumping most of the estimated usable and recoverable water. If as much as 1,000 feet of pumping lift would be economically justified, about 100 million acre-feet of water might be recoverable from the shallow aquifers. (Woodard-USGS)
W72-11678

GROUNDWATER MANAGEMENT ON THE TEXAS HIGH PLAINS,
Southwestern Great Plains Research Center, Bushland, Tex.
O. R. Jones, and A. D. Schneider.
Water Resources Bulletin, Vol 8, No 3, p 516-522, June 1972. 3 fig, 1 tab, 16 ref.

Descriptors: *Water management (Applied), *Texas, *Groundwater, *Water quality control, *Conjuctive use, Water reuse, Return flow, Irrigation water, Irrigation operation and maintenance, Irrigation practices, Water conservation.
Identifiers: Ogallala aquifer (Texas).

The effects of major water management practices on the pumping requirement from the Ogallala aquifer are discussed. Demand on the aquifer may

be reduced as much as 15% by recycling irrigation runoff, 25% by recycling irrigation runoff and irrigating with water from playas, and 29% by recycling irrigation water in combination with irrigation from playas and artificial recharge of playa water to the aquifer. Other practices that can result in more efficient use of precipitation and groundwater are limited irrigation, land forming, soil profile modification, and improved irrigation systems, thereby reducing the pumping demand on the Ogallala. Additional water supplies can be obtained by water harvesting, weather modification, and water importation. The overdraft on the aquifer can be reduced by the application of sound water management practices on an area-wide basis. (Knapp-USGS)
W72-11679

4C. Effects on Water of Man's Non-Water Activities

GRAHAM BURKE PUMPING PLANT, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 08C.
W72-11514

WATER AND URBAN DECENTRALIZATION IN NEW SOUTH WALES,
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 06D.
W72-11591

QUALITY OF STORMWATER DRAINAGE FROM URBAN LAND,
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.
For primary bibliographic entry see Field 05B.
W72-11651

4D. Watershed Protection

HURRICANE CREEK WATERSHED STRUCTURAL PROJECT MEASURE, HOPKINS COUNTY IN KENTUCKY, TRADEWATER RIVER RC AND D PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-203 511-D, $3.00 in paper copy, $0.95 in microfiche. October 14, 1971. 7 p, 1 tab.

Descriptors: *Environmental effects, *Watershed management, *Administration, *Erosion control, *Kentucky, Flood control, Land improvement, Water management (Applied), Adoption of practices, Administrative decisions, Comprehensive planning, Coordination, Multiple-purpose projects, Planning, Administrative agencies, Balance of nature, Environmental engineering.
Identifiers: *Environmental impact statements.

The Hurricane Creek Watershed Structural Project Measure in Hopkins County, Kentucky, would provide a 100-year level of flood protection to 170 acres of flood plain and reduce erosion and sediment problems in the 4300 acre watershed. This will be accomplished by the installation of three floodwater retarding structures, improvement of approximately 4 miles of channel, and land treatment work. The sediment pools of the three flood retarding structures will provide 36 acres of temporary lake fishery. Installation of the measure will permit more intensive use of the flood plain for both agricultural and industrial purposes. This draft environmental statement lists adverse environmental effects as commitment of 48 acres of agricultural and forestry land for the sediment pools and structure areas and the loss of wildlife uses on 36 acres of land in the sediment pools, along with temporary disruption of such uses on another 126 acres in the flood pools, and other disturbed areas. Alternatives considered were one large floodwater retarding structure, alternate locations for the three floodwater structures, installation of the structures alone, and taking no action. Irreversible and irretrievable commitments of resources include the loss of agricultural and wildlife use on 36 acres in the sediment pool and 12 acres of dams and spillways lost to agriculture. (Widman-Florida)
W72-11184

EDEN WATERSHED, MISSISSIPPI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-203 301-D, $3.00 in paper copy, $0.95 in microfiche. August 23, 1971. 11 p, 1 map.

Descriptors: *Mississippi, *Environmental effects, *Flood protection, *Channel improvement, Flood plains, Erosion control, Watershed management, Silting, Sedimentation, Wildlife habitats, Deltas, Agricultural watersheds, Vegetation effects, Canal construction, Structures, Stream stabilization, Floodwater, Dredging, Project planning.
Identifiers: *Environmental Impact Statements.

The project will involve conservation land treatment supplemented by one floodwater retarding structure, three grade stabilization and sediment control structures, and about 29 miles of stream channel improvement in the Eden Watershed. Environmental impacts would include reduction of residential and agricultural flooding from vegetation planting which also will provide new food and cover for wildlife reduction of silt and sand deposits on flood plain land, elimination of woodlands by inundation, loss of wildlife habitat, erosion reduction, and loss of agricultural production and wildlife food on about 50 acres of cropland. Adverse impacts would include loss of agricultural use and wildlife habitat, and periodic interruption of agricultural use and wildlife habitat in 11 acres of woods to be used for temporary floodwater detention. Alternatives considered were conservation land treatment alone, less intensive use by retiring overly wet cropland to pasture land, and continuing present agricultural use. (Grant-Florida)
W72-11189

COW CREEK WATERSHED, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.
W72-11262

CLARKS FORK--BULLOCKS CREEK WATERSHED, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-203 877D, $3.00 in paper copy, $0.95 in microfiche. September 1971. 14 p, 1 map, 1 illus.

Descriptors: *South Carolina, *Environmental effects, *Flood protection, *Watershed management, Erosion control, Flood control, Land management, Water management (Applied), Water supply, Multiple-purpose projects, Recreation, Land development, Streams, Lakes, Detention reservoirs, Sedimentation, Fisheries.
Identifiers: *Environmental Impact Statements.

The project, located in York County, South Carolina, would consist of conservation land treatment over the watershed, supplemented by six floodwater retarding structures, one multiple purpose structure for flood prevention and recreation, and 360 acres of critical area treatment. The project will reduce erosion and sedimentation; reduce floodwater damages by 87 percent; benefit 100 farms; provide new wildlife habitat; create a 650 acre recreation lake and related facilities for an expected 230,000 visitor days annually; create 394 acres of lake fishery at the six floodwater retarding structures; and create additional local employment opportunities. Adverse effects would include elimination of agricultural and wildlife use on 1,044 acres; periodical interruption of agricultural and wildlife use in the 1,110 acres used for detention pools; elimination of agricultural and wildlife use of 117 acres in dams and spillways until these areas are revegetated; inundation of 15 miles of stream channels; and increased vehicular traffic in the recreation area. Alternatives considered include conservation land treatment alone, less intensive use of the flood plain, alternate combinations of floodwater retarding structures, channel improvement to supplement the floodwater retarding structures, and other locations for the recreation development area. (Widman-Florida)
W72-11269

EFFECT OF POLYMERS ON THE RESISTANCE OF SOILS TO EROSION,
N. A. Muromtsev.
Nauchn Tr Obninsk Oto Geogr Obshch SSSR. 1. 1. p 26-30. 1968.
Identifiers: Erosion, *Polymers, Soils, *Erosion control, *Soil erosion, *Soil treatment.

Resistance to erosion increases with the dose (0.01-0.05%) of polymers. With polyacrylamide and polyacrylnitrile, the effective concentrations are 0.05 wt% of soil for horizon A and 0.01 wt% for horizon B1. 'Vam' polymer (0.01-0.05%) was ineffective for horizon A and even damaging for horizon B1.--Copyright 1972, Biological Abstracts, Inc.
W72-11337

GREEN MANURE IN EROSION CONTROL AND FERTILITY IMPROVEMENT OF ERODED SOILS,
V. I. Donyushkin, and V. A. Bannyi.
Byull Gos Nikit Bot Sad. Vol 1, No 12, p 48-50. 1970.
Identifiers: *Erosion control, Fertility, *Manure, Pea-D, Rye-M, Vetch-D, *Soil erosion, *Crimea.

On the southern coast of the Crimea and in its foothills, green manure consisting of field pea, spring pea, vetch, rye and their mixtures considerably reduces or completely prevents erosion. Plowed-under green manure, particularly field pea and vetch, improves soil fertility by increasing the content of organic matter, N, P and K.--Copyright 1972, Biological Abstracts, Inc.
W72-11339

SNOWMELT CONTROL ON BELORUSSIAN ERODED LOAMY SOD PODZOLIC SOILS,
U. V. Zhylko, and H. Kazakou.
Vyestsi Akad Nauk Byelarus SSR Ser Sel'-Skahaspad Nauk. 2. p 53-55. 1969.
Identifiers: *Belorussian, *Erosion control, Loamy, *Podzolic soils, Soils, USSR, *Snowmelt control, Snow packing.

Snowmelt was controlled by packing the snow on the upper slopes (Where the snow cover was thin) to slow its melting and by blackening the snow on the middle and lower slopes (where the snow cover was considerably thicker) to insure more rapid melting. Melting became more uniform, the soil absorbed more water, erosion was lessened, and water reserves were increased.--Copyright 1972, Biological Abstracts, Inc.
W72-11345

THE INTERACTION OF PLANT COVER AND ENVIRONMENTAL CONDITIONS IN GEOLOGICAL WATER CATCHMENT BASINS,
I. A. Titov.
Tr Vses Sel'Skokhoz Inst Zaoch Obrazov. 35 p, 88-101. 1970.
Identifiers: *Watersheds (Basins), Development, *Environment, Erosion, Geology, Interaction, Land, Management, Plants, *Vegetation.

'Water catchment basin' is not only a hydrological but also a geochemical concept; its principal characteristics are a geological basis (rocks), geological structure, and activity of the surface, soil, and bedrock waters. Any plant association in it cnhanges the environment, not only in its habitat, but also on the slope below and sometimes also above; the fluid and solid runoffs cause an extension of the influence of the vital activities of each plant association. The entire complex of environmental conditions and plant associations of the the basin constitutes a single geovegetational system (of a basin, gully, etc.). Depending on the climate, vegetation, and nature of the migration of the elements, the geovegetational system may be humus-, peat-, or salt-accumulative, or some transitional state. In basins with active erosion processes which plant associations cannot endure, what is formed is not so much a geovegetational as a geodynamic system, or, in brief, the geosystem of a water catchment basin. Emphasis is given to the importance for land management of the interaction of the processes in the system.--Copyright 1972, Biological Abstracts, Inc.
W72-11401

WATERSHED PLANNING.
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W72-11439

BOXELDER CREEK WATERSHED, COLORADO AND WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.
W72-11540

PUBLIC DOMAIN ADMINISTRATION--A SCIENTIFIC BASIS FOR WATERSHED MANAGEMENT,
Utah Univ., Salt Lake City, Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-11595

FOREST REPLANTING ON THE TERRACES OF OPEN CUT MINING WORKS IN THE UKRAINE,
V. N. Dan'Ko.
Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 18. 7-11. 1969.
Identifiers: Acer-Tataricum-D, *Erosion control, Elaeagnus-Angustifolia-D, Erosion, *Trees, Fertilizers, Forest, Fraxinus-Pennsylvanica-D, Lonicera-Tatarica-D, Malus-D, Mining, Pinus-Banksiana-G, Pinus-Sylvestris-G, Planting, Pyrus-D, Quercus-Robur-D, Robinia-Pseudacacia-D, Salix-Alba-D, Terraces, *Ukraine, USSR.

The following tree species are used: Pinus sylvestris, P. banksiana, Robinia pseudacacia, Elaeagnus angustifolia, Quercus robur, Acer tataricum, Fraxinus pennsylvanica, Salix alba, Lonicera tatarica, Malus, Pyrus and others. Most of these trees possess a good survival rate and are characterized by satisfactory and good growth. Thorough planning of the site to prevent gully erosion and supplying the fertility requirements of the individual tree species are important.--Copyright 1972, Biological Abstracts, Inc.
W72-11673

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

NONDESTRUCTIVE DETERMINATION OF ELEMENTS IN SPECIFIC FRESHWATER MICROPLANKTON BY ACTIVATION ANALYSIS,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
M. Merlini, O. Ravera, and C. Bigliocca.
Modern Trends in Activation Analysis, Vol 1, June 1969, p 475-481. 1 fig, 4 tab, 17 ref.

Descriptors: *Neutron activation analysis, *Trace elements, *Zooplankton, *Phytoplankton, Analytical techniques, Spectroscopy, Laboratory tests, Sampling, Manganese, Calcium, Potassium, Sodium, Nutrient requirements, Water quality control, Pollutant identification.
Identifiers: *Decay time, *Interferences.

Samples of water were obtained from 4 freshwater lakes and selectively filtered. The microplankton filtered from the water were placed in six categories according to size. The categories were: I = > 1180 micro m; II = 950 to 1180 micro m; III = 700 to 950 micro m; IV = 500 to 750 micro m; V = 295 to 500 micro m; and VI = 85 to 295 micro m. Phytoplankton was concentrated in the finest fraction, number VI, while almost all the zooplankton was present in I to V. Analyses of Ca, Mn, K, and Na were made on dried samples by neutron activation and gamma spectrometry of the irradiated samples. Results indicated: (1) rapid determinations of Ca, Na, Mn, and K content of small quantities of microplankton are possible, with the same samples left suitable for use for the determination of other elements; (2) phytoplankton (primarily Tabellaria) had higher levels of Ca and K than Na; (3) Caldocera and Copepoda concentrate Ca by approximately the same amount irrespective of the Ca content in the water in which they are found. (Lowry-Texas)
W72-11093

FLUID CONTAMINATION MEASURING SYSTEM,
Alpha Advanced Systems, Inc., Inglewood, Calif. (assignee).
J. E. Friederichs, E. E. Friederichs, and L. Weg.
U. S. Patent No. 3,655,052, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 2, p 500, April 11, 1972.

Descriptors: *Patents, *Remote sensing, Measurement, *Water pollution, *Water quality control, Pollutant identification.

A fluid pollution measuring system consists of a sampling valve adapted to continuously withdraw a small representative portion of a stream flowing in an enclosed conduit. A filter moves in proportion to the cumulative amount of particles retained in it. The filter is connected to a sensor adapted to detect directly, but remotely the movement of the filter. (Sinha-OEIS)
W72-11139

SANITARY-BIOLOGICAL CONDITIONS AT PURIFICATION INSTALLATIONS,
Kharkov State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W72-11216

CHLORINATED HYDROCARBON RESIDUES IN MARINE ANIMALS OF SOUTHERN CALIFORNIA,
Westinghouse Ocean Research Lab. Annapolis, Md.
For primary bibliographic entry see Field 05C.
W72-11235

SUMMARY OF PLANS FOR ACQUISITION OF SURFACE-WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1973: STAGE, STREAMFLOW AND QUALITY.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07A.
W72-11287

A HYDROLOGICAL-METAL POLLUTION STUDY, HEATH STEELE MINES AREA, NEW BRUNSWICK, CANADA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05B.
W72-11300

ANALYSES OF LONG-TERM TRENDS IN WATER-QUALITY PARAMETERS,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 05B.
W72-11304

SIMPLE DETERMINATION OF DISSOLVED ORGANIC CARBON IN POLLUTED WATERS,
A. Otsuki, and T. Hanya.
Misc Rep Res Inst Nat Resour. Vol 71 p 38-39. 1969.
Identifiers: *Pollutant identification, Acetate, Benzenesulfonate, Benzoate, *Organic carbon, Chloride, Citric acid, Dodecyl, Fructose, Glucose, Glutamic acid, Histidine, Scenedesmus, Sodium, Starch, Analytical techniques.

The present method gives good recovery for glucose, fructose, sodium acetate, citric acid, glutamic acid, histidine HCl and sodium benzoate. Soluble starch and dodecyl benzene sulfonate also were tested. Their recovery ranged from 90-100% in all compounds tested, with the exception of docyl benzene sulfonate which gave a value of 75%. Persulfate oxidation gave unsatisfactory results (55-65%) for wet combustion of green algal cell, Scenedesmus sp. killed by freezing-dry. Unsatisfactory results may be obtained in measurements of the sample containing suspended organic matter.--Copyright 1972, Biological Abstracts, Inc.
W72-11314

THE SEPARATION OF IONIC AND ORGANIC MERCURY FROM WATER USING MILK PROTEINS, XANTHATES AND KERATIN,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05D.
W72-11317

PESTICIDE MOBILITY IN SOILS: II. APPLICATIONS OF SOIL THIN-LAYER CHROMATOGRAPHY,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
For primary bibliographic entry see Field 05B.
W72-11353

THE DESIGN OF A CONTINUOUS FLOW BIOLOGICAL EARLY WARNING SYSTEM FOR INDUSTRIAL USE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05G.
W72-11393

IMPROVED METHODS FOR DETERMINING CONTENTS OF CHLOROPHYLL, PROTEIN, RIBONUCLEIC ACID, AND DEOXYRIBONUCLEIC ACID IN PLANKTON POPULATIONS,
Nagoya Univ. (Japan). Research Inst. of Biochemical Regulation.
T. Iwamura, H. Nagai, and S. E. Ichimura.
Int Rev Gesamten Hydrobiol. Vol 55 No 1 p 131-147. 1970.

Identifiers: *Analytical techniques, Chlorella, Chlorophyll, DNA, Habitats, Lakes, Phaeodactylum, *Plankton, Populations, Protein, RNA.

Improved methods of assay of the 4 cellular components, chlorophyll, protein, RNA and DNA contained in planktonic populations were described. As preliminaries and controls, analyses were performed with laboratory (pure) clutures of a fresh water green alga, Chlorella, and a marine diatom, Phaeodactylum. The same analyses were performed with planktonic populations collected from varying depths in 3 lakes (Lake Nakanuma, Lake Haruna and lake Yunoko) and in sea (Suruga Bay). Most of them (except for Lake Yunoko) showed, at the time of water sampling, characteristic stratification of planktonic populations, which may not be easily detectable by the conventional survey methods. The result obtained in these natural water were compared with each other as well as the those obtained with laboratory-grown algae mentioned above. The assay methods adopted and these results were discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-11410

A STUDY OF OXIDANT CONCENTRATION TRENDS IN THE SAN FRANCISCO BAY AREA,
Bay Area Air Pollution Control District San Francisco, Calif. Dept. of Meteorological Data Analysis.
J. S. Sandberg, R. Thuillier, and M. Feldstein.
J Air Pollut Contr Ass. Vol 21, No 3, p 118-121. 1971. Illus.
Identifiers: *Air pollution, Air temperature, *Oxidants, *San Francisco Bay area, California.

To estimate annual changes in emission levels, and thus of control program effectiveness, the meteorological stratification of data was employed to provide 'comparable days'. For the San Francisco Bay Area photochemical oxidant data, simple criteria based on maximum temperature and on height of inversion base were selected. Temperature provided a readily available integrated index of solar energy input and of ventilation, while the inversion data added a vertical dilution factor. An earlier study, employing only the temperature criteria, showed that oxidant levels on comparable warm days had nearly doubled from 1954 through 1962. The current study of oxidant data 1962-1969 shows a gradual rise through 1965, and a sharp reversal in 1966, when for the first time a simultaneous decrease was noted at each benchmark station. Data through 1969 show that average oxidant levels have been maintained at this 25% lower plateau, with minor fluctuations at individual stations. The general improvement in air quality since 1965 is attributed to the reduction of reactive organics emitted from stationary and automotive sources.--Copyright 1972, Biological Abstracts, Inc.
W72-11422

TRITIUM AND RADIOCARBON IN HAWAIIAN NATURAL WATERS: PART I,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W72-11438

CHROMIUM IN WATER--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-11442

ALDRIN AND ENDRIN IN WATER--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-11443

CHARACTERIZATION OF TASTE AND ODORS IN WATER SUPPLIES,
Connecticut Univ., Storrs. Regulatory Biology Section.
R. P. Collins.
Copy available from GPO Sup Doc EP2.10:16040 DGH 08/71, $0.35; microfiche from NTIS as PB-211 025, $0.95. Environmental Protection Agency Water Pollution Control Research Series. August, 1971, 21 p, 1 fig, 8 ref. EPA Program 16040 DGH 08/71.

Descriptors: *Taste, *Odor, *Organic compounds, Analytical techniques, Separation techniques, Gas chromatography, Sepctroscopy, Algae, Actinomycetes, Fungi, Laboratory tests, Water quality control.
Identifiers: *Odor-producing algae.

Cultured samples of Streptomyces odorifer, Synura petersenii, and Trichoderma viride, an actinomycete, an algae, and a fungus, respectively, were steam distilled and the aqueous distillates were then extracted with an organic solvent and reduced to a small volume for analysis to determine their odorous constituents. Analysis of the extracts was by gas chromatography, infrared, mass, and nuclear magnetic spectroscopy. The major odorous constituents of Streptomyces odorifer were identified as trans-1, 10-dimethyl-trans-9-decalol (geosim), 2-exo-hydroxy-2-methylbornane, and cadin-4-ene-1-ol. A large number of odorus compounds were identified from Synura petersenii, with heptanol containing the odor normally associated with Synura petersenii. The major odorous compound produced by Trichoderma viride was 6-pentyl-2-pyrone. (Lowry-Texas)
W72-11604

NEUTRON ACTIVATION ANALYSIS OF VANADIUM IN NATURAL WATERS,
Colorado Univ., Boulder, Dept. of Civil Engineering.
K. D. Linstedt, and P. Kruger.
Modern Trends in Activation Analysis, Vol 1, June 1969, p 87-92, 2 fig, 2 tab.

Descriptors: *Analytical techniques, *Neutron activation analysis, *Natural streams, Dissolved solids, Radioisotopes, Sodium, Chlorides, *Pollutant identification.
Identifiers: *Vanadium, Interferences, Sample concentration, Radiochemical separation, Colorado River, Sacramento River, San Joaquin River.

Radiochemical separation methods and gamma-ray spectroscopic analysis were combined with neutron activation analysis to achieve a maximum sensitivity in excess of that required to measure vanadium in natural water containing large amounts of dissolved solids. Preirradiation sample concentration and postirradiation radiochemical separation procedures were required to reduce interferences. Samples were irradiated at a thermal neutron flux of about 10'n/cm2/sec for five minutes. For river waters, the major analytical interference was contributed by the gamma rays of 15 h 24Na and 37.3 min. 38Cl. The neutron activation analysis procedure was applied to the analyses of 170 natural water samples collected at 11 different sites throughout the Sacramento, San Joaquin, and Colorado River basins. A summary of the concentration data from these sites was presented in tabular form showing the range of concentrations observed as well as the mean concentration value. The vanadium concentrations ranged from a low of 0.2 mg/1 to a high value of 49.2 mg/1. (Galwardi-Texas)
W72-11607

SPECIFIC ACTIVATION ANALYSIS TECHNIQUES AND METHODS FOR THE ASSAY OF TRACE SUBSTANCES IN AQUATIC AND TERRESTRIAL ENVIRONMENTS,
Missouri Univ., Columbia. Dept. of Nuclear Engineering and Radiological Sciences.
G. W. Leddicotte.
Modern Trends in Activation Analysis, Vol 1, June 1969, p 76-80. 4 tab.

Descriptors: *Analytical techniques, *Trace elements, *Neutron activation analysis, Spring waters, Industrial water, Pesticide residues, Vegetation, Soils, Manganese, Magnesium, Copper, Gamma rays, *Pollutant identification.
Identifiers: Deionized water, Bromine, Cerium, Lanthanum, Scandium, Thorium, Gamma ray spectrometer.

Samples of water, soil, stream sediments, dusts, and vegetation were assayed for unusual, as well as common, elements utilizing neutron activation analysis techniques. Activation analyses were conducted at a flux of at least 5 x 10 to the 13th power m per cm sq per sec. Irradiation periods ranged from 30 seconds to 20 minutes. A multichannel gamma-ray spectrometer was used for all radioactivity measurements. Results from investigations of trace elements in deep spring waters, raw industrial waters and deionized water were arranged in tabular form. Also, chloride pesticide residues, trace concentrations of bromine, manganese, magnesium and copper in vegetation and cerium, lanthanum, scandium, and thorium in soils were reported. (Galwardi-Texas)
W72-11612

THE CONTROL AND REMOVAL OF MATERIALS OF ECOLOGICAL IMPORTANCE FROM WASTEWATERS IN LOS ANGELES, CALIFORNIA, U. S. A.,
Los Angeles Bureau of Sanitation, Calif.
For primary bibliographic entry see Field 05B.
W72-11624

COPPER, MANGANESE AND ZINC CONCENTRATIONS IN GULF OF MEXICO WATERS,
Texas A and M Univ., College Station.
J. F. Slowey, and D. W. Hood.
Geochimica et Cosmochimica Acts, Vol 35, No 2, p 121-138, February 1971. 3 fig, 13 tab, 23 ref. AEC Contract Nos, AT (40-1)-2799 and AT- (04-3)-310.

Descriptors: *Trace elements, *Gulf of Mexico, *Copper, *Manganese, *Zinc, Chemical analysis, Analytical techniques, Sampling, Water chemistry, Sea water, Water pollution sources, Pollutant identification.

Nuetron activation analysis techniques were used to determine the total concentration of copper, manganese and zinc in 84 samples obtained from 28 stations in the Gulf of Mexico. All samples were oxidized with peroxydisulfuric acid and extracted with diethyldithiocarbamate before activation to remove most of the interferences from the major elements. Wide ranges in concentration were found for all three elements. Coastal values for manganese (0.18-19.0 micrograms/liter) were about a magnitude higher than those in the open sea (0.05-0.88 micrograms/liter). Copper and zinc concentrations were greater in the open sea than in coastal regions. Highest values in the open Gulf were usually found at the surface and at intermediate depths. The higher metal concentrations in the intermediate water appear to originate outside the Gulf of Mexico from release of trace metals by decomposing organisms. Deeper waters were uniformly low in all three elements. (Woodard-USGS)
W72-11656

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1970-71 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02H.
W72-11670

THE DISTRIBUTION OF CO, CR, CU, FE, MN, NI AND ZN IN FRAMVAREN, A NORWEGIAN ANOXIC FJORD,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02K.
W72-11680

SIMULTANEOUS DETERMINATION OF COPPER AND MANGANESE WITH SODIUM DIETHYL DITHIOCARBAMATE,
Bridgeport Univ., Conn. Dept. of Chemistry.
S. M. Shah, and J. Paul.
Microchemical Journal, Vol. 17, No. 1, p 119-124, February 1972. 5 tab, 5 ref.

Descriptors: *Chemical analysis, *Trace elements, *Copper, *Manganese, Separation techniques, Solvent extractions, Copper, Compounds, Chemical reactions, *Pollutant identification, Methodology.
Identifiers: Organic solvents, Carbon tetrachloride, Chloroform, Methyl-isobutyl acetate, Amyl acetate, Diethyl ether, Benzene, Toluene, Perchloric acid, Dithiocarbamate, Complexation, Metal complexes, Isoamyl alcohol, Octanol, Butyl acetate, Isobutyl acetate.

A simple, rapid, and accurate method for the simultaneous determination of Cu and Mn in the presence of each other involves the selective formation of copper diethyl dithiocarbamate complex, at pH less than 1.0, in the presence of perchloric acid and sodium diethyl dithiocarbamate, and the solvent extraction of the Cu complex with n-butyl acetate. The separated aqueous layer is then neutralized with ammonia solution followed by formation of the manganese diethyl dithiocarbamate complex and subsequent extraction of this complex with isobutyl acetate in the presence of perchlorate ions. Composite tables are included showing the efficiency of extraction and the stability of the complexes in selected organic solvents. (Mackan-Battelle)
W72-11696

APPLICATION OF DIFFERENTIAL THERMAL ANALYSIS TO ORGANIC ELEMENTAL MICROANALYSIS: 1. COMBINATION WITH CARBON AND HYDROGEN DETERMINATION APPARATUS,
Shionogi Research Lab., Osaka (Japan).
T. Ieki, and K. Daikatsu.
Microchemical Journal, Vol. 17, No. 1, p 93-104, February 1972. 9 fig, 7 ref.

Descriptors: *Carbon, *Hydrogen, *Differential thermal analysis, Water analysis, Oxidation, Dehydration, Copper sulfate, Gravimetric analysis, Sublimation, Boiling, Organic compounds, Thermal properties.
Identifiers: Vaporization, Benzoic acid, Sucrose, Zygosporin A, Fusion, *Microanalysis, Decomposition products, Thermal decomposition.

Differential thermal analysis (DTA) has been applied to the microdetermination of carbon and hydrogen whereby samples are slowly heated normally at 15 C/min in a quartz vessel on a thermocouple detector in an air stream and carbon-hydrogen values are determined gravimetrically. During heating, thermal characteristics of the sample are indicated as the exothermic peak or endothermic negative peak in a differential thermogram. Differential thermocouples are placed in the layer of oxidizing catalyst and also in water and carbon dioxide absorption tubes to monitor the combustion of organic vapor in the effluent gas. This is not a rapid process but is valuable for samples that give anomalous results with more conventional carbon and hydrogen techniques. This technique also enables an estimation of the decomposition product of the sample at a certain temperature where the DTA indicated a thermal change in the thermogram. (Mortland-Battelle)
W72-11698

TITRIMETRIC MICRODETERMINATION OF YTTRIUM AND SCANDIUM: DISODIUM SALT OF RHODIZONIC ACID AS COMPLEXING AGENT,
Allahabad Univ., (India). Dept. of Chemistry.
O. C. Saxena.
Microchemical Journal, Vol. 17, No. 1, p 68-71, February 1972. 2 tab, 18 ref.

Descriptors: *Metals, *Volumetric analysis, *Trace elements, Potentiometric level, Chelation, Methodology, Chemical reactions, Heavy metals.
Identifiers: *Yttrium, *Scandium, Rare earth metals, Disodium salts, Rhodizonic acid, Mineral acids, Ceric sulfate, Complexing agents, Chemical interference, Metal complexes, Errors, Sample preparation.

In the titrimetric method for the determination of microamounts of yttrium or scandium, a complex is formed between the yttrium or scandium and disodium salt of rhodizonic acid in a 1:3 ratio. The complex is decomposed with a dilute mineral acid and the product titrated against a ceric sulfate solution using N-phenylanthranilic acid as the indicator. The yttrium- or scandium-rhodizonate complexes are formed at pH 4.9. Using this method, yttrium was estimated in the range 72.38 to 179.97 ng per liter and scandium in the range 94.95 to 237.39 ng per liter. Maximum errors were 1.7 and 1.1 percent, respectively. Interference by metal ions was observed. (Mortland-Battelle)
W72-11699

A COLORIMETRIC METHOD OF ESTIMATING HYDROLYZABLE CHLORINE IN LINDANE (GAMMA-HEXACHLOROCYCLOHEXANE),
Central Food Technological Research Inst., Mysore (India).
K. Visweswariah, S. K. Majumder, and M. Jayaram.

Descriptors: *Pollutant identification, *Colorimetry, *Chlorinated hydrocarbon, Pesticides, Organic pesticides, Chemical reactions, Hydrolysis, Chlorine, Acids, Alkalis (Bases), Color reactions.
Identifiers: *Lindane, *Dehydrochlorination, Gamma-hexachlorocyclohexane, Sample preparation, Detection limits, Chemical indicators, Precision, Absorbance.

The techniques for colorimetrically estimating the dehydrochlorination of lindane involved hydrolyzing a quantity of lindane with monethanolamine and mixing the colorless hydrolytic product with a volume of para-nitrobenzenediazonium fluoborate solution. The resulting red solution was read against a reagent blank at 520 millimicrons where it showed maximum absorption. After 15-20 min exposure the color gradually fades. Concentrated nitric, hydrochloric, and sulfuric acids change the complex violet red, while NH4OH, KOH, and Na2CO3 turns it brick red. The method obeys Beer's law between 80 to 320 micrograms/ml of solution and the sensitivity is superior to Volhard's titration method. The insecticide can be estimated in pure form with an accuracy of plus or minus 0.8 to 1.9 percent. (Mackan-Battelle)
W72-11700

IMPROVED TISSUE SOLUBILIZATION FOR ATOMIC ABSORPTION,
Cincinnati Univ., Ohio. Dept. of Environmental Health.
A. J. Jackson, L. M. Michael, and H. J. Schumacher.
Analytical Chemistry, Vol. 44, No. 6, p 1064-1065, May 1972. 3 tab, 13 ref.

Descriptors: *Trace elements, *Chemical analysis, *Spectrophotometry, Zinc, Copper, Iron, Manganese, Aqueous solutions.
Identifiers: *Atomic absorption spectrophotometry, *Biological samples, *Sample preparation, Tissue, Soluene-100, Muscle, Liver, Brain, Plasma, Solubilization, Precision.

Homogeneous, aspiratable tissue samples can be prepared quickly and with minimal handling for analysis by atomic absorption spectrophotometry using Soluene-100, a quaternary ammonium hydroxide tissue solubilizer. Samples prepared by adding 0.5-1.0 ml Soluene/100 mg tissue and allowed to stand at room temperature for 24 hr are analyzed using the AAS additions method. The applicability of the procedure for Zn, Cu, Fe, and Mn analysis was investigated using rat liver, brain, and muscle and rabbit plasma. The same tissue analyzed using standard solutions containing known concentrations of the metals in a Soluene matrix gave values in agreement with those obtained by the method of additions. Precision of Soluene method was calculated to be 5.1 percent and data comparisons show this method to be more sensitive. This method is capable of giving reproducible data with a sample size of 50-100 mg of tissue. Due to the conditions of sample preparation, the sample is likely to be less contaminated and, in addition, one obtains increased sensitivity because of the organic medium. (Snyder-Battelle)
W72-11701

SIMULTANEOUS DETERMINATION OF SAMPLE CONCENTRATION AND REAGENT BLANK,
Hach Chemical Co., Ames, Iowa. Water Analysis Research Lab.
M. B. Kloster, and C. C. Hach.
Analytical Chemistry, Vol. 44, No. 6, p 1061-1064, May 1972. 3 fig, 1 tab, 2 ref.

Descriptors: *Reliability, *Water analysis, *Iron, *Standards, Silica, *Trace elements, Colorimetry, Mathematical studies, Equations, Statistical methods, Chemical analysis, Quality control, Aqueous solutions, Calibrations, *Pollutant identification, Laboratory tests.
Identifiers: *Ultrapure water, Reagents, Ferrozine.

A method is presented for the simultaneous determination of the reagent blank and trace iron in ultrapure water. A calibration curve is prepared for the reagents involved, which allows the ion concentration to be determined simultaneously by running only two rapid and direct colorimetric tests. One ml of acid reagent solution and 1 ml of buffer solution are added to a 50 ml neutral solution and the color is allowed to develop for 1 minute. A purple color with maximum absorbance at 562 nm develops if iron is present. This color may be read and compared to a similarly prepared standard. In basic or acidic solutions, Ferrozine may be formulated for use in trace iron determination. The Ferrozine Color is allowed to develop for 5-10 minutes and is read at 562 nm to determine the mg/l concentration of iron in the solution. Multiplying by the dilution factor gives the mg/l iron in the acid or alkali solution. The method provides a simultaneous check on the reagent while running an analysis, thus providing a continual check on the reliability of a reagent. The method is being extended to iron determinations in reagent grade chemicals and to trace silica determinations. (Mortland-Battelle)
W72-11703

RAPID CHARACTERIZATION OF SALMONELLA ORGANISMS BY MEANS OF PYROLYSIS--GAS-LIQUID CHROMATOGRAPHY,
Public Health Service, Atlanta, Ga. Microbial Chemistry Lab.
E. Reiner, J. J. Hicks, M. M. Ball, and W. J. Martin.
Analytical Chemistry, Vol. 44, No. 6, p 1058-1061, May 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Salmonella, *Pollutant identifications, Systematics, *Gas chromatography, Drying, Pathogenic bacteria, Cultures, *Enteric bacteria, *Aerobic bacteria.
Identifiers: *Pyrolysis-gas-liquid chromatography, Sample preparation, Pyrolysis, Culture media, Salmonella panama, Salmonella cubana, Salmonella paratyphi var durazzo, Salmonella il-

linois, Salmonella newport, Salmonella bredeney, Salmonella typhimurium, Salmonella chester, Flame ionization gas chromatography.

Fifty-four driedipellet samples of Salmonella were characterized by pyrolysis-gas-liquid chromatography (PGLC). Pyrochromatograms were recorded from gas chromatographs equipped with a flame ionization detector and a pyrolysis module. Standard biochemical and serological aseptic techniques were used in preparing the samples for analysis. Classification of the organisms was performed visually by superimposing respective pyrochromatograms over a light box. All fifty-four samples were correctly classified by comparing their PGLC tracings. (Snyder-Battelle)
W72-11704

SENSITIVITY OF DETECTION OF THE ELEMENTS BY PHOTOELECTRON SPECTROMETRY,
Shell Development Co., Emeryville, Calif.
C. D. Wagner.
Analytical Chemistry, Vol. 44, No. 6, p 1050-1053, May 1972. 4 fig, 2 tab, 5 ref.

Descriptors: *X-ray analysis, Metals, Molybedenum, *Sodium compounds, *Fluorine, Carbon, Oxygen, Nitrogen, Sodium, Magnesium, Aluminum, Phosphorus, Sulfur, Lead, Chlorine, Potassium, Calcium, Chromium, Manganese, Iron, Nickel, Zinc, Cadmium, Iodine, Strontium, Spectrometers, Titanium, Bromine, Boron.
Identifiers: *Atomic sensitivity, *X-ray photoelectron spectrometry, *Chemical elements, Sample preparation, Lithium, Germanium, Arsenic, Selenium, Rubidium, Rhodium, Antimony, Barium, Samarium, Hafnium, Tungsten, Rhenium, Iridium, Platinum, Bismuth, Uranium, Spectrometry, Sensitivity, Fluorine compounds.

In the application of x-ray photoelectron spectrometry to a variety of solid-state systems, it is important to obtain knowledge of the relative sensitivity of detection of the elements. The sensitivity of 43 elements has been determined experimentally by examining the spectra of a variety of sodium and fluorine compounds with a Varian spectrometer. Compounds of the highest commercial purity were ground and sifted to a powder of less than 150 microns. This was brushed upon a sample cylinder and placed within the vacuum chamber of the instrument without access to air. The spectrometer was used with an aluminum anode, with the analyzer set to detect retarded electrons of 100 volts energy. Spectral scanning was done by varying the retarding energy in steps. Relative sensitivities are tabulated by peak heights and areas. Those factors affecting sensitivity and intensity are discussed. (Mackan-Battelle)
W72-11705

DIRECT STEADY STATE CALIBRATION OF A FLAME IONIZATION DETECTOR,
Rice Univ., Houston, Tex. Dept. of Chemical Engineering.
G. F. Carruth, and R. Kobayashi.
Analytical Chemistry, Vol. 44, No. 6, p 1047-1050, May 1972. 2 fig, 2 tab, 17 ref.

Descriptors: *Calibrations, *Laboratory equipment, Flow rates, Instrumentation, Equations, Least squares method, Gases, Liquids, Organic compounds.
Identifiers: *Flame ionization detectors, *Ethane, Hexane, *Butane, Pentane, Heptane, Octane, Nonane, Decane, Relative molar responses, *Aliphatic hydrocarbons, Paraffins, Precision, *Propane.

Calibration responses over wide concentration ranges of n-paraffin hydrocarbons, ethane through n-decane, in a helium carrier gas, were determined by a steady state flow method. Calibration mixtures were prepared by accurately metering known flow rates of the hydrocarbon into the carrier gas by use of a newly designed 8 cu cm positive displacement micropump rated to 5000 psi. The amount of hydrocarbon passing the detector per unit time was determined with a Barber-Colman hydrogen flame ionization detector (FID), with a 1-cm diameter platimum ring as an ion collector. Ethane, propane, and butane were metered as vapors and the other hydrocarbons as liquids. Calibration data for each compound are tabulated and comparisons of collected data and calculated data (expected results), displayed as molar flow rate vs. signal current, yield an average standard deviation of 1.8 percent (maximum deviation of any single point was less than 5 percent). The conclusion is that the uncertainty of this calibration technique is considerably less than the uncertainty in current measuring systems presently available. (Mackan-Battelle)
W72-11706

TURBIDIMETRY VIA PARALLEL PHOTOMETRIC ANALYSIS-DETERMINATION OF SULFATE,
Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
R. L. Coleman, W. D. Shults, M. T. Kelley, and J. A. Dean.
Analytical Chemistry, Vol. 44, No. 6, p 1031-1034, May 1972. 2 fig, 2 tab, 15 ref.

Descriptors: *Sulfates, *Pollutant identification, *Chemical analysis, Laboratory equipment, Water quality control, Turbidity, Optical properties, Physical properties, Phosphates, Automation, Computers.
Identifiers: *Turbidimetry, *Parallel photometry, Barium chloride, 4-amino-4'-chlorodiphenyl hydrochloride, Turbidants, Photomultiplier detector, Orthophosphates, Chemical interference, Detection limits, Absorbance, Precision, Sensitivity.

The utility of the parallel photometric (GeMSAEC) analysis techniques for turbidimetric measurements has been investigated using 2 turbidants-barium chloride, and 4-amino-4-chlorodiphenyl hydrochloride (CAD)-suitable for sulfate analysis. The method employs 15 optical cells located along the periphery of a centrifuge rotor. Samples and reagents are loaded into individual cups arranged in two concentric circles in a transfer disk, with each circle having 15 cups corresponding to the 15 optical cells. The apparatus is aligned and shaped so that the content of the inner cups is transferred radially by centrifugal force through a mixing chamber and into the corresponding cell where optical absorbance is measured and the transmittance of the cells read by a PDP-8/I computer which is interfaced with the GeMSAEC instrument as the cups spin past the photomultiplier detector. The GeMSAEC-CAD procedure allows the determination of sulfate in 0.3 ml with precision and accuracy of about 1 percent at 4 micrograms/ml sulfate. Results can be obtained for 30 samples in less than 1 hour. The CAD procedure has also been found to be free from interference by orthophosphate at concentration levels of less than 500 micrograms/ml orhtophosphate. Precision, accuracy, sensitivity, and speed are generally comparable to spectrophotometric procedures. (Mackan-Battelle)
W72-11708

INTERNATIONAL AFLATOXIN CHECK SAMPLE PROGRAM: 1971 STUDY,
WARF Inst., Inc., Madison, Wis.
F. B. Coon, F. J. Baur, and L. R. L. Symmes.
Journal of the Association of Official Analytical Chemists, Vol. 55, No. 2, p 315-327, 1972, 8 tab, 127 ref.

Descriptors: *Pollutant identification, *Methodology, Evaluation, Quality control, Poisons, Toxins, Peanuts, Food processing industry, Statistical methods, Testing, Sampling.
Identifiers: *Aflatoxins, *Performance evaluation, *Collaborative studies, *Interlaboratory studies, Peanut products, Phytotoxins.

An International Aflatoxin Check Sample Committee was formed in 1971 to establish a check sample program of commodities or materials with aflatoxin contaimination, which would be available to laboratories throughout the world. A set of 4 aflatoxin-contaminated peanut samples was prepared and mailed to 150 participating laboratories. Sufficient data were obtained from this study to permit statistical comparison of 3 of the 4 AOAC methods for analysis of peanuts and peanut commodities. The analysis showed significantly higher means for the CB method than for the BF or Pons method for 2 of the samples examined. (Mackan-Battelle)
W72-11709

UTILIZATION OF THE WESTOO PROCEDURE FOR THE DETERMINATION OF METHYL MERCURY IN FISH BY GAS-LIQUID CHROMATOGRAPHY,
Food and Drug Administration, Washington, D.C. Div. of Chemical Technology.
L. R. Kamps, and B. McMahon.
Journal of the Association of Official Analytical Chemists, Vol. 55, No. 3, p 590-595, May 1972. 1 fig, 3 tab, 8 ref.

Descriptors: *Fish, *Mercury, *Gas chromatography, Separation techniques, Solvent extractions, Methodology.
Identifiers: *Methyl mercury, *Gas liquid chromatography, Cleanup, Electron capture gas chromatography, Mercury chloride, Swordfish, Tuna, Tissue, Biological samples, Detection limits, Mercury compounds, Sample preparation.

The analytical procedure developed by Westoo for the GLC determination of methyl mercury in fish utilizes HCl to provide cleanup and to partition the benzene solution in order to extract the methyl mercury chloride. After the cysteine layer is separated and acidified, the methyl mercury chloride is re-extracted into benzene. Gas-liquid chromatography is then used for final analysis of the benzene solution. This step requires calculation of the g sample/ml available since aliquots are used in the various steps and a further calculation is used to compensate for incomplete partitioning. The normal detection limit of the method is 0.08 ppm methyl mercury chloride with provisions for detecting as little as 0.02 ppm. (Mortland-Battelle)
W72-11710

RAPID SEMIMICRO METHOD FOR THE DETERMINATION OF METHYL MERCURY IN FISH TISSUE,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. F. Uthe, J. Solomon, and B. Grift.
Journal of the Association of Official Analytical Chemists, Vol 55, No 3, p 583-589, May 1972. 3 fig, 3 tab, 15 ref.

Descriptors: *Fish, *Mercury, *Pollutant identification, *Gas chromatography, Mink, Pikes, Eels, Salmon, Crabs, Crustaceans, Herrings, Lake trout, Rainbow trout, Separation techniques, Aquatic animals, Solvent extractions, Sharks, Walleye, Marine animals, Heavy metals, Methodology.
Identifiers: *Methyl mercury, Mercury compounds, Thin layer chromatography, Demethylase, Seals (Animal), Cleanup, Florisil, Biological magnification, Tullibee, Whitefish, Tuna, Dogfish, Mercury chloride, Electron capture detector, Muscle, Tissue, Whales, Coho salmon, Northern pike, Liver, Column chromatography, Chemical interference, Sample preparation, Organic solvents, Biological samples, Electron capture gas chromatography.

A procedure for determining methyl mercury in fish tissue involves extracting the methyl mercury into toluene as methyl mercuric bromide, partitioning the bromide into aqueous ethanol as a thiosulfate complex, and re-extracting into benzene as methyl mercuric iodide. Gas chro-

matography is then used to quantitate methyl mercury with a sensitivity of 0.01 ppm. Thin-layer chromatography and gas chromatography of the thin-layer spot were used to detect methyl mercury in the final extract. Comparisons were made of methyl and total mercury in tissues of various aquatic animals; the high levels of nonmethyl mercury in seals suggest that demethylase is present. None of the mercurial compounds tested interfered with the analysis. However, some samples required additional changes by column chromatography on Florisil; 3 M potassium iodide was injected intermittently to keep the column operational. Use of the concentric tube electron capture detector was recommended because of column bleed and resulting detector contamination. (Mortland-Battelle)
W72-11711

SELECTIVE DETECTION OF CHLORINATED INSECTICIDES IN THE PRESENCE OF POLYCHLORINATED BIPHENYLS,
Purdue Univ., Lafayette, Ind. Dept. of Entomology.
J. W. Dolan, R. C. Hall, and T. M. Todd.
Journal of the Association of Official Analytical Chemists, Vol 55, No 3, p 537-538, May 1972. 2 fig, 12 ref.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Gas chromatography, Conductivity, Heptachlor, Aldrin, DDT, Dieldrin, Selectivity, *Pollutant identification, *Insecticides.
Identifiers: Conductivity detector, Lindane, Chemical interference, Aroclor 1221, Aroclor 1254, Aroclor 1260, p p' DDT.

A gas chromatographic method for selectively detecting chlorinated insecticides in the presence of polychlorinated biphenyls utilized a gas chromatograph equipped with a Coulson electrolytic conductivity detector modified to allow precise control of reaction gas composition and quantity as well as furnace temperature. The glass column, containing 3 percent OV-1 on acid-washed 80-100 mesh Chromosorb W was operated at 225 C with the transfer and inlet line maintained at 240 C. Nitrogen carrier gas was used at an inlet pressure of 40 psig and a flow rate of 40 ml/min. The reaction gases were nitrogen and hydrogen at 40 psig and a combined flow rate of 80 ml/min. After experimentation with varying conditions, the greatest selectivity of insecticides in the presence of PCB was found at a furnace temperature of 600 C and hydrogen reaction gas flow of 1-2 ml/min. (Mortland-Battelle)
W72-11712

CONFIRMATION OF PESTICIDE RESIDUE IDENTITY. I. DERIVATIVE FORMATION FOR THE CONFIRMATION OF PHOTOPRODUCTS OF ENDRIN: HEXACHLORO- AND PENTACHLORO-KETONE PESTICIDE RESIDUES BY GAS CHROMATOGRAPHY,
Department of the Environment, Burlington (Ontario). Water Quality Div.
A. S. Y. Chau.
Journal of the Association of Official Analytical Chemists, Vol 55, No 3, p 519-525, May 1972. 3 fig, 1 tab, 28 ref.

Descriptors: *Pesticide residues, *Endrin, *Pollutant identification, Water analysis, *Chlorinated hydrocarbon pesticides, *Gas chromatography, Fish, Mud, Heptachlor, Aldrin, DDD, DDE, Dieldrin, DDT, Alcohols, Solvent extractions, Chemical reactions.
Identifiers: *Ketones, Hexachlor-ketone, Pentachloro-ketone, Chlorochlordane, Ketone I, Ketone II, Sample preparation, Hydroxochlordene, Lindane, Acetoxychlordene, DDMU, Endosulfan, Methoxychlor, o p'-DDD, Dicofol, 1-Acetoxychlorodene, Heptachlor epoxide, o p'-DDE, DDMU, gamma-Chlordane, alpha-Chlordane, p p'-DDE, o p'-DDD, Chlordane, o p'-DDT, p p'-DDD, p p'-DDT, p p'-Methoxychlor, Photodieldrin, Silylation, Acetylation, Cleanup, Metabolites, Tissue, Chromous chloride, Chemical interference, Photoisomers.

A derivation procedure for the confirmation of two photoproducts of endrin, ketone I and II, using an alkali reaction avoids confusion with the identification of endrin pesticide residues. The ketones are treated with potassium t-butoxide in t-butanol and then silylated or acetylated to the corresponding silyl ether or acetate. The hydroxyl products and the unreacted endrin all have significantly different retention times and can be easily differentiated. The procedure can be used to identify residues as low as 0.02-0.03 ppb in a 25 g fish sample or 0.01 ppb in a 1 liter water extract. The presence of other common organochlorine pesticides does not interfere with this confirmatory procedure. Those that do not react under the described conditions have different retention times than the endrin derivatives. Compounds that do react are: p,p' - methoxychlor, p,p' - DDT, p,p' - DDD, o,p' - DDT, o,p' - DDD, gamma-chlordane, alpha-chlordane, heptachlor, and to a lesser extent, heptachlor epoxide. The use of chromous chloride to confirm these residues is discussed and data are given for gas-liquid chromatographic analysis of some organochlorine pesticides and their derivatives. (Mortland-Battelle)
W72-11713

SOIL MOISTURE INFLUENCE ON TREATMENT AND EXTRACTION OF DDT FROM SOILS,
Agricultural Research Service, Beltsville, Md. Maryland Plant Science Research Div.
R. G. Nash, and W. G. Harris.
Journal of the Association of Official Analytical Chemists, Vol 55, No 3, p 532-536, May 1972. 2 fig, 3 tab, 16 ref.

Descriptors: *DDT, *Separation techniques, *Soil analysis, *Soil moisture, Soils, Alkaline soils, Clays, Chlorinated hydrocarbon pesticides, Gas chromatography, Soil treatment, Moisture content.
Identifiers: Liquid scintillation, *Gas liquid chromatography, Metabolites.

Techniques were investigated in order to prevent the conversion of DDT to DDE during extraction of DDT treatment of highly alkaline soils. Three different extraction methods were used on soils having a wide range of pH values and treated in either a moist or dry condition. Data indicated a tendency for heat and time to convert DDT to DDE during extraction whereas moistening the soils reduced conversion. The development of a new column extraction method prevented further conversion. This method was quicker than Soxhlet or shake extraction and used less expensive equipment but was not as efficient. With column extraction, about 4 percent DDT remained after extraction of incubated soils compared to about one percent after Soxhlet extraction. For clay soils both methods were inefficient. It was concluded that alkaline soils, if equilibrated in a moist condition, can apparently be extracted safely with either Soxhlet or column extraction. (Mortland-Battelle)
W72-11714

THIN LIQUID INFRARED CELL FOR QUANTITATIVE STUDIES USING AQUEOUS SOLUTIONS,
General Technologies Corp., Reston, Va.
E. F. Rissmann.
Analytical Chemistry, Vol 44, No 3, p 644-646, March 1972. 4 fig, 7 ref.

Descriptors: *Laboratory equipment, *Aqueous solutions, *Sulfates, *Nitrates, Nitrites, *Ions, Calcium compounds, Inorganic compounds, Chemical analysis, Calibrations, Reliability.
Identifiers: *Infrared spectrometry, Absorbance, Sulfites.

Two sample cells have been designed for quantitative infrared spectrometric analysis using aqueous solutions. The cells, a sealed and a demountable one, consist basically of two Irtran 2 plates, the bottom one of which is coated with a 3-micron thick silver film which serves as a cell spacer. The flat, top plate prevents voids or bubbles and is transparent enough to see such artifacts if present. Both types of cells have been used to obtain calibration curves of absorbance at specific frequencies versus concentration for solutions of calcium nitrate and nitrite in water and calcium sulfate, sulfite, nitrate and nitrite in saturated aqueous tetrasodium EDTA solution. There is little scatter and good reproducibility of the results. Such cells should make it possible to analyze for several inorganic ions of the type recently given by other investigators for sulfate in EDTA solutions and in applying the IR method to the study of reaction kinetics in aqueous solutions. (Mackan-Battelle)
W72-11715

CHANGES IN ORGANOCHLORINE CONTAMINATION OF THE MARINE ENVIRONMENT OF EASTERN BRITAIN MONITORED BY SHAG EGGS,
Durham Univ. (England). Dept. of Zoology.
J. C. Coulson, I. R. Deans, G. R. Potts, J. Robinson, and A. N. Crabtree.
Nature, Vol 236, No 5348, p 454-456, April 28, 1972. 2 fig, 1 tab, 12 ref.

Descriptors: *Sea water, *Bird eggs, *Monitoring, *Chlorinated hydrocarbon pesticides, *Pollutant identification, Aquatic environment, Water pollution sources, DDE, Dieldrin, Water birds, Incubation, Ecosystems, Bioassay, Water pollution, Trophic level.
Identifiers: *Shag, p p'DDE, Seabirds, Phalacrocorax aristotelis, Metabolites, Biological samples, Bioaccumulation.

Changes in organochlorine contamination of the marine environment of eastern Britain were monitored using shag eggs which were collected at representative locations and at different dates during the breeding season, incubated, and the concentrations of organochlorine insecticides determined. During 1964 to 1971, only dieldrin and p,p'-DDE were recorded because the amounts of the others were not analytically significant. The data collected show that during the periods 1964-1971, significant changes in the concentrations of dieldrin occurred in the eggs of shags in eastern Britain. There were a short-lived decrease in the concentrations of both dieldrin and p,p'-DDE recorded in 1968, followed by a significant increase in 1969. The changes in the concentrations of these two organochlorine compounds in the eggs of shags are of particular interest in relation to attempts to establish mathematical models for the behavior of such compounds in ecosystems. The significant declines of the concentrations in recent years are particularly noteworthy as the shag is a member of the fourth trophic level, and the decline of the concentration of p,p'-DDE is inconsistent with the model prepared by Harrison et al. which predicts no decrease in DDT concentration in animals at the top of the trophic structure even if no further quantities of this substance are added to the biosphere. (Byrd-Battelle)
W72-11721

SOME ATHECATE HYDROIDS FROM THE SHELF WATERS OF NORTHERN CANADA,
National Museum of Natural Sciences, Ottawa (Ontario).
D. R. Calder.
Journal of the Fisheries Research Board of Canada, Vol 29, No 3, p 217-228, March 1972. 16 fig, 1 tab, 20 ref.

Descriptors: *Systematics, *Aquatic life, Marine animals, *Canada, Alaska, Invertebrates, Benthos, Distribution patterns, Spatial distribution.

Identifiers: *Hydroids, Coelentrates, Macroinvertebrates, Euphysa, Corymorpha groenlandica, Tubularia regalis, Monocoryne gigantea, Myriothela phrygia, Coryne hincksi, Cornye pusilla, Sarsia tubulosa, Rhizogeton nudus, Hydractinia carica, Hydractinia monocarpa, Rhizorhagium roseum, Eudendrium arbusculum, Eudendrium capillare, Eudendrium rameum, Eudendrium tenellum.

Sixteen species of athecate hydroids have been collected and identified from shelf waters of northern Canada between the Strait of Belle Isle and the Alaska-Yukon border. This brings the number of athecate species reported from Canada's north coast to 21, and the total number of hydroid species known from the region to 92. No high-arctic forms were presented, and only eight of the species are panarctic or low-arctic in distribution. Of the remaining species, six occur in boreal as well as subarctic waters, and two have a wide latitudinal range. Five species, Corymorpha groenlandica, Tubularia regalis, Monocoryne gigantea, Rhizogeton nudus, and Hydractinia monocarpa, are recored in North American waters for the first time. These five, plus Myriothela phrygia, Eudendrium capillare, and the hydroid of Euphysa, are new records for northern Canada. (Mackan-Battelle)
W72-11723

THE CONTRIBUTION OF GAS CHROMATOGRAPHY TO THE IDENTIFICATION OF SUBSTANCES,
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
For primary bibliographic entry see Field 02K.
W72-11725

FLAME IONISATION DETECTION (FLAME IONISATION PHENOMENA),
Ceskoslovenska Akademia Ved, Brno. Ustav Instrumentalni Analyticke Chemie.
For primary bibliographic entry see Field 02K.
W72-11726

REPORT ON HAZARDOUS SUBSTANCES,
Food and Drug Administration, Washington, D.C. Office of Product Safety.
For primary bibliographic entry see Field 07B.
W72-11728

ANALYSES OF BENTHIC COMMUNITY STRUCTURE IN A RESERVOIR BY USE OF DIVERSITY INDICES,
Kansas State Teachers Coll., Emporia.
For primary bibliographic entry see Field 02H.
W72-11729

THE RAPID DETERMINATION OF TUNGSTEN IN SOILS, STREAM SEDIMENTS, ROCKS AND VEGETATION,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry and Biochemistry.
B. F. Quin, and R. R. Brooks.
Analytica Chimica Acta, Vol 58, No 2, p 301-309, February 1972. 4 fig, 3 tab, 10 ref.

Descriptors: *Spectrophotometry, *Chemical analysis, Soils, Sediments, Rocks, Vegetation, Molybdenum, Geochemistry, *Pollutant identification, Water pollution sources, Water quality control, Methodology, Photometry, Leaching, Trace elements, Soil analysis.
Identifiers: *Tungsten, Toluene-3 4 dithiol, Chemical interference, Absorbance, Precision, Sensitivity, Detection limits, Dry ashing.

A rapid spectrophotometric method for the analysis of tungsten in geological and biological materials (soils, stream sediments, rocks, and vegetation) using toluene-3,4 dithiol (dithiol) involves fusing the soil, sediment, and rock samples with potassium hydrogen sulfate before leaching with concentrated HCl, and ashing the vegetation at 500 C before leaching. The remainder of the analytical procedure is identical except for the addition of a tin (II) chloride solution to the soil, sediments, and rock samples for the removal of any possible interference from molybdenum. Tungsten is extracted from the sample solution into a solution of dithiol in isoamyl acetate by heating for several hours and the remaining globule is dissolved in petroleum ether. The absorbance of the complex is measured at 630 nm. Up to 150 soils or 200 ashed plant samples can be analyzed per man day. Sensitivity of the method is 0.2 for soils and 0.01 for plants on a dry weight basis. The coefficient of variation of replicate analyses is better than plus or minus 11 percent in the range 0.2-150 micrograms of tungsten. (Mackan-Battelle)
W72-11730

IDENTIFICATION AND LOCATION OF ACTINOMYCETES IN THE SOUTHERN END OF LAKE MICHIGAN,
Chicago Dept. of Water and Sewers, Ill. Water Purification Div.
L. M. McMillan, S. P. Karshen, and B. F. Willey.
Journal of the American Waters Works Association, Vol. 64, No. 5, p 312-315, May 1972. 9 fig, 12 ref.

Descriptors: *Actinomycetes, *Water pollution sources, *Taste, *Odor, *Water pollution effects, *Pollutant identification, Aquatic fungi, Aquatic bacteria, Population, Aerobic bacteria, Soil bacteria, Ecological distribution, Surfactants, Biological properties, Environmental effects, *Lake Michigan, Electron microscopy, Biodegradation, Cultures, Growth rates.
Identifiers: *Streptomyces longispororuber, Streptomyces griseus, Streptomyces lavendulae, Culture media, Substrate utilization.

The concentrations of actinomycetes in the southern end of Lake Michigan were identified and located. Representative water samples were collected and cultured using specially prepared media and after the isolated, individual colonies of actinomycetes propagated, they were examined microscopically for color, appearance of growth, and odor. They were also examined microscopically for identification of mycelia and spores. The slide culture technique was used to provide undisturbed morphological growth of the organisms, and morphological identifications were made using an electron microscope. Actinomycetes of the genera Streptomyces and Micromonospora were present in Lake Michigan throughout the year, with a peak in the summer months. The maximum concentration of actinomycetes was along and within a mile of the shoreline, with diminishing appearance out to 10 miles. (Byrd-Battelle)
W72-11731

INSTRUMENTATION FOR MEASUREMENT OF WASTEWATER FLOW,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 05B.
W72-11732

TOTAL OXYGEN DEMAND: A NEW TOOL FOR WASTEWATER ANALYSIS,
W. N. Wills.
Water Pollution Control Federation, Vol. 9, No. 2, p D-2 - D-3, February 1972. 3 fig, 2 tab.

Descriptors: *Laboratory equipment, *Monitoring, *Sewage effluents, Instrumentation, Biodegradation, Carbohydrates, Water analysis, *Oxygen, Biochemical oxygen demand, Waste water (Pollution), Regression analysis.
Identifiers: *Total oxygen demand analyzer, Total oxygen demand, Substrate utilization.

A description is given for an instrument, the Total Oxygen Demand (TOD) analyzer, which can be used in monitoring oxygen concentrations in wastewater and tests involving the biodegradability of substrates. The TOD analyzer continuously monitors by means of a fuel cell the changes in oxygen concentration in a stream of nitrogen gas. Combustion of the water solution of the sample at 900 C over a platinum catalyst causes a change in oxygen concentration in the gas stream. The change is recorded and compared with the oxygen depletion caused by the combustion of a known compound. All sampling operations are automatic and if all adjustments are correct, the drop size is uniform. At least two peaks are normally obtained for each sample. TOD and BOD data can be correlated very well; the BOD can be estimated from TOD data using regression line equations. TOD caused by filterable material can be readily differentiated from TOD caused by soluble material passing a 4.45-micron filter. (Holoman-Battelle)
W72-11735

THE SEPARATION OF ALIPHATIC AMINES IN DILUTE AQUEOUS SOLUTION BY GAS CHROMATOGRAPHY AND APPLICATION OF THIS TECHNIQUE TO THE QUANTITATIVE ANALYSIS OF TRI- AND DIMETHYLAMINE IN FISH,
Torry Research Station, Aberdeen (Scotland).
J. N. Keay, and R. Hardy.
Journal of the Science of Food and Agriculture, Vol. 23, p 9-19, January 1972. 5 fig, 2 tab, 13 ref.

Descriptors: *Pollutant identification, Food processing industry, Chemical analysis, Nitrogen compounds, Pollutants, *Commercial fish, Separation techniques, *Gas chromatography, Organic compounds, Aqueous solutions.
Identifiers: *Trimethylamine, *Dimethylamine, Food spoilage, Cod, Gadus morhua, Chemical interference, Gas liquid chromatography, Column chromatography, Steam distillation, Sample preparation.

Gas chromatography on an alkaline Dowfax 9N9 column has been found suitable for the qualitative and quantitative analysis of alkylamines in dilute aqueous solution. This method has been used for the easy identification and estimation of methylamines in fish, having special application to trimethylamine (TMA) and dimethylamine (DMA) produced by bacterial reduction of trimethylamine oxide during spoilage of iced fish. Standardization of values for quantitative analysis of TMA and DMA was achieved by gas liquid chromatography and a steam distillation method tested for removal of the amines from fish tissues. After determining the accuracy of the method (up to 98 percent recovery) samples of frozen cod, Gadus morhua, were withdrawn after various freezing periods, steam distilled to remove the amines, and chromatographed for positive quantitative and qualitative analysis. This method not only appears accurate for analysis of methylamines and therefore a useful index of frozen fish spoilage, but also avoids the interference of DMA in the 'picrate' procedure for TMA determination. (Mackan-Battelle)
W72-11736

A NEW MOUNTING MEDIUM FOR DIATOMS,
Bemidji State Coll., Minn. Dept. of Biology.
D. B. Czarnecki, and H. D. Williams.
Transactions American Microscopical Society, Vol. 91, No. 1, p 73, January 1972. 2 ref.

Descriptors: *Diatoms, *Microscopy, Chrysophyta, Aquatic algae.
Identifiers: *Mounting media, Methylene iodide, Toluene, Polystyrene, Slide preparation, Sample preparation.

An improved inexpensive mounting medium, consisting of a mixture of polystyrene and methylene iodide in toluene, has been used in preparing diatom slides. The medium has a refractive index of 1.75 at 24 C and provides for detail resolution exceeding that of Hyrax mounts. For mixing the medium: add 15.75 g of polystyrene in some toluene, allow to stand until clear, then mix in 200 g of methylene iodide. (Synder-Battelle)
W72-11738

5B. Sources of Pollution

NONDESTRUCTIVE DETERMINATION OF ELEMENTS IN SPECIFIC FRESHWATER MICROPLANKTON BY ACTIVATION ANALYSIS,
European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 05A.
W72-11093

TOXICITY OF PETROCHEMICALS IN THE AQUATIC ENVIRONMENT,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W72-11105

MODES OF OCCURRENCE OF LEAD AND ZINC IN CHELEKEN THERMAL BRINES (O FORMAKH NAKHOZHDENIYA SVINTSA I TSINKA V TERMAL'NYKH RASSOLAKH CHELEKENA),
Akademiya Nauk SSSR, Moscow. Institut Geologii Rudnykh Mestorozhdenii Petrografii, Mineralogii i Geokhimii.
For primary bibliographic entry see Field 02K.
W72-11118

ISOTOPIC COMPOSITION OF SULFATES IN NATURAL WATERS FROM SULFIDE DEPOSITS IN THE MIDDLE URALS (O VOZMOZHNOSTI ISPOL'ZOVANIYA IZOTOPNOGO SOSTAVA SUL'FATNOY SERY PRIRODNYKH VOD V KACHESTVE POISKOVOGO PRIZNAKA KOLCHEDANNOGO ORUDENENIYA NA SR EDNEM URALE),
Uralskoe Geologicheskoe Upravlenie, Sverdlovsk (USSR).
For primary bibliographic entry see Field 02K.
W72-11119

JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
F. G. Barber, G. Godin, and T. S. Murty.
Canada Department of the Environment, Marine Sciences Branch Manuscript Report Series No 24, 1972. 193 p.

Descriptors: *Bays, *Water circulation, *Tides, *Oceanography, *Canada, Hydrologic data, Data collections, Estuaries, Investigations, Water temperature, Salinity, Currents (Water), Ice, Atlantic Ocean, Rivers, Inflow, Winds, Hydroelectric plants, Water pollution sources, Forecasting.
Identifiers: *James Bay (Canada), Hudson Bay.

The 3 reports in this publication were prepared in response to a request to Federal authorities from the government of the Province of Quebec for an initial consideration of the possible influence of the James Bay Hydroelectric Project on the marine environment. The data include water circulation, temperatures, salinity distribution, ice effects, winds, tidal effects, and river inflow. The reports are entitled: 1. On the Oceanography of James Bay; 2. The Tides of James Bay; and 3. Circulation in James Bay. (See W72-11132 thru W72-11134) (Woodard-USGS)
W72-11131

ON THE OCEANOGRAPHY OF JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
F. G. Barber.
In: Canada Department of the Environment, Marine Sciences Branch Manuscript Report Series No 24, p 1-96, 1972. 24 fig, 4 tab, 80 ref.

Descriptors: *Bays, *Hydrologic data, *Water circulation, *Canada, Water temperature, Salinity, Estuaries, Reviews, Rivers, Inflow, Currents (Water), Tides, Ice, Atlantic Ocean, Oceanography.
Identifiers: *James Bay (Canada), Hudson Bay.

Certain aspects of the oceanography of James Bay (Canada) were examined for possible influence on the water with the development of the hydroelectric potential there. The work constitutes a review or reappraisal of knowledge of the region. The review emphasizes the importance to James Bay of processes operating in adjacent waters and the fact that all of these waters generally reflect to similar degree the influence of similar internal and external factors. The water reflects to a large extent an influence of the Atlantic Ocean and an influence of a process occurring within the system. Much of the water is less than oceanic salinity, specifically less than 24.7 salinity, so that a point of maximum density can occur at temperatures warmer than that of ice formation at the surface. At such low salinities, surface cooling at temperatures close to freezing would lead to stability. Furthermore, at those locations where the surface layer is fresh or nearly so, the amount of salt made available to the surface layer through freezing is negligible. (See also W72-11131) (Woodard-USGS)
W72-11132

THE TIDES IN JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
G. Godin.
In: Canada Department of the Environment, Marine Sciences Branch Manuscript Report Series No 24, p 97-142, 1972. 11 fig, 4 tab, 3 ref, append.

Descriptors: *Tides, *Bays, *Estuaries, *Canada, *Data collections, Currents (Water), Diurnal, Flow profiles, Tidal effects, Water level fluctuations, Gages, Measurement.
Identifiers: *James Bay (Canada), Hudson Bay.

The amplitude and phase of the major constituents of the tide observed at various gage stations in James Bay (Canada) are tabulated. The tidal wave which progresses along the southern rim of Hudson Bay is strongly refracted around Cape Henrietta Maria and enters James Bay as a damped progressive wave. Its advance is considerably retarded in the vicinity of Akimiski Island and reaches Hannah Bay and Rupert Bay seven hours after it has rounded Cape Henrietta Maria. Its amplitude is larger on the western and southern portions of the bay due to the presence of a degenerate node of the semidiurnal tide on the eastern side of the bay. The mean amplitude of the tide varies from over 90 cm in the western and southern portions to less than 40 cm in the eastern portions near Akimiski Island. (See also W72-11131) (Woodard-USGS)
W72-11133

CIRCULATION IN JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
T. S. Murty.
In: Canada Department of the Environment, Marine Sciences Branch Manuscript Report Series No 24, p 143-193, 1972. 7 fig, 1 tab, 23 ref.

Descriptors: *Water circulation, *Bays, *Currents (Water), *Canada, *Estuaries, Model studies, Winds, Storms, Water temperature, Thermocline, Investigations, Forecasting, Hydroelectric plants, Data collections, Theoretical analysis, Environmental effects, Water pollution sources, Thermal pollution.
Identifiers: *James Bay (Canada).

The interest on physical oceanographic problems of James Bay (Canada), arose in connection with the proposed hydroelectric power project on some rivers draining into the bay. The normal modes of response of James Bay are calculated using a one dimensional topographic model. Using the method of characteristics it is shown that at the southern shores of James Bay the storm surge amplitude could reach up to 19 feet. The thermohaline circulation can be as intense as the wind-generated circulation which may explain some of the anomalous ice drift patterns. Although no barotropic coastal jets appear to be possible, baroclinic coastal jets with a width of 7 kilometers can occur with the core of the jet being at about 7 km seaward from the position where the thermocline intersects the bottom. The circulation in some rivers draining into James Bay is examined theoretically using the concepts of the three modes of estuarine circulation, namely the river-discharge mode, wind-stress mode, and gravitational-convection mode. The question of atmospheric water balance over these river basins is briefly examined and some possible consequences of the manmade changes are speculated. (See also W72-11131) (Woodard-USGS)
W72-11134

LAND AND WATER POLLUTION FROM RECREATIONAL USE.
National Industrial Pollution Control Council, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-11188

CLEAN WATER: AFFLUENCE, INFLUENCE, EFFLUENTS, A DESIGN FOR WATER QUALITY MANAGEMENT.

Available from the National Technical Information Service as N71-37861, $3.00 in paper copy, $0.95 in microfiche. ASEE-NASA Research Center and Old Dominion University Research Foundation, Hampton, Va., 1971. 228 p, 26 fig, 26 tab, 166 ref, 18 append. NGT 47-003-028.

Descriptors: *Water pollution, *Water management (Applied), *Systems analysis, *Regional development, Water resources development, Costs, Legal aspects, Rivers, Virginia, Social aspects.
Identifiers: *James River.

A system design analysis is applied to the problem of water pollution in Virginia's James River. First, the problem of declining water quality is outlined and specific obstacles to effective water quality management are identified. Twenty-five separate socio-economic impediments to effective management are identified. In general these impediments include such things as lack of will, misplaced priorities, poor laws, and failure to enforce the law. All of these impediments stem from society's current lack of commitment to clean up the environment. Second, the design of a management system for water resources is outlined, and general recommendations for effective management are developed. The recommendations are applied in a case study of the James River. Finally, 74 specific recommendations concerning approaches to achieving improved water quality are made. These recommendations fall into six broad categories: (1) commitment and enforcement, (2) river basin planning and management, (3) standards and waste treatment, (4) economic considerations, (5) organizational considerations, and (6) special technical considerations. Although based on a case study of the James River, these conclusions are meant to apply generally to the entire country. (Settle-Wisconsin)
W72-11219

DISTRIBUTION OF NATURALLY OCCURRING CHELATORS (HUMIC ACIDS) AND SELECTED TRACE METALS IN SOME WEST COAST FLORIDA STREAMS, 1968-1969,
Florida Dept. of Natural Resources, St. Petersburg.
D. F. Martin, M. T. Doig, III, and R. H. Pierce, Jr.
Professional Papers Series, No 12, April 1971. 52 p, 16 fig, 21 tab, 159 ref.

Descriptors: *Humic acids, *Chelation, *Iron, *Copper, *Manganese, *Zinc, *Water analysis, *Water chemistry, *Red tide, Streams, Rivers, Runoff, Freshwater, Florida, Dinoflagellates, Gymnodinium, Trace elements, Spectroscopy.

Identifiers: *Trace metals, Atomic absorption spectroscopy.

Monthly freshwater samples from 14 west coast Florida streams were collected during 1968-69 and analyzed for selected constituents. Concentrations of humic acids were determined by an extraction procedure that was based upon the operational definition of these materials ('that soil fraction that is soluble in alkali and insoluble in acid and ethanol'). Particulate and soluble forms of iron, copper, manganese, and zinc were determined by means of atomic absorption spectroscopy. In addition, rainfall and riverflow data for appropriate locations were obtained from government sources during the study period. Linear correlation coefficients of humic concentration with rainfall and with trace metal concentrations were obtained for each of the 14 rivers during a 12 month period. The origin, properties, spectra, and structure of humic acids were reviewed, and the biogeochemistry of selected trace metals (iron, zinc, manganese and copper) was considered. It was anticipated that it might be possible to find an association between red tide outbreaks and variations in the stream constituents, especially the distribution of iron and/or naturally occurring chelators. (Svensson-Washington)
W72-11238

LIMITATIONS AND EFFECTS OF WASTE DISPOSAL ON AN OCEAN SHELF.
Florida Ocean Sciences Inst., Deerfield Beach.

Copy available from GPO Sup Doc EP2.10:16070 EFG 12/71, $2.25; microfiche from NTIS as PB-210 862, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 317 p, 151 fig, 27 tab, 24 ref. EPA Program 16070 EFG 12/71.

Descriptors: *Continental shelf, *Florida, *Outlets, *Waste disposal, *Invertebrates, *Recreation, *Sampling, *Sands, *Coliforms, Temperatures, Salinity, Analytical techniques, Dyes, Tracers, Diffusion, Waste dilution, Water quality standards, Fluometry, Currents.
Identifiers: Boca Raton (Fla), Pompano Beach (Fla), Delray (Fla), Sample Fit analysis, Gausian Fit analysis.

A three year study to determine the effects of sewage outfall on macroscopic marine life and human recreation by comparison surveys was made using Boca Raton as a control for the Pompano Beach and Delray, Florida, outfalls. Sand samplings from the sewage lift stations were tested for total fecal and coliform counts, using standard methods. Temperature, salinity and current profiles were done and fluorometric dilution measurements were augmented by Sample Fit Analysis and Gausian Fit Analysis, measuring concentration deviations of the dye tracking of plumes resulting from the rising effluent surface 'boils'. A diffusion model furnished the basis of analysis on the various physical data and charted the fluorometric data. Rules are enumerated for limiting pollution on beaches as set by the state water quality controls. Programmed sampling of effluents and coastal circulation by plume dye tracking and sample collections of coliforms, phosphate and other matter are suggested. (Ensign-PAI)
W72-11275

A HYDROLOGICAL-METAL POLLUTION STUDY, HEATH STEELE MINES AREA, NEW BRUNSWICK, CANADA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
J. E. Charron.
Technical Bulletin No 43, 1972. 47 p, 11 fig, 3 tab, 6 ref.

Descriptors: *Water pollution sources, *Heavy metals, *Mine wastes, *Canada, Zinc, Copper, Water pollution control, Streams, Surface waters, Water analysis, Chemical analysis, Water quality, Streamflow, Flow rates, Sampling, Data collections, Mining.
Identifiers: *New Brunswick (Canada).

Two streams in the Heath Steele Mines area of New Brunswick, Canada, were determined to be affected by metal pollution (Zn and Cu). These streams and the springs of the area are not polluted in their natural environment because the sulfide ore in its natural unbroken state was unoxidized and, therefore, insoluble. The pH of these natural waters ranged from 6.0 to 8.0 while the value of total dissolved solids was low as indicated by specific conductance values of less than 100 micromhos/cm. Therefore, the metal pollution in the Northwest Miramichi River must be caused by the Heath Steele mining operation at the head of the Tomogonops River basin. On the mining property, the extreme values obtained for pH, specific conductance, and copper were 5.0, 3,650 micromhos/cm, and 72.0 ppm, respectively. Metal pollution increased appreciably after heavy precipitation, due mainly to the lack of facilities for transmitting these polluted waters to the tailing pond. If the capacity of pumping and transmitting facilities or the storage capacity were increased immediately, metal pollution resulting from heavy precipitation could be reduced by 85%. (Woodard-USGS)
W72-11300

ANALYSES OF LONG-TERM TRENDS IN WATER-QUALITY PARAMETERS,
Geological Survey, Trenton, N.J. Water Resources Div.
P. W. Anderson, S. D. Faust, and J. S. Zogorski.
Reprint from Proceedings of the 4th American Water Resources Conference, November 18-22, 1968, New York, N Y: American Water Resources Association, Urbana, Ill, p 123-131, 1968. 9 fig, 5 ref.

Descriptors: *Water pollution, *New Jersey, *Dissolved oxygen, Statistics, Statistical methods, Biochemical oxygen demand, Regression analysis, Municipal wastes, Industrial wastes.
Identifiers: *Passaic River (NJ).

The Passaic River basin in northeastern New Jersey affords a unique opportunity for a water-quality trend study. Stream-quality records are available up to 23 years, 1945-67, at 6 mainstream and 10 tributary sampling sites. These data, collected monthly by the Passaic Valley Water Commission, include turbidity, color, odor, pH, hardness, alkalinity, carbon-dioxide, acidity, chloride, nitrate, nitrite, ammonia, temperature, dissolved oxygen, biochemical-oxygen demand, and coliform bacteria. In addition, daily records are collected at a downstream site. The Passaic River drains approximately 950 sq. mi., of which roughly 85 percent is located in northeastern New Jersey. The remainder drains a part of southeastern New York State. The basin is the most widely developed major river system in New Jersey. A set of linear-regression curves derived from observed biochemical-oxygen demand loads and streamflow data are given for three time periods. The biochemical-oxygen demand load at the sampling site is increasing. For example, at the average streamflow of 758 mgd, the river carried a biochemical-oxygen demand load of 10 tons/day in 1951-52, 14 tons/day in 1953-54, and 17 tons/day in 1963-64. Dissolved-oxygen loads decrease with time: the long-term average flow carried 42 tons/day of dissolved oxygen in 1953-54, 31 tons/day in 1959-60, and 24 tons/day in 1965-66. (Knapp-USGS)
W72-11304

BREWERY EFFLUENT CONTROL, COMMENTS ON POLLUTION AND ITS ABATEMENT,
Kappele, Wright MacLeod Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 05D.
W72-11308

PESTICIDE MOBILITY IN SOILS: II. APPLICATIONS OF SOIL THIN-LAYER CHROMATOGRAPHY,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
C. S. Helling.
Soil Sci Soc Am Proc. Vol 35, No 5, p 737-743. 1971. Illus.
Identifiers: Adsorption, *Chromatography, *Clays, Diffusion, Dioxins, Herbicides, Insecticides, Leaching, Organic, *Pesticides, Soils, *Surfactants.

Forty pesticides were grouped into 5 categories based on relative mobilities on Hagerstown silty clay loam plates, using soil thin-layer chromatography. Diffusion was also examined in moist and airy-dry soils. Methyl esterification greatly reduced mobility of herbicides while increasing diffusion and volatility. The surfactant Tween 20 (1% in solution) increased 2,4-D movement, but 0.5% solutions of 5 surfactants were relatively ineffective with several herbicides. Metabolites of atrazine, propanil, and 2,4-D were less mobile than their parent compounds. Two chlorinated dibenzo-p-dioxins, potential 2,4,5-T impurities, were immobile. Movement of components in chlorpropham/propham/p-chlorophenyl methylcarbamate and atrazine/propachlor combinations were mutually independent.--Copyright 1972, Biological Abstracts, Inc. (See also W72-11353)
W72-11353

PESTICIDE MOBILITY IN SOILS: III. INFLUENCE OF SOIL PROPERTIES.
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
C. S. Helling.
Soil Sci Soc Am Proc. Vol 35, No 5, p 743-748. 1971.
Identifiers: *Soil properties, *Pesticides, Adsorption, Capacity, Chromatography, Clays, Dicamba, Fenac, Herbicides, Insecticides, Leaching, Mobility, Moisture, Movement, Picloram, Soils.

Soil parameters influencing pesticide movement were isolated using simple correlation and multiple linear regression analyses. Mobilities of 12 pesticides on 14 soils were first characterized by soil thin-layer chromatograppy. Mobility of nonionic compounds was inversely related to adsorption of similar compounds, field moisture capacity, organic matter and clay contents, and cation-exchange capacity. Mobility of acidic compounds (dicamba, picloram, fenac, and 2,4-D) was directly correlated with soil pH and inversely with picloram adsorption. Pesticide mobility tended to be directly related to increased water flux. When soils were grouped according to their clay mineralogy, there was a tendency for movement of acidic pesticides to be directly related to montmorillonitic clay content and inversely related to nonmontmorillonitic clay content. Regression equations usually contained field moisture capacity, water flux and often simazine or chlorpropham adsorption terms for predicting movement. These parameters are highly correlated with soil organic-matter content, which does not itself appear in the regression equations. The average deviation of predicted from observed mobility, across all soils and pesticide, was 0.04 RF units.--Copyright 1972, Biological Abstracts, Inc. (See also W72-11353)
W72-11354

CLOSTRIDIUM BOTULINUM IN THE GREAT LAKES,
Wisconsin Univ., Madison. Food Research Inst.
For primary bibliographic entry see Field 05C.
W72-11392

DDT IN THE BIOSPHERE: WHERE DOES IT GO.,
Brookhaven National Lab., Upton, N.Y. Dept. of Biology.
G. M. Woodwell, P. P. Craig, and H. A. Johnson.
Science, Vol 174, No 4014, p 1101-1108. 1971. Illus.

Identifiers: *Water pollution sources, Biosphere, Biota, Cycles, *DDT, Hazards.

The worldwide pattern of movement of DDT residues appears to be from the land through the atmosphere into the oceans and into the oceanic abyss. Calculations based on the fragmentary data available on rates of movement and sizes of various pools of DDT residues lead to the conclusion that concentrations in the atmosphere and in the mixed layer of the oceans lag by only a few years behind the amounts of DDT used annually throughout the world. A model suggests that maximum concentrations of DDT residues occurred in air in 1966 and will occur in the mixed layer of the oceans in 1971. The biota probably contains in total less than 1/30 of 1 yr's production of DDT during the mid-1960's, a very small amount in proportion to the total potentially available. The reason for the biota's failure to absorb larger quantities and to be affected much more severely is unclear. The analysis suggests that mere good fortune has protected man and the rest of the biota from much higher concentrations, thus emphasizing the need to determine the details of the movement of DDT residues and other toxins through the biosphere and to move swiftly to bring world use of such toxins under rational control based on firm knowledge of local and worldwide cycles and hazards.--Copyright 1972, Biological Abstracts, Inc.
W72-11423

MERCURY IN A GREENLAND ICE SHEET: EVIDENCE OF RECENT INPUT BY MAN,
Naval Undersea Research and Development Center, San Diego, Calif.
H. V. Weiss, M. Koide, and E. D. Goldberg.
Science, Vol 174, No 4010, p 682-694, 1971.
Identifiers: Greenland, Ice, *Mercury, *Waster pollution sources, Human population.

The increased Hg content in a Greenland ice sheet over the last several decades suggests the dissemination of this element about the earth's atmosphere through the activities of man. The Hg content in the atmosphere appears to result primarily from the degassing of the earth's crust. Increased flux may come about as a result of the enhancement of this degassing process through the actions of man.--Copyright 1972, Biological Abstracts, Inc.
W72-11426

GENERAL STUDY OF CHEMICAL POLLUTANTS THROWN INTO SEA WATER: INVENTORY AND TOXICITY STUDIES,
Institut National de la Sante et de la Recherche Medicale, Nice (France). Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale.
M. Aubert, J. Aubert, J. P. Gambarotta, B. Donnier, and M. Barelli.
Rev Int Oceanogr Med. 4 volumes, 1969.
Identifiers: *Pollutant identification, *Sea water, Water pollution sources, France, Atlantic, Channels, Detergents, Industrial wastes, Inventory, Mediterranean, Methodology, Pesticides, Petroleum, Toxicity, Waste water (Pollution).

An inventory of chemical pollution of French coastal waters is presented in 4 volumes: the first is dedicated to general considerations and methodology, the others describe present pollution in the Mediterranean, Atlantic, Channel and North Sea regions. The results emphasize the need for classical analytic methodology, new techniques and 'biological counters' adapted to this particular problem. Various types of chemical pollutants are surveyed, such as synthetic detergents, petroleum products, pesticides and industrial waste. Some particular cases of widespread pollution are studied. The general experimental considerations developed lead, for the study of industrial waste, to the use of a standardized methodology which demonstrates the phenomena of intervening acute toxicity on the constituents of the marine environment. The possibility of transmitting these toxic effects to the final consumer in the biological chain is also studied. Techniques used to carry out these biological measurements are described in detail, as well as a method for interpreting the results thus obtained. The results are grouped according to zone: Mediterranean, Channel and Atlantic.--Copyright 1972, Biological Abstracts, Inc.
W72-11428

SOIL PROPERTIES AFFECTING THE RETENTION OF PHOSPHORUS FROM EFFLUENT,
Department of Agriculture, Agassiz (British Columbia). Research Station.
M. K. John.
Can J Soil Sci. Vol 51, No 3, p 315-322, 1971.
Identifiers: *Waste water treatment, Aluminum, Canada, Waste disposal, Effluents, Extracts, Iron, New Zealand, *Phosphorus, Retention, Saturation, Sewage, Soils, Texture, Hydrogen ion, Concentration, Soil properties.

Factors affecting removal of P from waste water effluent on 376 soils from British Columbia and 6 soils from New Zealand were studied. When shaken at a ratio of 1:50 soil to effluent, the soils of the dry British Columbia interior removed on an average 31% of the effluent P, whereas wet coastal soils removed 85% and the New Zealand soils removed 76%. The capacity of the soil to remove effluent P was related mostly to Al, Fe and P extracted by various extractants, pH, base saturation, organic matter and texture.--Copyright 1972, Biological Abstracts, Inc.
W72-11430

TRITIUM AND RADIOCARBON IN HAWAIIAN NATURAL WATERS: PART I,
Hawaii Univ., Honolulu. Water Resources Research Center.
T. H. Hufen, R. W. Buddemeier, and L. S. Lau.
Available from the National Technical Information Service as PB-210 916, $3.00 in paper copy, $0.95 in microfiche. Completion Report, No. 53, April 1972. 54 p, 15 fig, 5 tab, 15 ref, 3 append. OWRR B-016-HI (1).

Descriptors: *Radiocarbon, *Tritium, *Isotopes, Groundwater, *Hawaii, *Oahu, Path of pollutants, Pollutant identification, Water wells, Radioactivity.

Instrumentation and procedures for an investigation of the tritium and radiocarbon levels in natural waters on the island of Oahu have been developed, and a number of measurements have been made. Tritium concentrations in rainwater are in excess of natural abundance levels, and fluctuate seasonally. Excess radiocarbon (as HCO3-) and tritium from atmospheric nuclear tests were also found in surface waters from these sources. Samples from nine tunnels into the Koolau Range dike compartments had tritium activities ranging from contemporary to pre-bomb; only two contained excess radiocarbon, however. Basal water samples from wells and shafts generally show little or no tritium and radiocarbon concentrations lower than the dikewater. Three springs discharging perched water show tritium in excess of current rainwater levels, but differ in their radiocarbon activities. In the irrigated Pearl Harbor-Central Oahu area, both radiocarbon and chloride content in well water increase down the gradient toward Pearl Harbor. A saline well T-133 at Ewa Beach was sampled at three different depths. All samples were low in radiocarbon, the activity of which is positively correlated with Cl- but negatively correlated with depth. This suggests exchange between the dissolved HCO3- and the carbonate aquifer.
W72-11438

CHROMIUM IN WATER--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
Available from NTIS, Springfield, Va 22151 as PB-210 921, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 72-205, June 1972. 126 p, 83 ref.

Descriptors: *Bibliographies, *Abstracts, *Water pollution sources, *Chromium, *Information retrieval, Publications, Documentation, Indexing, Classification, Information exchange, Data storage and retrieval.

This bibliography, containing 83 abstracts is one in a series of planned bibliographies in water resources produced wholly from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 41,521 abstracts covering SWRA through May 15, 1972 (Volume 5, Number 10). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. A comprehensive index represents all of the descriptors and identifiers by which each paper in this bibliography has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Another index lists the authors alphabetically and gives page numbers for the abstracts. Abstracts with full bibliographic details are listed in ascending Accession Number order. (Woodard-USGS)
W72-11442

ALDRIN AND ENDRIN IN WATER--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-210 922, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 72-203, 1972. 119 p, 77 ref.

Descriptors: *Bibliographies, *Abstracts, *Water pollution sources, *Aldrin, *Endrin, Pesticides, Publications, Documentation, Information retrieval, Indexing, Classification, Information exchange, Data storage and retrieval.

This bibliography, containing 77 abstracts is one in a series of planned bibliographies in water resources produced wholly from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 37, 916 abstracts covering SWRA through February 15, 1972 (Volume 5, Number 4). Abstracts with full bibliographic details are listed in ascending Accession Number order. A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. A comprehensive index represents all of the descriptors and identifiers by which each paper in this bibliography has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. (Woodard-USGS)
W72-11443

THE AQUEOUS UNDERGROUND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
L. W. Gelhar.
Technology Review, Vol 74, No 5, p 45-53, March-April 1972. 5 fig, 3 ref.

Descriptors: *Groundwater resources, *Water resources development, *Planning, *Water pollu-

tion control, *Reviews, Water demand, Water supply, Water quality, Hydrogeology, Model studies, Legal aspects, Pollution abatement, Water quality standards, Regulation.

Problems associated with the development of groundwater resources are reviewed. As demands increase on underground sources, the need for fundamental knowledge as well as understanding of many local geologic details becomes apparent. With the gradual development of water-reclamation schemes based on the recharge of aquifers, the water-quality aspects of artificial recharge are becoming important. Although groundwater is generally protected from gross pollution, low-level contamination which may present a hazard in drinking water is now common. The contamination increases gradually, reflecting the slow movement in the aquifer, and is thus less dramatic than surface-water pollution. Thus it is more insidious--and potentially just as serious. Future developments and management of the system will require, as a basis, information on the long-term response of the aquifer system to possible hydrologic changes. An effective program to control groundwater pollution might comprise measures ranging from public information programs to total bans on certain hazardous materials and might include strict controls on subsurface disposal practices and land use. (Woodard-USGS)
W72-11466

SUBSURFACE POLLUTION PROBLEMS IN THE UNITED STATES,
Environmental Protection Agency, Washington, D.C. Fresh Water Pollution Control Section.
R. K. Ballentine, S. R. Reznek, and C. W. Hall.
Available from NTIS, Springfield, Va. 22151 as PB-210 923, $3.00 in paper copy, $0.95 microfiche. Environmental Protection Agency Technical Studies Report TS-00-72-02, May 1972. 29 p, 5 fig, 6 ref, 2 append.

Descriptors: *Water pollution sources, *Water pollution effects, *Groundwater, *United States, Reviews, Water demand, Projections, Injection wells, Septic tanks, Landfills, Pesticides, Fertilizers, Saline water intrusion, Water pollution control, Water supply, Water utilization.

Sources of subsurface water contamination can generally be assigned to one of three basic categories: (1) the direct introduction of pollutants deep within the earth by injection through wells; (2) percolation of pollutants from surface and near surface sources such as septic tanks, leaching ponds, sanitary landfills, and pesticides and fertilizers used in agricultural practices; and (3) intrusion of salt water into fresh-water aquifers as a result of reductions in fresh-water flow in coastal areas or the breaching of impervious strata in inland areas. These pollution problems are reviewed concerning the increasing demands for water of acceptable quality for the various types of water needs in the United States. (Woodard-USGS)
W72-11472

EFFLUENTS FROM FRUIT AND VEGETABLE PROCESSING-PART I,
For primary bibliographic entry see Field 05D.
W72-11608

EFFLUENTS FROM FRUIT AND VEGETABLE PROCESSING-CONCLUSION,
For primary bibliographic entry see Field 05D.
W72-11609

THE CONTROL AND REMOVAL OF MATERIALS OF ECOLOGICAL IMPORTANCE FROM WASTEWATERS IN LOS ANGELES, CALIFORNIA, U. S. A.,
Los Angeles Bureau of Sanitation, Calif.
R. D. Bargman, and W. F. Garber.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 9, Hall B, Paper No. 17, June 21, 1972. 9 p, 1 fig, 4 tab, 2 ref.

Descriptors: *Water quality control, *Inspection, *Sampling, *Monitoring, *California, Data processing, Industrial wastes, Instrumentation, Laboratory tests, Heavy metals, Toxicity, Chlorinated hydrocarbon pesticides, Mercury, Pollutant identification, Water pollution sources.
Identifiers: *Fats and oils, *Los Angeles (Calif).

The City of Los Angeles has developed an entire section of the wastewater department for the specific tasks of characterizing waste discharges from industries and identifying, with the help of laboratory back-up personnel, any materials of ecological significance. The 13,000 industrial waste discharge permits are arranged by type of industry, and a data processing bank drawn from the permit file allows information to be categorized in the following ways: (1) by waste processing; (2) by treatment done or necessary; (3) by inspection frequency; (4) by industrial wastes control district; (5) by receiving waters-sewers, storm drain, ocean; (6) by flow characteristics; (7) by industrial class; (8) by specific element or waste type; and (9) by other characteristics as the need becomes apparent. By such a refined system of data processing, source control of compounds, even in the part per billion range, is now possible. Case histories of such instances are presented to illustrate the applications of the system. (Lowry-Texas)
W72-11624

COMPARISON OF DISCHARGES FROM URBAN STORMWATER RUNOFF, MIXED STORM OVERFLOW AND TREATED SEWAGE,
Allmanna Ingenjorsbyran, Stockholm (Sweden).
For primary bibliographic entry see Field 05D.
W72-11638

QUALITY OF STORMWATER DRAINAGE FROM URBAN LAND,
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.
E. H. Bryan.
Water Resources Bulletin, Vol 8, No 3, p 578-588, June 1972. 1 fig. 7 tab, 12 ref.

Descriptors: *Water pollution sources, *Urban runoff, Urban hydrology, Storm runoff, Organic matter, Chemical oxygen demand, Urban drainage, Urbanization, Water quality, Water pollution effects, *North Carolina.
Identifiers: *Durham (NC).

Urban stormwater from a 1,067-acre drainage basin in Durham, N.C. was characterized to determine yield of pollutants. Population density averaged 9 persons per acre. Annual BOD contribution attributable to surface wash during storms was approximately equal to contribution by its secondary wastewater treatment plant effluent. Total organic matter exceeded the amount in raw sanitary sewage from a residentially developed area of the same size. Mean basin yields (lb/acre/day) were: BOD-0.23, COD-2.85, Total Solids-43.6, Volatile Total Solids-4.8, Total Phosphate-0.01 and Chloride-0.20 (as NaCl). The yield of lead presumed to originate from internal combustion engines operating on and near the basin was 0.006 lb/acre/day. The concentration of total pesticides weighted for flow significance was 1.2 parts per billion. The major long-term pollutional impact on a projected downstream reservoir was considered to be the fixed solids residue and long-term oxygen demand. Intermittent release of other pollutants in slugs during runoff periods may be a significant factor in causing undesirable effects in streams draining urban areas. (Knapp-USGS)
W72-11651

WATER QUALITY PREDICTION WITHIN AN INTERBASIN TRANSFER SYSTEM,
Texas Water Devleopment Board, Austin. Systems Engineering Div.
W. A. White, L. F. Tischler, and T. A. Austin.
Water Resources Bulletin, Vol 8, No 3, p 483-494, June 1972. 6 fig, 7 ref.

Descriptors: *Water quality, *Inter-basin transfers, *Mathematical models, *Texas, *Planning, Computer programs, Simulation analysis, Systems analysis, *Model studies.
Identifiers: *Texas Water plan.

A methodology for predicting the spatial and temporal levels of conservative water quality constituents within a multibasin water resource system is presented. Dissolved solids, sulfates, and chlorides are the constituents used during this investigation; however, any other conservative ion or mineral can be incorporated into the simulation model. The methodology is tested on the proposed Texas Water System. The water quality model, QNET-I, utilizes monthly canal and river flows and reservoir storage levels calculated by the Texas Water Development Board's systems simulation model. Discharge-concentration relationships are developed for each source of water in the system, including significant waste-water discharges. Reservoirs in the system are assumed to be completely mixed with respect to conservative constituents. A mass balance analysis is performed for each node and each month during the simulation period. The output from the water quality simulation is a table of the concentrations of the conservative water quality constituents at each demand point in the system and in each reservoir and canal for every month the system is in operation. The desired quality of the water at the demand locations is used to determine the economic utility of transporting and mixing water from various sources. (Knapp-USGS)
W72-11652

COPPER, MANGANESE AND ZINC CONCENTRATIONS IN GULF OF MEXICO WATERS,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 05A.
W72-11656

THE ROLE OF THE WATER FACTOR IN THE SPREAD OF INTESTINAL INFECTIONS,
I. P. Gal'Perin, and A. V. Vasil'Eva.
Zdravookhr Turkm. 9. 34-36. 1970.
Identifiers: Dysentery, Fever, Human diseases, *Intestinal infections, *Salmonella-Gaertneri, Typhoid, USSR, Public health, *Aerobic bacteria, *Pathogens.

Bacteriological analysis of 364 water samples from different sources, including 208 samples of tap water, 46 from purification equipment, 64 from irrigation ditches, 27 from rivers and wells, and 19 from swimming pools showed that all the sources contained pathogenic bacteria, but the most bacteria were found in the water from irrigation ditches and rivers. Salmonella gaertneri was found mostly in tap water (8 of 11 times), the pathogens of typhoid fever and dysentery in open waters (16 of 20 times). On 2 occasions tap water contained pathogenic serotypes of coliform bacilli. The presence of the pathogens of intestinal infections in water depended on the time of year. Typhoid microorganisms were found with equal frequency in spring and fall, dysentery more frequently in spring, Salmonella in spring and summer. These data show the potential danger of the occurrence of epidemic outbreaks of typhoid fever, paratyphoid, and dysentery from water in the area of Turkmenistan studied.--Copyright 1972, Biological Abstracts, Inc.
W72-11692

SOIL MOISTURE INFLUENCE ON TREATMENT AND EXTRACTION OF DDT FROM SOILS,
Agricultural Research Service, Beltsville, Md. Maryland Plant Science Research Div.
For primary bibliographic entry see Field 05A.
W72-11714

HETEROTROPHY BY PLANKTON IN THREE LAKES OF DIFFERENT PRODUCTIVITY,
Oak Ridge National Lab., Tenn. Ecological Sciences Div.
For primary bibliographic entry see Field 05C.
W72-11720

CHANGES IN ORGANOCHLORINE CONTAMINATION OF THE MARINE ENVIRONMENT OF EASTERN BRITAIN MONITORED BY SHAG EGGS,
Durham Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W72-11721

IDENTIFICATION AND LOCATION OF ACTINOMYCETES IN THE SOUTHERN END OF LAKE MICHIGAN,
Chicago Dept. of Water and Sewers, Ill. Water Purification Div.
For primary bibliographic entry see Field 05A.
W72-11731

INSTRUMENTATION FOR MEASUREMENT OF WASTEWATER FLOW,
IIT Research Inst., Chicago, Ill.
T. K. Nedved, E. G. Fochtman, W. M. Langdon, and F. O. Sullivan.
Journal Water Pollution Control Federation, Vol. 44, No. 5, p 821-825, May 1972. 2 fig, 3 ref. DACW 23-68-C-0058.

Descriptors: *Instrumentation, *Suspended solids, *Drainage water, *Monitoring, *Discharge measurement, Hydrogen ion concentration, Dissolved oxygen, Chlorides, Sewage effluents, Physicochemical properties, Stream gages, Automation, Flow meters, Solid wastes, Dissolved solids, Water pollution sources, Analog computers, Equipment, Data collections, Water sampling, Turbidity, Specific conductivity.
Identifiers: Accuracy.

Variance in local stream conditions, inadequate sampling techniques, and unavailability of manpower have necessitated the development of more efficient methods of measuring suspended solids (SS) from industrial waste effluents. An automated water monitoring system has been designed to monitor the SS in proportion to water outflow and to require servicing only every 24 hours. The instrument is portable and self-contained and connected to an analog computer to perform required calculations and to initiate sampling. Outflow monitoring is measured with a pilot tube which provides information for water velocity calculations. Suspended solids (water turbidity) are measured by a photoelectric cell which detects quantities of reflected light. The instrument is very flexible and can be programmed to monitor any probe type measurement such as pH, dissolved oxygen, specific conductance, dissolved solids and chlorides. Furthermore, these values can be integrated with other variables tested. (Long-Battelle)
W72-11732

TOTAL OXYGEN DEMAND: A NEW TOOL FOR WASTEWATER ANALYSIS,
For primary bibliographic entry see Field 05A.
W72-11735

ACCUMULATION OF CS-137 BY AEDED AEGYPTI LARVAE AND THE EFFECT OF POTASSIUM CONCENTRATION,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
For primary bibliographic entry see Field 05C.
W72-11737

5C. Effects of Pollution

TOXICITY OF PETROCHEMICALS IN THE AQUATIC ENVIRONMENT,
Texas Univ., Austin. Dept. of Civil Engineering.
J. F. Malina, Jr.
Water and Sewage Works, Vol 111, No 10, October 1964, p 456-460. 1 fig, 2 tab, 20 ref.

Descriptors: *Pollutant identification, *Toxicity, *Bioassay, Fish, Aquatic environment, Organic pesticides, Hydrogen ion concentration, Temperature, Chlorinated hydrocarbon pesticides, Algae, Laboratory tests, Water pollution effects.
Identifiers: *Petrochemical compounds, Mean tolerance limit, Bluegills, Chlorella pyrenoidosa, Benzene compounds.

The organic chemical concentration carried in many water courses has been increasing as a result of the growing industrial, agricultural, and domestic applications of petrochemical products. The toxic effects of various petrochemicals on aquatic organisms were summarized. The results of bioassay tests indicating the acute toxicity of a specific compound on acclimatized test animals, namely fish, were arranged in tabular form. The toxicity data were reported as the 96 hour median tolerance limit. It was noted that in conducting a toxicity bioassay it is necessary to use the same species and size of test animal and that the water must be of uniform quality and the pH and temperature must be relatively constant. The chlorinated and phosphorus containing organic pesticides were more toxic to fish and invertebrates than any of the compounds tested. Alkyl aryl sulfonate, lactonitride, sodium butyl mecaptide, sodium cyanide and tetraethyl lead were toxic to bluegills in concentrations less than 10 mg/l. Also, the toxicity of various organic chemicals to a species of green algae Chlorella pyrenoidosa which had been evaluated in laboratory studies were reported. Compounds of the benzene series exhibited the highest toxicity with nitrobenzene being toxic at concentrations of 0.01 mg/l or less. (Galwardi-Texas)
W72-11105

PHOSPHATES AND PHOSPHATE SUBSTITUTES IN DETERGENTS (PART 2).
Committee on Government Operations (U.S. House).

Hearings--Comm. on Government Operations, U.S. House of Representatives, 92d Cong, 1st sess, October 29, 1971. 394 p, 3 fig, 6 illus, 1 photo, 38 tab, 5 append.

Descriptors: *Phosphates, *Water pollution sources, *Eutrophication, *Detergents, Water quality control, Domestic wastes, Runoff, Water softening, Environmental effects, Aquatic algae, Algal control, Algal poisoning, Aquatic environment, Aquatic fungi, Acquifer characteristics, Genetics, Dissolved oxygen.

Testimony is presented to the subcommittee on natural resources of the House Government Operations Committee concerning the effects of using phosphates in detergents. Testimony concerns consumer marketing attempts to eliminate phosphate detergents both voluntarily and by prohibiting their use through law. Testimony is also presented concerning the manner by which phosphate detergent discharges speed the normal eutrophication of a water body. The complete ban on phosphate detergent sale in Dade County, Florida, is discussed along with the unique ecological conditons present in that area. Efforts on the part of the Environmental Protection Agency to speed up the removal of phosphate discharges in water bodies are described. The dangerous health aspects of phosphate substitutes are also discussed. Optical brighteners used in detergents are examined and a scientific paper is appended. One problem with brighteners is that not enough is known about their effect on the environment. One scientist believes they may cause genetic mutations in some organisms. Appendices contain information on eutrophication, detergent content and analysis of their effects on the environment, and survey studies on pollution and eutrophication in the Nation's lakes. (Grant-Florida)
W72-11186

UREASE ACTIVITY OF CITRATE-POSITIVE E. COLI AS AN ECOLOGICAL SIGN,
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
G. G. Kalina.
Zh Mikrobiol Epidemiol Immunobiol. Vol 47, No 11, p 68-72. 1970. Illus. English summary.
Identifiers: Citrate, Ecology, *Pollutant identification, *E. coli, Feces, Sewage, Urease activity.

On the basis of studying 417 strains of citrate-positive Escherichia coli of various origin (from the intestine of healthy persons and dysentery patients, sewage, and river water of different degree of contamination) the urease activity of the citrate-positive E. coli was confirmed as an index of their fecal origin. Reduction in the relative amount of urease-active strains was not adequate for improvement of the sanitary-bacteriological characteristics of the water under study with the development of the autoclearance processes in them. This points to a more prolonged survival of such strains, which in the presence of satisfactory indices of the sanitary-indicative organisms pointed to a former fecal contamination. Finding of urease-positive E. coli can solve the question of the presence of fecal contamination.--Copyright 1972, Biological Abstracts, Inc.
W72-11213

SANITARY-BIOLOGICAL CONDITIONS AT PURIFICATION INSTALLATIONS,
Kharkov State Univ. (USSR).
T. V. Dogadina, L. I. Logvinenko, and M. V. Steblyuk.
Gidrobiol Zh. Vol 6, No 1, p 81-85. 1970. Illus.
Identifiers: *Algae, Astasia klebsii, Biology, Chilomonas paramecium, Chlamydomonas monadina, Cyclidiopsis acus, E. Coli, Mallomonopsis robusta, Mineralization, Nitzschia hungarica, Oscillatoria splendida, Oscillatoria tenuis, Oxygen, Palmellopsis gelatinosa, Phycomycetes, Phythiopsis cymosa, *Water purification, Synechoccus elongatus, USSR.

The purification of liquid effluents from the City of Pervomaisk was studied in Sept.-Dec., 1967 with particular attention given to the biological aspects of the process involved. The role of algae in lowering the Escherichia coli titer of the water was substantiated. With increasing proliferation of algae, as indicated by the number of species, the E. coli titer decreased and the index of biochemical utilization of O2 increased. Oscillatoria tenuis, O. splendida, Synechoccus elongatus, Nitzchia hungarica, Astasia klebsii, Cyclidiopsis acus, Chlamydomonas monadina, Chilomonas paramecium and Palmellopsis gelatinosa were present. Of the 139 species of algae found, 130 were in the biological purification pond. There were 6 species of golden algae. One of the golden algae species, Mallomonopsis robusta, was present in the pond in concentrations of 500,000 cells/l (1.28 mg/l), which is high for biological purification ponds. Of 22 representative saprobes detected in the pond, 20 were beta-mesosaprobes. Phycomycetes were present in the untreated effluent waters. With increasing degrees of purification of the water of bacteria, the number of species of phycomycetes increased. Phythiopsis cymosa was found for the first time in the Ukraine. The presence of 15 species of phycomycetes belonging to 7 genera was established. Due to the heterotrophic and saprophitic type of nutrition of phycomycetes, their participation in the biological mineralization of organic substances in the effluent waters may be assumed.--Copyright 1972, Biological Abstracts, Inc.
W72-11216

FECT OF HYDROGEN SULFIDE ON ORTHERN PIKE EGGS AND SAC FRY,
innesota Univ., St. Paul.
R. Adelman, and L. L. Smith, Jr.
ansactions of the American Fisheries Society, ol. 99, No. 3, p 501-509, July 1970. 2 fig, 11 tab, ref.

escriptors: *Hydrogen sulfide, *Bioassay, *Dis-lved oxygen, *Fish eggs, *Fish physiology, kes, Growth rates, Toxicity, Mortality, atching.
entifiers: *Median tolerance limits, *Sublethal fects, Esox spp., Sac fry, Malformations.

oassays were conducted to test the effect of 2S at two concentrations of oxygen on northern ke (Esox lucius) eggs and sac fry. At an oxygen ncentration of approximately 2 mg/l, mean edian tolerance limits (TLm) for eggs were 0.411, 076, 0.038, 0.034, and 0.030 mg/l H2S for 24, 48, , 96 hr, and for the duration of the embryonic riod, respectively. At an oxygen concentration approximately 6 mg/l, mean TLm values were 181, 0.046, 0.041, 0.037, and 0.032 mg/l H2S for , 48, 72, 96 hr, and for the duration of the emb-onic period, respectively. Mean TLm values for c fry were 0.035, 0.016, 0.012, and 0.009 mg/l 2S at 2 mg/l oxygen, and 0.160, 0.047, 0.030, and 026 mg/l H2S at 6 mg/l oxygen for 24, 48, 72, and hr, respectively. Eggs subjected to H2S sulted in increasing percentages of sac fry with natomical malformations. Sac fry hatched from gs held at the higher H2S concentrations were naller than the controls. Sac fry subjected to H2S owed decreased growth rates at the higher con-ntrations. The maximum possible safe level of 2S for eggs is between 0.014 and 0.018 mg/l, and r sac fry between 0.004 and 0.006 mg/l for 96 ours exposure. (Svensson-Washington)
72-11228

ATE OF ACCLIMATION OF JUVENILE HANNEL CATFISH, ICTALURUS PUNC-ATUS, TO HIGH TEMPERATURES,
rkansas Univ., Fayetteville.
. O. Allen, and K. Strawn.
ransactions of the American Fisheries Society, ol 100, No 4, p 665-671, 1971. 8 fig, 14 ref.

escriptors: *Acclimation, *Water temperature, Channel catfish, *Bioassay, *Fish physiology, quatic environment, Fish, Heat resistance, ates, Mortality, Regression analysis, Fisheries, reshwater fish, Fish management.
dentifiers: Ictalurus spp.

xperiments were designed to determine the rate f temperature acclimation, measured in terms of hange in heat resistance, when fish were kept at -- 6.0, 30.0, and 34.0C. Fish were tested at lethal emperatures of 38.5, 39.0, and 40.0C. Changes in verage resistance time were used to determine rogress toward acclimation. Fish changed from wer to higher temperatures were nearly reaccli-ated in 1-3 days. However, fish changed from igher to lower temperatures required 4-14 days to pproach acclimation to the new temperature. In oth changes, complete reacclimation required at ast 12 days. Acclimation was accelerated at igher temperatures. A strong cyclic effect in the ean daily resistance time was noted. A maximum minimum in resistance time occurred about very 2-4 days. These oscillations in resistance me were tested by utilizing multiple regression alysis. The equation derived were found to be artic. No explanation was found for this rhythm. hese findings indicate that tempering for a few ours would increase heat tolerance to some ex-nt, but upwards of one day would be required to gnificantly increase heat tolerance. On the other and, channel catfish could be held in cold water r 1-2 days with only a partial loss of heat lerance. Fish exposed to fluctuating temperature ould retain a relatively high heat tolerance. ivensson-Washington)
72-11229

THE ACUTE AND SUBACUTE TOXICITY OF CADMIUM (TOXICITATEA ACUTA SI AU-BACUTA A CADMIULUD),
Institutul de Igiena si Sanatate Publica, Bucharest (Rumania).
A. Sporn, I. Dinu, L. Stoenescu, A. Cirstea, and L. G. Ghizelea.
Igiena, Vol 19, No 4, p 201-208, 1970. 2 tab, 24 ref.

Descriptors: *Cadmium, *Daphnia, *Toxicity, Bioassay, Water pollution effects, Lethal limit, Rodents, Freshwater, Animal physiology, Enzymes, Metals, Public health, Heavy metals.
Identifiers: *Cadmium chloride, Acute toxicity, Subacute toxicity, Sublethal toxicity, Lupinus spp., Rats, White rats, LD50, LD100, Mammaliam enzymes.

The action of cadmium chloride on growth of Lupinus albus, and on the mortality of Daphnia magna and the white rat was investigated. The minimum dose affecting the growth of L. albus was 5 mg/l, for D. magna the LD50 was 0.1 mg/l and the LD100 was 5 mg/l. For the white rat the LD50 per oral administration was 141 mg/kg of body weight. (Katz-Washington)
W72-11230

INVESTIGATIONS ON THE REMNANTS OF THE PHOSPHO-ORGANIC COMPOUND FOSCHLOR IN TISSUES OF FISHES SUBJECTED TO THE TREATMENT WITH THIS PREPARATION (BADANIA NAD POZOSTALOSCIA ZWIAZKU FOSFOROORGANICZNEGO FOSCHLOR W TKANKACH RYB PODDANYCH LECZENIU TYM PREPARATEM),
Wyzsza Szkola Rolnicza, Lublin (Poland). Zaklad Chorob Ryb.
M. Studnicka.
Polskie Archiwum Weterynaryjne, Vol 13, No 3, p 107-121, 1970. 3 tab, 22 ref.

Descriptors: *Organophosphorous pesticides, *Pesticide toxicity, *Fish physiology, *Physiological ecology, *Methodology, *Carp, *Persistence, Water temperature, Pesticide residues, Pesticide kinetics, Enzymes, Metabolism.
Identifiers: *Foschlor, *Acetylcholinesterase, *Residual effects, Muscle tissue, Brain tissue.

Studies were conducted on carp of various ages. Fish were subjected to 2% (20 min), 0.0002% - 4 days, and 0.0001% - 5 days of Foschlor at 3-4C and 10-16C. After treatment the acetylchloinesterase is reduced depending on the concentration and temperature of the test solution. Enzyme activity of all fish returned to normal after 14 days. Traces of Foschlor in the muscle tissue of fish subjected to 20% Foschlor could be detected up to the twelfth day. (Katz-Washington)
W72-11231

THE EFFECTS OF DDT, DIELDRIN AND 2,4-D ON AMPHIBIAN SPAWN AND TADPOLES,
Nature Conservancy, London (England). Monks Wood Experimental Station.
A. S. Cooke.
Environmental Pollution, Vol 3, p 51-68, 1972. 1 fig, 5 tab, 22 ref.

Descriptors: *Pesticide toxicity, *DDT, *Dieldrin, *2-4-D, *Frogs, *Toads, *Newts, Growth, Chlorinated hydrocarbon pesticides, Inhibition, Growth stages, Amphibians, Salamanders, Herbicides, DDE, Behavior, Pesticide residues, Animal behavior, Methodology.
Identifiers: *Growth inhibition, Frog eggs, Tadpoles, Absorption, Animal development, Developmental stages, Color changes.

Spawn of the common frog (Rana temporaria) or tadpoles of the common frog, common toad (Bufo bufo) or smooth newt (Triturus vulgaris) were maintained for 24 or 48 hr in amphibian saline to which pesticide had been added. DDT did not penetrate well-developed spawn and was only detected in hatching tadpoles after freshly laid spawn had been treated. These tadpoles became hyperactive after their external gills were lost. In the experiments in which frog and toad tadpoles were exposed to DDT, tadpoles were most susceptible either just before or just after developing hind limb buds and at these and later stages they became hyperactive when tissue concentrations reached 2-3 and 3-4 ppm, respectively. During tail resorption small frogs, unlike small toads, were susceptible to tissue residues of DDT that had been acquired during their larval development. At every stage of development, toads were more resistant to DDT than frogs, some toad tadpoles surviving despite tissue concentrations of greater than 300 ppm. After treatment with DDT, DDE was often detected in newt tadpoles and in frog and toad tadpoles with hind limbs. Dieldrin caused lower mortality among tadpoles than DDT and had less effect on behavior, although, like DDT, it produced distinct behavioral changes and morphological abnormalities. Only frog tadpoles were treated with 2,4-D. It had no visible effect and no tissue residues could be detected even after treatment in 50 mg/l for 48 hr. (Katz-Washington)
W72-11232

PERSISTENCE OF CHLORFENVINPHOS IN NATURAL WATERS,
Shell Research Ltd., Sittingbourne (England).
K. I. Beynon, M. J. Edwards, A. R. Thompson, and C. A. Edwards.
Pesticide Science, Vol 2, p 5-7, 1971. 1 fig, 2 tab, 19 ref.

Descriptors: *Organophosphorous pesticides, *Persistence, *Water pollution effects, *Benthos, Pesticide kinetics, Pesticide toxicity, Water pollution sources, Water pollution, Freshwater, Aquatic insects, Mayflies, Application methods, Crustacia, Pesticide residues.
Identifiers: Chironomid larvae, Aquatic arachnids, Arachnids, Chlorfenvinphos.

Chlorfenvinphos was sprayed at a dosage of 74 kg/ha (some 20-40 times the normal rate of application to agricultural land) on to the surface of a pond so that the water contained an average concentration of 6.1 mg/l. This decreased to 2.0 mg/l after 5 hr, and to 0.12 mg/l after one month. Residues were detected in the mud 5 hr after the treatment of the water and the concentration increased rapidly up to 5 hr after treatment, and reached a maximum value of 0.32 mg/kg at 115 hr after treatment. Chlorfenvinphos persisted in mud for at least 34 days, and while there was a decrease in the numbers of Chironomidae larvae, the numbers of other animals were too small to detect any significant changes. (Katz-Washington)
W72-11233

STUDIES ON THE CONTROL OF WHIRLING DISEASE (MYXOSOMA CEREBRALIS). I. THE EFFECTS OF CHEMICALS ON SPORES IN VITRO, AND OF CALCIUM OXIDE AS A DISINFECTANT IN SIMULATED PONDS,
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Diseases Lab.
G. L. Hoffman, Sr., and G. L. Hoffman, Jr.
Journal of Wildlife Diseases, Vol 8, p 49-53, 1972. 5 tab, 11 ref.

Descriptors: *Fish diseases, *Calcium compounds, *Potassium compounds, *Chlorine, *Ammonium compounds, *Sodium compounds, Copper sulfate, Rainbow trout, Chemcontrol, Treatment.
Identifiers: *Whirling disease, Calcium oxide, Potassium hydroxide, Ammonium chloride, Potassium permanganate, Sodium borate, Myxosoma, Alkyl dimethylbenzylammonium chloride, Fish disease treatment.

Based on presumptive evidence of death (extrusion of polar filaments and disintegration of sporoplasm) 1.0%, 0.5% and 0.25% calcium oxide or potassium hydroxide killed the spores of Myx-

osoma cerebralis in vitro. Chlorine at 400 mg/l destroyed 36% to 90% of the spores, but 13-37% of those in the controls perished. Calcium hydroxide, ammonium chloride, sodium borate, potassium permanganate, Roccal (alkyl dimethylbenzylammonium chloride), and copper sulfate allowed survival of 38-96% of the spores, usually not much less than the rate of survival of the controls. In simulated pond testing, quicklime at 380 grams or more per square meter (3360 lbs/acre) of pond bottom prevented whirling disease in rainbow trout (Salmo gairdneri). (Katz-Washington)
W72-11234

CHLORINATED HYDROCARBON RESIDUES IN MARINE ANIMALS OF SOUTHERN CALIFORNIA,
Westinghouse Ocean Research Lab. Annapolis, Md.
T. O. Munson.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 4, p 223-228, 1972. 2 tab, 6 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *DDT, *Polychlorinated biphenyls, *Outfall sewers, Pesticide kinetics, Path of pollutants, California, Herbivores, Food chains, Sewage effluents, Municipal wastes.
Identifiers: *Marine environment, Kellet's whelk, Sebastodes spp., Panalabrax spp., Sargo spp., Pinelo spp., Haliotis spp., Strongylcentrotus spp., Hinnites spp., Sea urchin, Scallops, ABALONE.

Fish, abalones and sea urchins were collected from a reef about one mile from the San Diego sewer outfall on October 1, 1970. Mollusks, lobsters, and echinoderms were collected off Orange County, California on October 7, 1970, and all were analyzed for DDT and PCB, and the DDT:PCB ratios were calculated. Highest body burdens of the chlorinated hydrocarbons were accumulated by organisms at the higher trophic levels. The lowest levels were found in the abalone, a strict herbivore, and the highest was found in fish. Kellet's whelk is suggested as a good indicator organism for these substances. (Katz-Washington)
W72-11235

RESEARCH ON THE EFFECTS OF LAUNDRY ENZYMES ON FISH AND OTHER AQUATIC ORGANISMS (UNTERSUCHUNGEN UEBER DIE WIRKUNG VON WASCHENMITTELENZYMEN AUF FISCHE UND ANDERE WASSERORGANISMEN),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten- und Binnenfischerei.
H. Mann.
Archiv fuer Fischereiwissenschaft, Vol 22, No 2, p 146-151, December 1971. 2 fig, 1 tab, 8 ref.

Descriptors: *Detergents, *Water pollution effects, *Toxicity, *Fish eggs, Water pollution sources, Laundering, Domestic wastes, Bioassay, Lethal limit, Pollutants, Enzymes, Freshwater fish, Aquatic life, Sewage treatment, Salinity, Rainbow trout, Tubificids, Eels.
Identifiers: *Laundry enzymes, *Detergent enzymes, *Fish larvae, Proteolytic enzymes, LD50, Guppies, Lebistes spp.

The effect of the proteolytic laundry enzyme Maxatase P on fish and other water organisms of fresh and brackish water was investigated. The most sensitive organisms are fish eggs and larvae. The 24-hr LD50 for eggs of aquarium fish (Rivulus cylindraceus) and trout fry amounts to approximately 1-5 mg/l of Mexatase P. Fully grown fish can endure relatively higher concentrations. The detrimental effect of Maxatase P examined increases with increasing salinity. Gammarids of brackish water are, according to the investigation, least affected. The heating of the washing solution up to over 50C during the washing process destroys most of the enzyme. Only a comparatively small quantity gets into sewage. The remainder is decomposed in purification plants. Under normal conditions proteolytic enzymes of detergents will have no detrimental effect. (LeGore-Washington)
W72-11236

THE RESPONSE OF BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) TO SEISMIC SHOCK,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
R. E. Sparks, and J. Cairns, Jr.
Hydrobiologia, Vol 39, No 2, p 273-276, 1972. 2 fig, FWQA 18050 EDQ.

Descriptors: *Stress, Sunfishes, Lepomis species, Earthquakes, Fish physiology, Physiological ecology, Fish behavior.
Identifiers: *Fright response, *Response, *Alarm, Polygraph records, Breathing, Physiological response.

Living bluegills exhibited a fright response to an earthquake on November 19, 1969. Abnormal breathing and heart responses were noted in laboratory fish after an earthquake. (Katz-Washington)
W72-11237

DISSOLVED NITROGEN CONCENTRATIONS IN THE COLUMBIA AND SNAKE RIVERS IN 1970 AND THEIR EFFECT ON CHINOOK SALMON AND STEELHEAD TROUT,
National Marine Fisheries Service, Seattle, Wash.
W. J. Ebel.
National Oceanic and Atmospheric Administration, Technical Report NMFS SSRF-646, August 1971. 7 p, 2 fig, 6 tab, 4 ref.

Descriptors: *Nitrogen, *Columbia River, *Chinook salmon, *Supersaturation, *Dams, *Fishkill, *Fish physiology, Fisheries, Trout, Bonneville Dam, Fish barriers, Fish migration, Fish populations, Fish diseases.
Identifiers: *Dissolved nitrogen, *Snake River, *Gas bubble disease, *Steelhead trout, Salmo spp., Oncorhynchus spp.

Concentrations of dissolved nitrogen gas varied widely (81.6-146.4% saturation) in 1970 but were generally lower in the Columbia River than in 1968-69. Concentrations were high, however, in some areas of the Snake River in the spring and early summer, mainly because of spilling of water at Little Goose Dam. Symptoms of gas bubble disease were widespread in Snake River juvenile and adult chinook salmon (Oncorhynchus tshawytscha) and steelhead trout (Salmo gairdneri). There were substantial losses of fish, particularly juveniles, during periods of high concentrations of dissolved nitrogen gas. (Svensson-Washington)
W72-11239

DDT: DISRUPTED OSMOREGULATORY EVENTS IN THE INTESTINE OF THE EEL ANGUILLA ROSTRATA ADAPTED TO SEAWATER,
Mount Desert Island Biological Lab., Salisbury Cove, Me.
R. H. Janicki, and W. B. Kinter.
Science, Vol 173, p 1146-1148, September 1971. 2 fig, 29 ref.

Descriptors: *DDT, *Osmosis, *Seawater, *Eels, *Pesticide toxicity, *Animal physiology, *Fish physiology, *Water pollution effects, Absorption, Teleosts, Pesticides, Insecticides, Chlorinated hydrocarbon pesticides, Enzymes.
Identifiers: *Osmoregulation, Intest inal absorption, Anguilla spp., Adenosine triphosphatase.

The drinking of seawater and absorption of water along with sodium across the intestinal epithelium are well known osmoregulatory events in marine teleosts. The insecticide DDT impairs fluid absorption in intestinal sacs from eels adapted to seawater. Furthermore, this functional impairment has an enzymatic basis; DDT also inhibits the Na (+) and K (+) activated, MG (2+) dependent adenosine triphosphatase in homogenates of the intestinal mucosa. Thus, the extreme sensitivity of teleosts to organochlorine pollutants may involve the disruption of osmoregulatory transport mechanisms. (Svensson-Washington)
W72-11240

STUDIES ON THE POLLUTION OF FISH MEAT BY MINERAL OILS--II. INJURY AND POLLUTION BROUGHT FORTH ON FISH BY OIL DISPERSERS,
Kagoshima Prefecture Fisheries Experimental Station (Japan).
O. Deshimaru.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 37, No 4, p 302-306, April 1971. 8 fig, 2 tab, 3 ref.

Descriptors: *Oil pollution, *Bioassay, *Water pollution effects, *Marine fish, *Toxicity, *Carp, Oily water, Gas chromatography, Analytical techniques, Taste, Odor, Water quality, Mortality.
Identifiers: *Seafood, *Crude oil, *Mineral oil, *Oil dispersers, Cyprinus spp.

The practice of using oil dispersers may be harmful to fish, and the pollution of fish meat caused by the oil and dispersers have also become of great concern. From this viewpoint, four kinds of commercial dispersers were tested with carp, Cyprinus carpio. Two of them were highly toxic for the fish; at a level lower than 20 mg/l half of the fish died after 48 hr, the other two were relatively nontoxic and 600 mg/l showed the same effect as in the above condition. Dispersers containing mineral oils in their ingredients showed an oily polluted smell on the fish meat. Analyzing the polluted meat with gas chromatographic techniques, the chromatogram interpreted well the causal dispersers which were olfactorily not easily distinguishable from one another. (Svensson-Washington)
W72-11241

STUDIES ON THE POLLUTION OF FISH MEAT BY MINERAL OILS--I. DEPOSITION OF CRUDE OIL IN FISH MEAT AND ITS DETECTION,
Kagoshima Prefecture Fisheries Experimental Station (Japan).
O. Deshimaru.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 37, No 4, p 297-301, 1971. 5 fig, 2 tab, 13 ref.

Descriptors: *Oil pollution, *Bioassay, *Oily water, *Water pollution effects, *Marine fish, Fish, Fish physiology, Absorption, Gas chromatography, Analytical techniques, Taste, Odor, Water quality.
Identifiers: *Crude oil, *Mineral oil, Seriola spp., Seafood.

Yellow tail, Seriola quinqueradiata, were reared in seawater experimentally polluted with crude oil and its deposition in the meat was studied. Testing a piece of meat in the mouth, an obvious or slight oily smell was perceived in fish reared in seawater with crude oil in the range of 50 mg/l for 5 days or 10 mg/l for 13 days. By feeding fish with a diet containing crude oil of about 1%, a slight smell was perceived in the meat after 8 days' culture. Collecting the vapor from the sample meat by the head space method, the resulting gas chromatogram was almost identical to the crude oil assayed. (Svensson-Washington)
W72-11242

VENTILATION, THE HEART BEAT AND OXYGEN UPTAKE BY MYTILUS EDULIS L. IN DECLINING OXYGEN TENSION,
Leicester Univ. (England).
B. L. Bayne.

omparative Biochemistry and Physiology, Vol 0A, p 1065-1085, 1971. 12 fig, 1 tab, 22 ref.

escriptors: *Oxygen requirements, *Dissolved xygen, *Animal physiology, *Respiration, *Mol-sks.
dentifiers: *Oxygen tension, *Blood oxygen apacity, Mytilus spp., Oxygen consumption, entilation rate, Heartbeat, Oxygen debt.

Whereas the direct measurement of heart output in Mytilus edulis has not proved possible to date, stimates of heart rate and amplitude, together vith simultaneous measurement of ventilation and espiration rates provide some understanding of as exchange in this species. The animals that vere used in the experiments recorded here were ble to regulate oxygen uptake in declining oxygen ension for up to 30 days in the laboratory, after hich they became metabolic conformers to ox-gen. This provided a means to study regulation of xygen consumption in this species, by comparing ndividuals capable of regulation with others howing conformity to oxygen tensions. Ventila-on rate and the frequency and amplitude of heart eat increased at slightly reduced oxygen tension. t low pO2 ventilation rate and heart frequency eclined, with increased amplitude of heart beat. he (ventilation): (relative perfusion) ratio ecreased with declining pO2 in regulators, but emained constant in conformers. It is suggested hat regulation of oxygen consumption at reduced xygen tension is based on control of the (ventila-ion) : (perfusion) ratio. (Svensson-Washington)
V72-11243

OXYGEN CONSUMPTION BY THREE SPECIES OF LAMELLIBRANCH MOLLUSC IN DECLINING AMBIENT OXYGEN TENSION,
Leicester Univ. (England).
B. L. Bayne.
Comparative Biochemistry and Physiology, Vol 40A, p 955-970, 1971. 15 fig, 1 tab, 14 ref. GR/3/516.

Descriptors: *Oxygen requirements, *Dissolved oxygen, *Mollusks, *Animal physiology, *Respiration, Ecology, Bioassay, Metabolism.
Identifiers: *Oxygen tension, *Oxygen consumption, *Lamellibranchs, Arctica spp., Laevicardium spp., Mytilus spp.

The results of experiments to determine the relationship between size, oxygen tension and oxygen consumption in three lamellibranch species are described. Oxygen consumption by Arctica islandica was dependent on oxygen tension. Oxygen uptake by Laevicardium crassum and Mytilus edulis was independent of oxygen tension above a certain critical tension. An index is derived to indicate the degree of dependence of oxygen consumption on oxygen tension. In L. crassum and M. edulis larger individuals were less dependent on oxygen tension than smaller individuals. In M. edulis dependence of oxygen consumption to oxygen tension increased during periods of laboratory stress. (Svensson-Washington)
W72-11244

CHEMICAL STUDIES OF COLD DEATH IN THE GULF KILLIFISH, FUNDULUS GRANDIS,
Cincinnati Univ., Ohio.
B. L. Umminger.
Comparative Biochemistry and Physiology, Vol 39A, p 625-632, 1971. 3 tab, 17 ref. 6B-26321.

Descriptors: *Cold resistance, *Fish physiology, *Bioassay, Mortality.
Identifiers: *Osmoregulation, *Ionoregulation, *Serum composition, *Gulf killifish, *Cold death, *Low temperature acclimation, Serum osmolality, Serum sodium, Serum chloride, Serum potassium, Serum glucose, Fundulus spp.

Serum chemistry was examined in saltwater-adapted Gulf killifish, Fundulus grandis, acclimated to 11, 4 and -1.5C. Exposure of fish to-1.5C caused cold death or coma in most fish within 7 days, presumably due to osmotic imbalance. Exposure to -1.5C was accompanied by a striking increase in serum osmolality and serum glucose, but by a decrease in serum sodium and chloride. Serum potassium was unchanged. The increase in serum osmalality in the cold was attributed to an accumulation of unknown organic substances. The reduction in serum electrolyte levels in the cold was thought to be an unsuccessful attempt to compensate for the elevation in serum osmolality caused by the buildup in serum organic constituents. (Svensson-Washington)
W72-11245

INFLUENCE OF PESTICIDES ON MARINE ECOSYSTEMS,
Fish and Wildlife Service Gulf Breeze, Fla.
P. A. Butler.
Proceedings of the Royal Society of London, Series B, Vol 177, p 321-329, 1971. 2 tab, 6 ref.

Descriptors: *Bioassay, *Pesticides, *Pesticide toxicity, *Pesticide residues, *Water pollution effects, *Water pollution sources, *Mollusks, *Pesticide kinetics, Mortality, Estuaries, DDT, Water pollution, Herbicides, Insecticides, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Public health, Dieldrin, 2-4-D, Aldrin, Endrin.
Identifiers: *Estuarine animals, *Marine ecosystems, *Sublethal effects, Mirex, Malathion, Toxaphene, DMPA, Dyrene, Naled.

A bioassay program undertaken in 1958 has evaluated the toxicity of about 240 pesticides to estuarine fauna. Studies indicate that chronic levels of sublethal amounts of pesticides may have more damaging effects than transitory changes due to acutely toxic levels of pollution. The first five years of a program monitoring the incidence of synthetic pesticide residues in populations of North American shellfish has been completed. The results demonstrate the ubiquity of DDT and its metabolites. Levels of contamination, however, are not high enough to indicate a human health problem. The runoff of surface waters from agricultural districts is indicated as the chief source of this type of pollution; municipal and industrial wastes, and the control of noxious insects are regionally important sources. Observations of laboratory populations experimentally contaminated with DDT indicate, by extrapolation, that pesticide pollution is causing significant changes in mortality, growth rates, or resistance to disease in some marine populations. (Svensson-Washington)
W72-11246

BOD SUB 5 AND TOXICITY ASSOCIATED WITH LOG LEACHATES,
Oregon State Univ., Corvallis.
F. D. Schaumburg, and S. Atkinson.
Report presented at the conference of the Western Division of the American Fisheries Society, July 13-16, (1970), Victoria, British Columbia, Canada. 7 p, 10 ref. WP 01320.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Leachate, *Lumbering, *Bioassay, *Fisheries, Toxicity, Mortality, Chinook salmon, Rainbow trout, Pacific Northwest U.S., Douglas fir trees, Hemlock trees, Ponderosa pine trees, Water pollution sources, Water pollution effects.
Identifiers: *Log leachates, Median tolerance limit.

A description of a quantitative evaluation of the 5-day biochemical oxygen demand (BOD sub 5) and acute toxicity associated with leachates from floating logs is presented. The leachates contain wood sugar and other biodegradable substances which exert a considerable BOD sub 5. Leachate from ponderosa pine, hemlock, and older Douglas fir logs, with and without bark, is not acutely toxic to salmon and trout fry in 96 hr exposure. Leachate from younger Douglas fir logs did result in mortality in some test fish. (Svensson-Washington)
W72-11248

EFFECT OF TEMPERATURE ACCLIMATION ON THE FATTY ACID COMPOSITION OF GOLDFISH INTESTINAL LIPIDS,
Agricultural Research Council, Babraham (England). Inst. of Animal Physiology.
P. Kemp, and M. W. Smith.
Biochemistry Journal, Vol 117, p 9-15, 1970. 1 fig, 5 tab, 18 ref.

Descriptors: *Acclimatization, *Water temperature, *Fish physiology, *Lipids, Aquatic environment, Adaptation, Chromatography.
Identifiers: *Goldfish, *Fatty acids, Sublethal effects, Phospholipids, Intestinal mucosa, Saturated fatty acids, Unsaturated fatty acids.

The fatty acid composition of both plant and animal tissues can be modified by a change in environmental temperature, the proportion of unsaturated to saturated fatty acids increasing when the environmental temperature falls. The fatty acid composition of whole goldfish, whole intestinal mucosa, intestinal mucosal membranes and individual phospholipids extracted from mucosal membranes were measured, fish adapted to different temperatures being used. Alterations of the adaptation temperature did not noticeably affect the fatty acid composition of the whole fish lipids, but there were marked changes in the fatty acids of lipids extracted from homogenates of goldfish intestinal mucosa. These changes were more pronounced in a membrane fraction prepared from these homogenates. Raising the adaptation temperature by 20C halved the percentage of C sub 20:1, C sub 20:4 and C sub 22:6 fatty acids and nearly doubled the percentage of C sub 18:0 and C sub 20:3 fatty acids recovered. Choline phosphoglycerides constituted about 1/2 and ethanolamine phosphoglycerides about 1/4 of the total membrane phospholipids. The fatty acids of choline and ethanolamine phosphoglycerides were more susceptible to temperature-dependent changes than were the phosphoglycerides of inositol or serine. The increase in C sub 18:0 fatty acid that occurred in membranes of warm-adapted fish was greatest for ethanolamine phosphoglycerides, but increases also occurred in other phospholipid fractions and in membrane neutral lipids. (Svensson-Washington)
W72-11249

ACTION OF DDT ON EVOKED AND SPONTANEOUS ACTIVITY FROM THE RAINBOW TROUT LATERAL LINE NERVE,
Michigan State Univ., East Lansing.
T. G. Bahr, and R. C. Ball.
Comparative Biochemistry and Physiology, Vol 38A, p 279-284, 1971. 2 fig, 8 ref. FWPCA FI-WP-26,004-03.

Descriptors: *Pesticide toxicity, *Insecticides, *DDT, *Chlorinated hydrocarbon pesticides, *Rainbow trout, *Fish physiology, *Bioassay, Pesticides, Aquatic environment.
Identifiers: *Neural activity, Lateral line, Central nervous system, Salmo spp.

Spontaneous and evoked neural activity was recorded from multifiber lateral line nerve preparations of rainbow trout, Salmo gairdneri. DDT was administered to fish in water and by intravenous injection. DDT-treated fish demonstrated classical poisoning symptoms in the absence of abnormal lateral line nerve discharge. Results indicate that the frequency of spontaneous activity from the lateral line nerve does not provide a sensitive index for analyzing the neurotoxic action of DDT, and afferent activity from this nerve appears to play a minor role in acute poisoning symptoms. (Svensson-Washington)
W72-11250

EFFECTS OF THERMAL EFFLUENT UPON MARINE FISHES NEAR THE CRYSTAL RIVER STEAM ELECTRIC STATION,
Florida Dept. of Natural Resources, St. Petersburg.
C. B. Grimes, and J. A. Mountain.
Professional Papers Series, No 17, October 1971. 64 p, 14 fig, 8 tab, 43 ref, 6 append.

Descriptors: *Gulf of Mexico, *Electric powerplants, *Thermal pollution, *Water pollution effects, *Aquatic environment, *Marine fish, *Fish populations, Florida, Electric generators, Water temperature, Hydrologic data, Cooling water, Thermal stratification, Salinity.
Identifiers: *Species diversity, *Thermal plume, Crystal River (Florida), Orthopristis spp., Bairdiella spp., Leiostomus spp., Lagodon spp.

A field investigation begun in 1969 to determine ecological effects of hot water discharge of a steam electric generating plant in Crystal River, Florida was continued. In 1970, a second generating unit was discharging heated water. Effects of the effluent upon the Gulf of Mexico fishes in the vicinity of the plant were studied. Bi-monthly trawl samples indicated that influence of the thermal plume had extended into previously unaffected intermediate depth areas. Species abundance at intermediate trawl stations was higher in 1970 than in 1969, except during August. It was higher at nonaffected than affected station except in December. A species diversity determination indicated higher shallow station diversity in winter at affected stations, but higher in summer at unaffected stations. Suppressed summer diversity may be due to thermal stress on the community. Greatest diversity both winter and summer occurred at affected intermediate depth stations. A pattern of increasing diversity from north to south in trawl stations transects (shallow and intermediate depth) was also observed. The pattern was apparently related to salinity, which also increased from north to south, and/or to habitat destruction from dredging operations, which was greatest at northern stations. Frequency of occurrence of the four most abundant species (Orthopristis chrysoptera, Bairdiella chrysura, Leiostomus xanthurus, and Lagodon rhomboides) in affected vs. unaffected areas was statistically analyzed and did not differ significantly. Spawning, movement, age, and growth of these species from affected and unaffected stations were also considered. (Svensson-Washington)
W72-11251

BENTHIC MARINE ALGAE FROM WATERS ADJACENT TO THE CRYSTAL RIVER ELECTRIC POWER PLANT (1969 AND 1970),
Florida Dept. of Natural Resources, St. Petersburg.
K. A. Steidinger, and J. F. Van Breedveld.
Professional Papers Series, No 16, June 1971. 46 p, 1 fig, 22 tab, 14 ref.

Descriptors: *Benthic flora, *Marine algae, *Gulf of Mexico, *Electric powerplants, *Thermal pollution, *Aquatic environment, Florida, Electric generators, Water temperature, Rhodophyta, Phaeophyta, Chlorophyta, Cooling water, Hydrologic data.
Identifiers: *Species diversity, Crystal river.

One hundred six taxa of marine algae were identified from Gulf of Mexico waters adjacent to the Florida Power Corporation electrical generating plant at Crystal River, Florida in 1969 and 1970. Of the 106 taxa, 19 belong to Chlorophyta, 24 to Phaeophyta, and 63 to Rhodophyta. Reductions in species diversity, as well as incidence of occurrence, were noted in 1970. Causes of these reductions are not known. However, increased temperature does not appear to be a factor since deeper water stations, which were also affected, are not exposed to the thermal plume. The study area is semi-tropical or warm-temperate, with a primarily seasonal flora. Winter appeared to be the season of lowest species diversity. Several new distribution records are reported. (Svensson-Washington)
W72-11252

STUDIES ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS--I. ON THE COPPER CONTENTS IN OYSTERS,
Miyazaki Univ. (Japan).
K. Ikuta.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 33, No 4, p 405-409, 1967. 2 fig, 1 tab, 11 ref.

Descriptors: *Copper, *Oysters, *Heavy metals, *Water pollution, *Industrial wastes, Absorption, Water pollution sources, Water pollution effects, Chemical wastes, Aquatic environment, Public health.
Identifiers: *Trace metals, *Green oysters, Nobeoka Bay (Japan), Biological magnification, Seafood Japan.

The copper content is discussed of the meat of oysters which were collected in Nobeoka Bay and its neighboring water, Miyazaki Prefecture, January to March, 1965. The experiment was carried out in order to prove the difference between the copper contents in oysters caught on the southern coast of Nobeoka Bay (s-group) and those in the waters adjacent to Nobeoka Bay (n-group). According to the mean value of the copper contents in oysters caught at each sampling station, the s-group ranged from 320.2 to 686.8 mg Cu/kg freshbody weight, and the n-group ranged from 40.0 to 99.4 mg. Between the copper content of s-group and n-group the evident difference is seen at the significance of 0.1%. It appears that one of the environmental factors making copper concentrated in the oysters of s-group is due to the copper being discharged into seawater by a Benberg factory and an exhausted mine gutter. (Svensson-Washington)
W72-11256

STUDIES ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS--II. ON ACCUMULATION OF COPPER AND ZINC IN OYSTERS,
Miyazaki Univ. (Japan).
K. Ikuta.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 34, No 2, p 112-116, 1968. 4 fig, 2 tab, 10 ref.

Descriptors: *Copper, *Zinc, *Oysters, *Heavy metals, Water pollution sources, Water pollution effects, Water pollution, Chemical wastes, Aquatic environment, Public health.
Identifiers: *Trace metals, *Green oysters, Biological magnification, Seafood, Accumulation, Nobeoka Bay (Japan), Japan.

Normal oysters at Urashiro Bay were transplanted to Akamizu Inlet where the variation of copper and zinc accumulation in the meats of oysters was examined. Normal accumulation refers to the copper and zinc accumulation in oysters at Urashiro Bay, the control field, and the abnormal accumulation refers to the copper and zinc accumulation in oysters at Akamizu Inlet, the test field. The quantity of absolute abnormal accumulation is calculated by subtracting the normal accumulation of copper and zinc at Urashiro Bay from the abnormal accumulation. The quantity of copper in abnormal accumulation increases in the exponential function type, $\log Y = 1.4399 + 0.0069X$, and that of zinc indicates a sigmoid type. It appears that the normal accumulation has influence upon the variation of quantity of absolute abnormal accumulation of copper and zinc. (Svensson-Washington)
W72-11257

STUDIES ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS--III. ON ACCUMULATION OF COPPER AND ZINC IN THE PARTS OF OYSTERS,
Miyazaki Univ. (Japan).
K. Ikuta.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 34, No 2, p 117-122, 1968. 10 fig, 2 ref.

Descriptors: *Copper, *Zinc, *Heavy metals, *Oysters, Water pollution, Water pollution effects, Chemical wastes, Aquatic environment, Public health, Animal physiology, Physiological ecology, Absorption.
Identifiers: *Trace metals, *Green oysters, Biological magnification, Seafood, Accumulation, Nobeoka Bay (Japan), Japan.

The variation is reported of accumulated copper and zinc in five parts of oysters: mantles, gills, labial palps, adductor muscle, and the remainder of the animal. Normal, abnormal, absolute abnormal and relative accumulation in the parts of oysters transplanted to copper and zinc polluted water in Akamizu Inlet and normal oysters at Urashiro Bay are discussed. (Svensson-Washington)
W72-11258

LIMITATIONS AND EFFECTS OF WASTE DISPOSAL ON AN OCEAN SHELF.
Florida Ocean Sciences Inst., Deerfield Beach.
For primary bibliographic entry see Field 05B.
W72-11275

THE EFFECT OF ZINC AND COPPER ON THE OSMOLALITY OF BLOOD SERUM OF THE CHANNEL CATFISH, ICTALURUS PUNCTATUS RAFINESQUE, AND GOLDEN SHINER, NOTEMIGONUS CRYSOLEUCAS MITCHELL,
South Illinois Univ., Carbondale. Dept. of Zoology.
S. D. Lewis, and W. M. Lewis.
Trans Am Fish Soc. Vol 100 No 4 p 639-643. 1971. Illus.
Identifiers: Blood, Catfishes, *Heavy metals, Copper, *Fish, Ictalurus punctatus, Notemigonus crysoleucas, Osmolality, Serum, Golden shiner, Toxicity, Zinc, *Water pollution effects.

A new, and possibly primary, effect of heavy metals on fishes is described. It is demonstrated that heavy metals so affect fishes as to cause a drop in the salt concentration in the blood serum. This change in the ionic content of the blood can cause the fish to become weakened, and pronounced change can be fatal. Salt changes in the blood were monitored by osmometry. The effects of both Zn and Cu were evaluated.--Copyright 1972, Biological Abstracts, Inc.
W72-11319

RATE OF ACCLIMATION OF JUVENILE CHANNEL CATFISH, ICTALURUS PUNCTATUS, TO HIGH TEMPERATURES,
Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experimental Station.
K. O. Allen.
Trans Am Fish Soc. Vol 100 No 4 p 665-671. 1971. Illus.
Identifiers: Acclimation, *Catfishes, Ictalurus punctatus, Rates, *Temperature.

Experiments were designed to determine the rate of temperature acclimation, measured in terms of change in heat resistance, when fish were changed between 3 temperatures-26.0, 30.0, and 34.0 C. Approximately 2300 juvenile I. punctatus, were tested. Fish acclimated to each of the 3 temperatures were exposed to each of the other 2 temperatures. The length of time required to acclimate to the new temperature was then monitored by testing samples of fish at 0, 1, 3, 9 hr, and then daily after the temperature change was made. Fish were tested at 3 lethal temperatures of 38.5, 39.0, and 40.0 C. Changes in average resistance time were used to determine progress toward acclimation. Fish changed from lower to higher temperatures were nearly reacclimated in 1 to 3 days. However, fish changed from higher to lower temperatures required from 4 to 14 days to approach acclimation

to the new temperature. In both changes, complete reacclimation required at least 12 days. Acclimation was accelerated at higher temperatures. A strong cyclic effect in the mean daily resistance time was noted. A maximum or minimum in resistance time occurred about every 2 to 4 days. These oscillations in resistance time were tested by utilizing multiple regression analysis. The equations derived were found to be quartic ($P<.01$). No explanation was found for this rhythm. These findings indicate that tempering for a few hr would increase heat tolerance to some extent, but upwards of 1 day would be required to significantly increase heat tolerance. Channel catfish could be held in cold water for 1 or 2 days with only a partial loss of heat tolerance. Fish exposed to fluctuating temperature should retain a relatively high heat tolerance.--Copyright 1972, Biological Abstracts, Inc.
W72-11320

TOXICITY OF ALUMINUM HYDROXIDE COMPLEXES IN NEUTRAL AND BASIC MEDIA TO RAINBOW TROUT,
Michigan State Univ; East Lansing. Inst. of Water Resources.
R. A. Freeman, and W. H. Everhart.
Trans Am Fish Soc. Vol 100 No 4 p 644-658. 1971. Illus.
Identifiers: *Aluminum, Mortality, *Rainbow trout, *Toxicity, Hydrogen ion concentration, Water pollution effects.

Toxic effects of aqueous Al complexes in neutral and basic media to rainbow trout fingerlings were investigated under constantly flowing, controlled conditions of concentration, pH, and temperature. Toxicities of various concentrations were highly pH dependent. Dissolved concentrations over 1.5 ppm Al caused drastic physiological and behavioral aberrations as well as acute mortality. While toxic effects of suspended aluminum are more noticeable at lower concentrations, they are not as concentration dependent as those of dissolved forms. The safe concentration of either dissolved or suspended Al is well below 0.5 ppm. Mortalities among test animals ceased almost immediately after Al exposures were concluded. Recovery times for fish exposed to the various tests were proportional to the severity of the test conditions and to the length of exposure. Normal growth resumed almost immediately in fish from the less severe tests, and after a period of a few weeks in fish from the more severe tests. After up to 4 mo. recovery the average weight of fish surviving both chronically and acutely toxic Al concentrations is markedly below the control average.--Copyright 1972, Biological Abstracts, Inc.
W72-11321

COMPARATIVE ASPECTS OF THE BIOLOGY OF PIKE, ESOX LUCIUS L., IN TWO SCOTTISH LOCHS,
Glasgow Univ. (Scotland). Dept. of Zoology.
I. Shafi, and P. S. Maitland.
Proc R Soc Edinb Sect Biol. Vol 71, No 4, p 41-60. 1971. Illus.
Identifiers: Age, *Biology, Coregonus clupeoides, Esox lucius, Growth stages, Invertebrates, Lochs, Perca fluviatilis, *Pike, Salmo trutta, Scotland.

Several aspects of the biology of E. lucius in 2 contrasting waters in Scotland were studied: one of these, Loch Lomond, is large and mesotrophic while the other, the Dubh Lochan, is small and eutrophic. Altogether, over 300 fish were examined during the study. Formulae for the length-weight relationship of pike in both waters were established. Age and growth was studied using opercular bones; the pattern of growth was the same throughout life, females growing faster than males in both lochs. The growth was found to follow Von Bertalanffy's formula closely and growth formulae for fish in both waters were established. The fecundity of pike in Loch Lomond indicated an average of 29,300 eggs/kg of body weight although the relationship was not a close one. The food of pike in the Dubh Lochan consisted mainly of perch (Perca fluviatilis L.) and invertebrates, and in Loch Lomond of powan (Coregonus clupeoides Lacepede) and trout (Salmo trutta L.). Tagging experiments in the Dubh Lochan indicated that the size of the population there was small-estimated at 89 adult fish in 1967 and 51 in 1968.--Copyright 1972, Biological Abstracts, Inc.
W72-11331

DISEASES OF FEEDLOT CATTLE,
R. Jensen, and D. R. Mackey.
Lea and Febiger: Philadelphia, Pa. 1971. 2nd Edition. 377 p.
Identifiers: *Animal diseases, Cattle, Feed lots, Farm wastes, Water pollution sources.

Emphasizing the diseases of feedlot cattle, this book brings together current literature pertinent to an expanding branch of veterinary medicine. Each disease is considered under the headings of definition, occurrence, etiology and pathogenesis, clinical signs, postmorten lesions, prevention and treatment. Autopsy findings are presented exactly as practitioners and students should have them to make accurate diagnoses. Carefully selected postmortem and antemortem photographs augment the test. In addition to individual treatments, mass treatments for numerous cattle in a specific lot are described. Many of the newer diseases are discussed, with advice on vaccinations and preventive methods found helpful in their control. Full consideration is given to the causes, clinical signs, diagnosis and treatment of viral bovine rhinotracheitis and other respiratory diseases which cause such serious losses to the cattle fattening industry. All chapters are revised for this edition, with up-to-date information added on treatments, including the use of thiamine hydrochloride for polioencephalomalacia. New preventive measures are discussed, such as the vaccine for the protection against shipping fever. The economic importance of each disease is given and the problems of feedlot pollution of water, soil and air are considered fully. New chapters cover such important topics as preconditioning, adapting cattle to the change in diet from roughage to concentrate, bluetongue, necrotic posthitis and high mountain disease. A subject index is included.--Copyright 1972, Biological Abstracts, Inc.
W72-11348

THE RECOVERY OF STREAM MACROBENTHIC COMMUNITIES FROM THE EFFECTS OF ACID MINE DRAINAGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
E. E. Herricks, and J. Cairns, Jr.
In: Proceedings, Fourth Symposium on Coal Mine Drainage Research, Mellon Institute, April, 1972, p 370-398. 13 fig, 6 tab. OWRR B-034-VA (3).

Descriptors: *Mine drainage, *Acid streams, Aquatic insects, *Aquatic animals, Biological communities, Aquatic drift, *Pennsylvania.
Identifiers: Recovery, *Indian Creek (Penn).

Indian Creek, Fayette County, Pennsylvania was studied to note the effects of acid mine drainage on aquatic macrobenthic communities. Indian Creek receives one major acid discharge and several minor seepage discharges in its upstream region. Reference stations showed a high diversity, d 3.2 and above. Diversity was depressed by the acid drainage; mid-portions of the stream had d values in the range of 1.8 to 2.8. Eight miles below the drainage region aquatic communities had recovered with d values greater than 3.0. The effect of the acid drainage varied with stream discharge. Low flow conditions in mid-summer showed a downstream shift in the effects of the acid drainage. Increases in d occurred after the confluence with unpolluted tributaries. The tributaries had the dual effect of improving water quality either by dilution or chemical reaction, and supplying organisms for the recolonization of damaged sections of the stream. The major mechanism of recolonization seems to be the downstream drift of organisms.
W72-11386

PHOSPHORUS LOADING FROM A MULTI-LAND USE WATERSHED,
Marquette Univ., Milwaukee, Wis. Water Resources Center.
R. C. Kapur.
M. S. Thesis, 1970. 94 p, 9 fig, 14 tab, 31 ref, append. OWRR A-014-WIS (2).

Descriptors: *Eutrophication, *Watersheds (Basins), *Phosphates, *Water pollution sources, Phosphorus compounds, Runoff, Fertilizers, Streams, Land use, Watershed management, Farm wastes, Lake Michigan, Wisconsin, Precipitation (Atmospheric).
Identifiers: *Phosphorus loading, *Menomonee River.

The Menomonee River watershed is a multi-land use watershed of 135 square miles area tributary to Lake Michigan. Approximately 370,000 people reside in the watershed which is 38 percent agricultural, 23 percent residential, and the remainder divided amon g the other land-use categories. Fifteen sampling sites were selected to evaluate the phosphorus loading from the watershed during various times of the year. During the two-year investigation period, 30 sampling surveys were conducted and the samples were analyzed for total soluble phosphorus. A statistical investigation of the data showed that the phosphate concentration could not be correlated with precipitation amount, whereas, phosphorus pound loading could. The amount of phosphorus conveyed by runoff during precipitation periods varied considerably depending upon the amount of precipitation; varying from negligible amounts during low precipitation periods to high value of 83 pounds of phosphate per day per square mile during high precipitation periods. It was estimated that 1,250 pounds per day of phosphate are discharged into Lake Michigan from the Menomonee River watershed, of which 40 percent is from treatment plant effluents.
W72-11390

CLOSTRIDIUM BOTULINUM IN THE GREAT LAKES,
Wisconsin Univ., Madison. Food Research Inst.
H. Sugiyama, T. L. Bott, and J. A. Soucheck.
Spores V, p. 314-317. 3 tab, 16 ref. 1972. OWRR A-026-WIS (2).

Descriptors: *Clostridium, Ecology, *Aquatic plants, *Bacteria, *Toxins, *Invertebrates, Shores, Freezing, Fish, Wisconsin, *Botulism, Great Lakes, Water pollution sources, *Great Lakes.
Identifiers: *Clostridium botulinum type E, *Food poisoning, *Green Bay (Wis).

Green Bay was taken as the model to study the source of Clostridium botulinum type E which contaminates fish of the Great Lakes to create a botulism hazard. Certain bottom deposits held in the laboratory after a freeze-thaw treatment supported the growth of type E (50 or more fold increase in most probable numbers). Without the freeze treatment the specimens did not support growth. Productive samples always contained vegetation and were those collected during the warm months. When placed in columns to obtain depth, artifically induced anaerobic conditions were not needed. Emphasis is placed on the similarity of the type E data to the ecology of C. botulinum type C, the cause of western duck sickness. The primary substrates in which type E multiplies is believed to be the macro-invertebrates associated with the aquatic vegetation that grow in the shallow shore line of Green Bay. Bacteriophages isolated from the Green Bay system have host ranges limited to nonproteolytic C. botulinum strains that produce type B, E, or F

toxin; they do not lyse proteolytic cultures producing type A, B, or F toxin. Clostridia which are type E by criteria other than toxin production are present in the Great Lakes.
W72-11392

THE DESIGN OF A CONTINUOUS FLOW BIOLOGICAL EARLY WARNING SYSTEM FOR INDUSTRIAL USE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05G.
W72-11393

TOXICOLOGIC METHODS FOR ESTABLISHING DRINKING WATER STANDARDS,
Robert A. Taft Sanitary Engineering Center, Cincinnatti, Ohio.
For primary bibliographic entry see Field 05G.
W72-11397

VEGETATION OF THE BOGS OF THE OKA--ZIMA INTERFLUVE IN IRKUTSK OBLAST,
For primary bibliographic entry see Field 02I.
W72-11403

UTILIZATION OF BIOGENIC ELEMENTS BY A PHYTOPLANKTON COMMUNITY DEPENDING ON THEIR CONCENTRATION IN THE AQUATIC ENVIRONMENT AND ILLUMINATION CONDITIONS,
Moscow State Univ., (USSR).
V. D. Fedorov, T. I. Belaya, and V. N. Maksimov.
Izv Akad Nauk SSSR Ser Biol. 3. p 398-414. 1970. Illus. (English summary).
Identifiers: Aquatic environment, *Biogenic elements, Concentration, Illumination, Iron, Nitrogen, Phosphorus, *Phyto plankton.

Utilization of biogenic elements by a biomass unit of phytoplankton increases depending on the concentration of these elements in the surrounding media. An increase in P concentration decreases N consumption. An increase in concentration of P and Fe causes a reciprocal consumption of each element. A doubling of illumination decreased consumption of all 3 elements.--Copyright 1972, Biological Abstracts, Inc.
W72-11406

THE ROLE OF THE GROWTH OF PHYTOPLANKTON UNDER ICE IN PRODUCING ORGANIC MATTER IN LAKE BAIKAL,
K. K. Botintsev.
Zap Zabaik Fil Geogr O-Va SSSR. 40 p 115-117. 1970.
Identifiers: *Lake Baikal, Biomass, Growth, Ice, Lakes, *Organic matter, Melosira, Peridineans, *Phytoplankton, Population, Production, Size, USSR.

The growth of algae spring forms under ice in Lake Baikal begins at the end of Feb. or the beginning of March. In some years of the dominants were species of Melosira or thinwalled peridinean algae. The maximum population size and biomass of these algae occurred from the middle of April into May. The role of phytoplankton growth under ice in general production process in the lake was different in different years and depended on composition and quantitative development of the algae. The production of phytoplankton during the ice period amounted to 34% of the total annual primary production in Lake Baikal in 1964, when ther was a high level of Melosira. In 1965, with the mass development of peridineans, it was 45%, and in 1966, when the phytoplankton were unproductive, it was only 9%. The maximum value of the utilization coefficient (up to 2.5-3% of the incident radiation) was noted at the time of the mass vegetation of peridineans.--Copyright 1972, Biological Abstracts, Inc.
W72-11409

THE EFFECT OF LIGHT ON THE PHOTOSYNTHESIS RATE OF THE PHYTOPLANKTON OF THE SUPERFICIAL STRATA OF THE WATER,
V. I. Romanenko, and A. S. Daukshta.
Biol Vnutr Vod Inform Byull. 3. p 10-12. 1969.
Identifiers: Carbon, Depth, *Light, *Photosynthesis, Phytoplankton, Rates, Strata, Transparency.

Observations were made at the Rybinsk Reservoir in the summer of 1966 and 1967, and also in some Latvian lakes in 1967. The series of analyses pertains to the superficial 1-m stratum, where samples were taken every 5-10 cm. The experiments were carried out during a period of intensive algal development. The radiocarbon method was used to determine the photosynthesis rate. The maximum such rate for water with a transparency of 1-2 m was noted at a depth of 10-25 cm, where the rates were 3-6 times as high as at the surface. With an increase in depth to 0.5 m there was a sharp decrease in the photosynthesis rate with a subsequent more gradual decrease. In waters with a transparency of 2-5 m the maximum rate was noted at greater depths and was less marked than in waters with lower transparency. The maximum photosynthesis rate in the thin superficial layers of water is not always observed; when it does occur it is at times of the maximum algal development or maximum insolation. When an analysis is made of the photosynthesis rate in summer with greater separation (0.5-1 m) between the bottles, the point of maximum photosynthesis may lie between them.--Copyright 1972, Biological Abstracts, Inc.
W72-11411

EFFECT OF DURSBAN IN THE DRINKING WATER OF CHICKS,
Manitoba Univ., Winnipeg. Dept. of Entomology.
R. A. Brust, S. Miyazaki, and G. C. Hodgson.
J Econ Entomol. Vol 64, No 5, p 1179-1183. 1971. Illus.
Identifiers: *Poultry, Blood, *Dursban, Cholin esterase, Water pollution effects.

The insecticide Dursban (0,0-diethy 0- (3,5,6-trichloro-2-pyridyl) phosphorothioate), was added to the drinking water of young Leghorn cockerels at 8 levels ranging from 0.08 to 1280 ppm active ingredient. Experiments were begun with chicks 3 or 5 days old and were concluded after 3 and 4 wk. Mortality at 80 ppm was 20%, and mortality at 320 and 1280 ppm was 100%. No adverse effects were apparent at lower levels. Solvent and inert ingredients of Dursban emulsifiable concentrate had no adverse effect on the chicks up to 717.7 ppm. Cholinesterase activity in whole blood was monitored at all treatment levels, and the activity decreased at 80 ppm Dursban and above. At lower levels there was no significant difference from the controls. Weight gain/day diminished with increased levels of Dursban. Starvation of treated chicks did not affect blood-cholinesterase activity.--Copyright 1972, Biological Abstracts, Inc.
W72-11412

NA+, K+-ACTIVATED-ATPASE INHIBITION IN RAINBOW TROUT: A SITE FOR ORGANOCHLORINE PESTICIDE TOXICITY,
Washington Univ., Seattle. School of Medicine.
P. W. Davis, and G. A. Wedemeyer.
Comp Biochem Physiol B Comp Biochem. Vol 40, No 3, p 823-827. 1971. Illus.
Identifiers: *Enzymes, ATPase, Chlorine, DDT, Dicofol, Endosulfan, Inhibition, Ions, Ouabain, Pesticides, Potassium, *Rainbow trout, Salmo gairdneri, Sites, Sodium, Toxicity, *Pesticide toxicity, *Chlorinated hydrocarbon pesticides.

The Na+, K+-activated, Mg2+-dependent-ATPase enzyme system in a heavy microsomal fraction of rainbow trout (Salmo gairdneri) brain was inhibited in vitro by chlorinated hydrocarbon pesticides. I50 (concentration at 50% inhibition) values for dicofol, endosulfan and DDT were 5 x 10 to the minus 6th power, 3 x 10 to the minus 5th power and 1 x 10 to the minus 4th power M, respectively. Similar inhibition by these pesticides occurred in kidney and gill ATPase preparations. An unexpected finding was a failure of the classic inhibitor, ouabain, to block the Na+, K+-activated component of ATPase activity in the gill. Inhibition of ATPase activity may be a causal factor in the toxic effects of organochlorine pesticides in fishes.--Copyright 1972, Biological Abstracts, Inc.
W72-11415

THE SEASONAL DYNAMICS OF VITAMIN B12 AND PHYTOPLANKTON VARIABILITY IN THE DALNEZELENETSKAYA GUBA (INLET) OF THE BARENTS SEA,
Murmanskii Morskoi Biologicheskii Institut (USSR).
L. N. Propp.
Okeanologiya. Vol 10, No 5, p 851-857. 1970. Illus. English summary.
Identifiers: *Vitamin B-12, *Barents Sea, Dynamics, Fluctuations, Inlets, Leptocylindrus danicus, Nitzschia spp, Nutrition, *Phytoplankton, Population, Seasonal, Skeletonema costatum, USSR, Variability, *Vitamins.

The monthly data obtained by the microbiological method averaged for the surface and near-bottom layers (32 to 36 m) show 2 maxima: the greater maximu, 2.16 mg/L, is observed in winter (Feb.) and the smaller maximum, 1.32 mg/L, is recorded in autumn (late Sept.-early Oct.). A simultaneous determination of phytoplankton numbers and specific composition and their comparison with vitamin content confirmed the possible ecological role of vitamin B12 and its control of algal succession. The zero vitamin B12 content in Aug. 1967, could be the result of an unusual vegetation of Skeletonema costatum, which is auxotrophic with respect to vitamin B13. Nitzschia species also reached their maximum development at this time. One of the species does not need vitamin B12. The winter maximum can be attributed to a gradual accumulation of the vitamin when algal vegetation is practically absent; the autumn maximum is explained by the decay of summer detritus and, to a lesser degree, by a disturbance of the density stratification of water masses. A comparison between the distribution of phosphate and nitrite and the vitamin content revealed similar trends. The sharp increase of nitrite which coincided with the autumn reduction of the vitamin indicates the existence of trophic relations between nitrite, bacteria and B12 vitamin. The competition between S costatum and Leptocylindrus danicus, resulting in the equilibrium of their numbers is evidence that the latter uses vitamin B12 or one of its analogues.--Copyright 1972, Biological Abstracts, Inc.
W72-11421

SURVEY OF THE PLANT ASSOCIATIONS OF THE SOUTHERN PART OF EAST GERMANY I. THE ASSOCIATIONS OF AQUATIC PLANTS,
W. Hilbig.
Hercynia. Vol 8, No 1, p 4-33, 1971.
Identifiers: Aquatic plants, *Germany, Macrophytes, Survey.

Aquatic plants from Thuringia, and central and western Saxony are discussed. The Spirodelo Lemnetum minoris association is the most common one of the Lemnion minoris union. The Spirodelo-Salvinietum is limited to the warm central Elbe valley. While the center of distribution o Lemnetum gibbae is in eutrophic pools, Riccietum gluitantis is found mainly in fish ponds on poo subsoil. The Hydrocharition union is most strongl represented by Hydrocharitetum. The Lemno Utricularietum was found in meadows in the cen tral Elbe, lower Mulde and Elster-Luppe Meado areas. The Utricularietum neglectae was found o the borders of the central mountain area, the Ol sersaale-Oberelster area and the Lausitz pool are Ceratophylletum demersi, found in eutrophate old river beds and ponds, occurs more frequentl The numerous, but species-poor associations Potamogetonion were characterized by th dominance of pondweed (Potamogeton). Of th

floating leaf associations of Nymphaeion, Myriophyllo-Nupharetum dominates. In higher and poorer areas Nymphaeetum albae and Polygono-Potamogetonetum natantis occur. Trapetum natantis and Ranunculetum aquatilis are limited to the central Elbe area and surrounding rivers and ponds, where the former populates deep parts of old river beds and pools and the latter populates flat, partially dried up eutrophic small ponds and ditches. In the upper acid regions of a river Callitricho (hamulatae)-Ranunculetum flevelops. In the center of the river Ranunculetum fluitantis is found in the Sparganium emersum Subassociation or is replaced by the Sparganium emersum-Potamogeton pectinatus association. In the brine pits near Artern/Unstrut stands of Ruppia maritima form. These belong to the Ruppietum maritimae.--Copyright 1972, Biological Abstracts, Inc.
W72-11429

ADVANCES IN ECOLOGICAL RESEARCH, VOL. 7.
For primary bibliographic entry see Field 06G.
W72-11524

DISTRIBUTION, PRODUCTION AND ROLE OF AQUATIC MACROPHYTES IN A SOUTHERN MICHIGAN MARL LAKE,
Michigan State Univ., Hickory Corners, Mich. W. K. Kellogg Biological Station.
J. H. Rich, R. G. Wetzel, and Nguyen-van-Thuy.
Freshwater Biology, Vol 1, p 3-21, 1971. 10 fig, 5 tab, 35 ref.

Descriptors: *Distribution, *Productivity, Aquatic plants, *Michigan, *Marl, Lakes, Seasonal, Chara, Biomass, Bulrushes, Pondweeds, Plant populations.
Identifiers: *Lawrence Lake (Michigan), Scirpus subterminalis, Potomogeton, Nitella flexilis, Utricularia, Najas flexilis, Nuphar variegatum, Brasenia schreberi, Lemna minor, Ceratophyllum emersum, Myriophyllum heterophyllum.

Spatial and seasonal distribution of macrophytic species and biomass was studied and species listed in Lawrence Lake, Michigan, a typical marl lake. Macrophytes dominate the total primary production. Submersed vegetation is extremely sparse on the shallow marl bench and is completely dominated by Scirpus subterminalis between 1-7 m. Two species of Chara are present in significant quantities, but are severely limited to shallow depths and protected areas. Several annual submersed angiosperms are present but only two species quantitatively important, Potamogeton illinoensis and P. praelongus. A striking feature of the seasonal biomass distribution of Scirpus subterminalis is the higher, viable biomass throughout the winter under ice cover. Cyclic fluctuations of the S. subterminalis populations were discerned at different depths, each with different periodicities. Estimates of macrophytic productivity of perennial species populations whose biomass remains relatively constant throughout the year were made employing several methods of calculation and turnover factors. The low diversity but relatively high quantitative importance of macrophytes in marl lakes is attributed to an adverse dissolved inorganic and organic chemical milieu which inhibits phytoplanktonic production and allows only certain adapted macrophytes to develop strongly. (Jones-Wisconsin)
W72-11561

MICROBIOLOGICAL STUDIES ON NITROGEN FIXATION IN AQUATIC ENVIRONMENTS-VII. SOME ECOLOGICAL ASPECTS OF NITROGEN FIXING BACTERIA,
Kyoto Univ. (Japan). Research Inst. of Food Science; and Mie Prefectural Univ. Tsu (Japan).
T. Kawai, and I. Sugahara.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 38, No 3, p 291-297, 1972. 3 fig, 1 tab, 7 ref.

Descriptors: *Microbiology, *Nitrogen fixing bacteria, *Nitrogen cycle, Environmental effects, Anaerobic conditions, Nitrates, Denitrification, Bottom sediments, Sea water, Freshwater, Ammonia, Eutrophication, Oxidation, Symbiosis, Azotobacter, Marine algae, Organic matter.
Identifiers: Nitrosomonas, Nitrobacter, Azotobacter.

The occurrence and abundance of bacteria responsible for nitrogen metabolism form a peculiar pattern for each water region. The number of each bacteria group having the ability to perform the following processes in the nitrogen cycle was counted in the water and bottom sediments of various regions: ammonification, nitrate reduction, denitrification, nitrification. The relationship is close between the number of nitrogen fixing bacteria occurring in the water and bottom sediments of various fresh water regions and that of nitrate reducers and denitrifiers. The growth of the three bacteria groups may be controlled by the same environmental factors, presumably concentration of available organic matter. This relationship was not obtained in sea water regions where amount of organic matter is considerably poorer. Bacterial adhesion on the suspended matter present in water regions was studied; water samples were treated with sonic oscillation and the bacteria counted. It may be that many nitrogen bacteria occur, together with the other heterotrophs, on or in the suspended particles and utilize the particle components as nutritional sources. In general, a dense bacterial biomass is found in fresh water environments, the population decreasing gradually from coastal to offshore regions. (See also W72-07513, W72-05472, W72-05164, W72-07948, and W72-07511) (Jones-Wisconsin)
W72-11563

A SHOCK-WAVE TECHNIQUE TO COLLAPSE THE VACUOLES OF BLUE-GREEN ALGAE,
University of Wales Inst. of Science and Tech., Cardiff.
For primary bibliographic entry see Field 05G.
W72-11564

CHEMOAUTOTROPHY IN NITRIFYING BACTERIA,
Indian Agricultural Research Inst., New Dehli. Div. of Biochemistry.
P. S. Rao, and M. S. Naik.
Journal of Scientific and Industrial Research, Vol 39, p 588-592, 1971. 1 tab, 45 ref.

Descriptors: *Biochemistry, *Nitrification, *Bacteria, Oxidation, Phosphorus, Nitrites, Cytological studies, Nitrogen compounds.
Identifiers: *Chemoautotrophy, Nitrobacter, Nitrosomonas, Phosphorylation.

This review of biochemistry of the Nitrosomonas and Nitrobacter bacteria, important not only for nitrification, but also for chemoautotrophic nature in which carbon dioxide serves as sole source of carbon for growth, emphasizes the biochemical reactions in chemoautotrophy. Utilization of oxidation energy for generation of reducing power, which enables these organisms to assimilate carbon dioxide, is a uniquely characteristic process in chemoautotrophy. In nitrifying bacteria, the oxidation of simple compounds, ammonia or nitrite, provides ATP, since oxidation reactions are associated with the particulate fraction containing electron carriers. Reduced pyridine nucleotides are generated by reversal of electron flow. ATP and NADH are utilized for carbon dioxide assimilation through Calvin cycle enzymes. The dark reactions of photoautotrophy are identical with those of chemoautotrophs. The main difference consists in replacement of the light reaction of photosynthesis by oxidation of ammonia or nitrite. The biochemical basis of chemoautotrophy rests on inability of the bacteria to use glucose as an energy source and low Krebs cycle and NADH oxidase activities. As in photoautotrophs, carboxydismutase accounts for a major portion of carbon dioxide fixation. Other pathways involving phosphoenolpyruvate carboxylase are also operative. (Jones-Wisconsin)
W72-11565

SOME RELATIONS OF LAND DRAINAGE, NUTRIENTS, PARTICULATE MATERIAL, AND FISH CATCH IN TWO EASTERN CANADIAN BAYS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
W. H. Sutcliffe, Jr.
Journal Fisheries Research Board of Canada, Vol 29, No 4, p 357-362, 1972. 7 fig, 25 ref.

Descriptors: *Surface runoff, *Nutrients, *Fisheries, *Bays, Suspended solids, Carbon, Nitrogen, Organic matter, Microorganisms, Productivity.
Identifiers: *Gulf of St. Lawrence (Canada), *St. Margaret's Bay (Nova Scotia), Seaweeds.

In preliminary investigations on primary productivity and nutrient features of St. Margaret's Bay, Nova Scotia, water samples were collected from September 1968 through August 1969 at approximately 2-week intervals and filtered through 0.45 micron membrane filters for ATP analysis or through 0.8 micron silver filters for particulate carbon and nitrogen determinations. For size fractionation, some samples were first poured through 10 micron nylon mesh or through a 5 micron silver filter with 50% retention effective at about 8 microns and 2 micron, respectively. ATP samples were frozen immediately; samples for particulate carbon were vacuum desiccated. Laboratory analysis showed a large portion of living material less than 8 microns in size; the bacterial fraction is likely underestimated. The carbon content of living and carbon and nitrogen content of nonliving suspended particulate material for the year is given. The nitrogen budget is compared with the carbon-nitrogen ratios and nutrient data from other sources. Positive correlations between runoff and catch of four commercially important species points to importance of runoffs. Correlations between the physical parameters and biological production do not suggest simple control. (Jones-Wisconsin)
W72-11566

OBSERVATIONS ON THE NITROGEN-FIXING POTENTIAL OF THE PLANKTON OF TWO FARM PONDS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. W. Toetz.
The American Midland Naturalist, Vol 87, No 2, p 555-559, 1972. 3 tab, 8 ref.

Descriptors: *Nitrogen fixation, *Plankton, *Analytical techniques, Farm ponds, Aquatic plants, Organic matter, Cyanophyta, Chlorella, Microorganisms, Detritus, Phytoplankton, *Oklahoma.
Identifiers: Acetylene reduction, Anacystis cyanea, Oscillatoria, Aphanizomenon holsaticum.

Using the N-15 technique and the acetylene reduction, with observations of environmental conditions and phytoplankton, the nitrogen fixation potential of the open water of two farm ponds in central Oklahoma was studied. After initial use of the N-15, the acetylene reduction was substituted because of its low cost and greater sensitivity. Uptake of nitrogen was not observed in either pond. Nonheterocystous blue-green algae such as Anacystis cynea and Oscillatoria dominated the flora of Pond A during the summer and Chlorella during the winter. The isotope ratios of nitrogen in organic matter in pond water exposed to 90% N-15 fell within the 95% confidence intervals for nitrogen blanks. Nitrogenase activity was detected during the winter in the pond where Ceratophyllum and Nelumbo were the dominant macrophytes, due perhaps to Aphanizomenon holsaticum, but microbial fixation cannot be excluded, especially in absence of dense algal blooms. It might be that detritus, usually abundant

during the winter, was utilized as a substrate by nitrogen fixing microbes. The open water of these ponds appears to be an unfavorable site for nitrogen fixation, although more frequent observations may reveal greater nitrogen fixing potential. (Jones-Wisconsin)
W72-11567

EFFECTS OF VOLCANIC ASHFALLS ON CHEMICAL AND SEDIMENT CHARACTERISTICS OF TWO ALASKAN LAKES,
Alaska Univ., College, Inst. of Marine Science; and Washington Univ., Seattle, Dept. of Oceanography.
For primary bibliographic entry see Field 02H.
W72-11569

ACID-IRON WASTE DISPOSAL AND THE SUMMER DISTRIBUTION OF STANDING CROPS IN THE NEW YORK BIGHT,
Woods Hole Oceanographic Institution, Mass.
R. F. Vaccaro, G. D. Grice, G. T. Rowe, and P. H. Wiebe.
Water Research, Vol 6, p 231-256, 1972. 4 fig, 8 tab, 37 ref.

Descriptors: *Industrial wastes, *Bays, *Waste disposal, *Water pollution effects, *New York, Heavy metals, New Jersey, Acids, Iron, Biota, Toxicity, Standing crops, Sediment, Zooplankton, Benthic fauna, Phytoplankton, Copepods, Trace elements, Benthos, Physicochemical properties.
Identifiers: *Acid-iron wastes, *New York Bight.

Hydrographic, chemical and biological conditions in coastal waters of the New York Bight where 50 million tons of acid-iron industrial waste were dumped over 22 years were studied and compared with those of a nearby control area. The maximum persistent iron concentration on the acid disposal grounds have a minimum dilution of the acid wastes of 1:39,000. There is no indication of an increase of iron in sediments of the past 14 years. Although standing crops of zooplankton and benthic animals were less on acid grounds than on the control areas, these differences were not attributed to acid waste. A phytoplankton toxicity experiment, carried out in a culture containing a concentration four times greater than in the field, had no effect on phytoplankton growth. Copepods were studied in seawater cultures containing acid waste; copepods either failed to reproduce or their development was prolonged in a 0.0001 concentration; no adverse effects were noted at lower concentrations. Comparison of the acid and control areas showed the highest values for eight trace metal concentrations in zooplankton, benthos, and sediments. No major effects of acid-iron waste on sediment and biota were detected. (Jones-Wisconsin)
W72-11570

THE EFFECTS OF SAPROBIC CONDITIONS ON SOME CILIATED PROTOZOA IN THE BENTHOS AND HYPOLIMNION OF A EUTROPHIC POND,
Freshwater Biological Association, Ambleside (England).
R. Goulder.
Freshwater Biology, Vol. 1, p 307-318, 1971. 5 fig, 3 tab, 27 ref.

Descriptors: *Anaerobic conditions, *Aquatic populations, *Protozoa, *Benthos, Hypolimnion, Seasonal, Fluctuations, Decomposing organic matter, Stratification, Oxygen, Toxicity, Ammonia, Carbon dioxide, Sulfides, Hydrogen ion concentrations, Alkalinity, Hydrogen sulfide, Water pollution effects.
Identifiers: Loxodes magnus, Loxodes striatus, Frontonia leucas, Spirostomum teres, Stentor coeruleus, Paramecium caudatum, Priest Pot (England).

Ciliate populations in benthos and hypolimnion of a eutrophic pond, Priest Pot, Lancashire, England, and their seasonal fluctuations were followed, May 1969 to December 1970. Loxodes magnus and Loxodes striatus were the most common species; Frontonia leucas, Spirostomum teres, Stentor coeruleus, and Paramecium caudatum were counted. Dense benthic populations of these ciliates were found in 0.1 ml of sediment, October to May, when pond was mixed and bottom water well oxygenated. Very few benthic ciliates were present in summer when stratification occurred, the hypolimnion containing low oxygen and high levels of potentially toxic substances such as sulphide, ammonia, and carbon dioxide. Water column conditions were perhaps less severe than sediment or the planktonic ciliates may have migrated vertically at times to an oxygen supply at the epilimnion boundary. Effect of an artificial saprobic environment was investigated. Loxodes species exposed to saprobic conditions in closed bottles were lost 50-150 hours. Deoxygenation carried out in an argon stream, with no build-up of the potential toxins associated with anoxia, killed nearly all Loxodes between 20 and 70 hours. Oxygen deficiency alone may explain low populations. (Jones-Wisconsin)
W72-11571

THE EFFECT OF CUPRIC AND FLUORIDE IONS IN THE RESPIRATION OF CHLORELLA,
University of Western Ontario, London (England). Dept. of Biophysics.
D. F. Sargent, and C. P. S. Taylor.
Canadian Journal of Botany, Vol. 50, p 905-907, 1972. 2 tab, 7 ref.

Descriptors: *Algal control, *Respiration, *Chlorella, *Inhibition, Copper, Fluorides, Ions, Cytological studies, Water pollution effects.
Identifiers: Chlorella pyrenoidosa.

Simulataneous application of cupric and fluoride ions virtually stops respiration of Chlorella vulgaris, although either cupric or fluoride ions alone cause no inhibition. Tests with various combinations of cupric and fluoride ions were made for endogenously respiring Chlorella pyrenoidosa. The sum of the inhibitions caused by cupric and fluoride ions individually is much less than the inhibition found when both agents are present. This work indicates that cupric ions alone do not block the alternate dissimilation pathway, but that both cupric and fluoride ions are required to inhibit completely. The response depends on the order of addition and the time between additions of the two poisons. The response to added cupric decreases as the time since the addition of fluoride ions increases. In Chlorella poisoned by dichlorophenyldimethylurea there is a light-induced respiratory inhibition which depends upon the functioning of glycolysis and which is suppressed by such glycolytic inhibitors as fluoride ions and iodoacetate. When fluoride ions are used, the light-induced inhibition gradually reappears, until, after an 80-minute incubation with fluoride, the effect is as great as before fluoride was added. Clearly glycolysis is no longer inhibited. (Jones-Wisconsin)
W72-11572

SUMMER BENTHOS IN NEWLY FLOODED AREAS OF BEAVER RESERVOIR DURING THE SECOND AND THIRD YEARS OF FILLING 1965-1966,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigations.
L. R. Aggus.
In: Reservoir Fisheries and Limnology, p 139-152. Special Publication No. 8, American Fisheries Society, Washington, D.C., 1971. 2 fig, 5 tab, 20 ref.

Descriptors: *Productivity, *Diptera, *Benthos, *Reservoirs, Bank erosion, Biomass, Vegetation effects, Fish, Impoundments, Deposition (Sediments), Silting, Autogenic succession, Fish food organisms, *Arkansas.
Identifiers: *New impoundments, *Beaver Reservoir (Ark), White River (Ark).

The creation of Beaver Reservoir on the White River in northwest Arkansas provided an opportunity to follow benthos formation in a large Ozark impoundment. Multiple-plate samplers were used during June-September 1965 and 1966 to obtain indexes to benthos production in areas of recently flooded herbaceous vegetation, timber, and cleared areas of Beaver Reservoir. Benthos accumulation on samplers was highest in flooded herbaceous vegetation during the early summer each year, followed by a strong seasonal decline. The most numerous during the early summer each year were the chironomids, the numerical benthic dominants on plate samplers throughout the study. Emergence traps indicated specimens of Glyptotendipes lobiferus and G. meridionalis to be dominant chironomid forms during the summer of 1965, decreasing in abundance during 1966, while Polypedilum digitifer and several undetermined species of Tanytarsini increased. Changes in the abundance of these chironomids coincided with a conspicuous increase in the rate of shoreline erosion and redeposition. Certain benthic forms appeared to be responsive to flooding of herbaceous vegetation; these organisms may represent a major avenue of energy transfer directly from decaying vegetation to fish. (Jones-Wisconsin)
W72-11573

THE LIMNOLOGICAL ROLE OF AQUATIC MACROPHYTES AND THEIR RELATIONSHIP TO RESERVOIR MANAGEMENT,
Atomic Energy Commission, Aiken, S.C. Savannah River Ecology Lab.
C. E. Boyd.
In: Reservoir Fisheries and Limnology, p 153-166. Special Publication No. 8, American Fisheries Society, Washington, D.C., 1971. 2 fig, 90 ref.

Descriptors: *Aquatic plants, *Reservoirs, *Management, Phytoplankton, Standing crops, Food chains, Phosphorus, Cattails, Nutrients, Rooted aquatic plants, Cycling nutrients, Foods, *Water hyacinth, Herbicides, Submerged plants, Floating plants, Aquatic weed control.
Identifiers: *Water lettuce, Nelumbo lutea, Alternanthera philoxeroides, Saururus, Salvinia rotundifolia, Hydrilla verticillata, Justicia americana, Ceratophyllum demersum.

The limnology of aquatic plants is presented to encourage management rather than eradication of macrophyte communities in reservoirs. In warm climates, floating vascular plants such as water hyacinth or water lettuce may completely cover reservoir surface. Degree of cover and macrophyte production are regulated by nutrients, space for growth, and a propagule source; they are important in aquatic ecosystem food webs. The proportion of total primary production attributed to macrophytes will vary with the growth suitability of the system. Although herbicide treatments of large portions of reservoirs are not recommended, localized plant stands can be controlled quite well. Invading species can sometimes be eliminated and obstructing vegetation eradicated from specific areas. Biological agents may have potential in controlling certain species, and mechanical removal of vegetation works well in certain situtations. When feasible, water level manipulation is one of the best control techniques. Excessive macrophyte production represents a potential food supply; leaf protein concentrate suitable for use in human diet can be prepared in satisfactory quantities from a number of macrophytes; economically valuable livestock feeds can be prepared from plants harvested for purpose of nutrient removal. (Jones-Wisconsin)
W72-11574

PHYTOPLANKTON PRODUCTIVITY IN WYOMING COOLING-WATER RESERVOIR,
Utah Univ., Salt Lake City. Dept. of Biology.
W. H. Funk, and A. R. Gaufin.

In: Reservoir Fisheries and Limnology, p 167-178. Special Publication No 8, American Fisheries Society, Washington, D.C., 1971. 2 fig, 6 tab, 17 ref.

Descriptors: *Phytoplankton, *Productivity, *Reservoirs, Nutrients, Eutrophication, Limiting factors, Fish harvest, Stratification, Rainbow trout, Dissolved oxygen, Chlorophyll, Diatoms, Primary productivity, Physicochemical properties, *Wyoming.
Identifiers: *Lake Viva Naughton (Wyo).

The productivity of Lake Viva Naughton, a newly impounded reservoir at Kemmerer, Wyoming, was investigated in a study of plankton: the ecological succession, the available mineral nutrients and the physical characteristics enhancing growth, trends of planktonic productivity by C-14 uptake and by other methods such as oxygen evolution and chlorophyll analysis. Algal blooms did not occur immediately after filling the reservoir in 1961, but Pandorina morum and Aphanizomenon flos-aquae became prevalent in the early summer months of 1962. The reservoir is not stratified during the summer growing season, as wind action causes constant circulation of the water. Macro- and micronutrients were in sufficient quantity to support algal blooms at any time. Reduction of nutrients and decreased light penetration by sheer cell density apparently represent the main limiting factors of algal growth. Temperature, addition or dilution of nutrients by precipitation and runoff may be limiting factors. Spawning adult rainbow trout, trapped above the dam after closure, and fish planted by the Wyoming Fish and Game Department, provided phenomenal fishing during 1962-1965. (Jones-Wisconsin)
W72-11575

EFFECTS OF STORAGE AND MAINSTREAM RESERVOIRS ON BENTHIC MACROINVERTEBRATES IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
B. G. Isom.
In: Reservoir Fisheries and Limnology, p 179-191. Special Publication No. 8, American Fisheries Society, Washington, D.C., 1971. 1 fig, 9 tab, 47 ref.

Descriptors: *Reservoirs, *Benthic fauna, *Invertebrates, *Tennessee Valley Authority, Silting, Water level fluctuations, Hydrostatic pressure, Oxygen, Food chains, Fisheries, Mussels, Snails, Insects, Mollusks, Fish populations, Fish food organisms, Rainbow trout.
Identifiers: *Storage reservoirs, *Macroinvertebrates, Clinch River (Tenn), Norris Dam (Tenn).

Although the literature analyzing benthic macroinvertebrates in the Tennessee Valley over the past 50 years is limited, there are sufficient studies for comparison with postimpoundment research. Virtually all benthic fauna have been eliminated from storage impoundments in the Valley, but some seasonal colonization of shallow overbank areas has occurred. Below mainstream impoundments the benthic fauna includes mussels and residual populations of Pleuroceridae. The short plankton-to-fish food chain is characteristic. The seasonally low oxygen tension below some impoundments may limit benthic fauna. Recent decline of mussel populations is attributed to impoundment and overharvest. Few Unioninae but significant numbers of Anodontinae and Lampsilinae have colonized postimpoundment mud-sand shallows. The decline of Unionidae may have been caused by fish-host association changes. Habitat alterations as a result of impoundments are associated with decline of snail populations in the upper Tennessee River drainage and of Pleuroceridae throughout the Valley. The Asiatic clam (Corbicula manilensis) accidentally introduced, although somewhat of a pest, is utilized by a number of faunal associates. It has been the most successful invader of impoundments on the Tennessee River and some of its tributaries. (Jones-Wisconsin)
W72-11576

PHYTOPLANKTON PRODUCTIVITY RESPONSE TO NUTRIENTS CORRELATED WITH CERTAIN ENVIRONMENTAL FACTORS IN SIX TVA RESERVOIRS,
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
M. P. Taylor.
In: Reservoir Fisheries and Limnology, p 209-217. Special Publication No. 8, American Fisheries Society, Washington, D.C., 1971. 7 fig, 3 tab, 6 ref.

Descriptors: *Phytoplankton, *Productivity, *Nutrients, *Reservoirs, Tennessee Valley Authority, Water quality, Fish populations, Retention, Oxygen, Physical properties, Lake morphology, Thermal stratification.
Identifiers: *Tennessee Valley reservoirs, Storage reservoirs, Mainstream reservoirs, Tributary reservoirs.

To evaluate phytoplankton productivity rates, nutrient concentrations, certain environmental factors, and some resultant effects, six reservoirs, typical of the Tennessee Valley, were studied. With their contrasting nutrient and productivity values, they illustrate representative reservoir types: mainstream, storage, and tributary. Considerable annual variation in phytoplankton productivity occurred both within each reservoir and among all six. Excessive phytoplankton productivity in some reservoirs is a factor in low oxygen content of water discharged through turbines, thus contributing to altered water downstream. This low-oxygen water phenomenon can exist in every deep storage reservoir but may be intensified in those supporting a heavier phytoplankton population. Short water retention time affects mainstream reservoir productivity by limiting time for phytoplankton growth; long water retention time of storage impoundments and of Beech Reservoir, a multipurpose tributary reservoir, provides more phytoplankton growth time. Lake morphology is important in a comparison of storage and mainstream impoundments because thermal stratification and the deep water withdrawal from storage impoundments permit separate aging of the hypolimnetic and epilimnetic strata. In mainstream impoundments, nutrients sink into a deoxygenated hypolimnion, sealed from the surface by the thermocline. Release occurs only through turbines or by fall and winter overturn. (Jones-Wisconsin)
W72-11578

MACROBENTHOS OF THE PAMLICO RIVER ESTUARY, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Zoology.
K. R. Tenore.
Ecological Monographs, Vol. 42, No. 1, p 51-69, 1972. 9 fig, 2 tab, 77 ref.

Descriptors: *Benthos, *Estuaries, *Biological communities, *North Carolina, Salinity, Temperature, Dissolved oxygen, Environmental effects, Brackish water, Limiting factors, Sediments, Water pollution effects, Dredging, Aquatic life, Distribution, Density, Seasonal, Dam construction.
Identifiers: *Macrobenthos, *Pamlico River (North Carolina), Rangia cuneata, Nereis succinea, Heteromastus filiformis, Heteromastus fragilis, Mulinia lateralis, Glycera dibranchia.

Pamlico River, North Carolina, can be described as an oligohaline-mesohaline system according to the Venice classification of brackish waters. Density, distribution, and community organization of the macrobenthos of this estuary were studied for a year. Measurements of salinity, temperature, dissolved oxygen, as well as particle size and concentrations of sediment organic matter were made. The sediment types were a sand substrate in the shallow area and a silty clay substrate in the deep area. Eighteen species of macrobenthos were found in preliminary sampling and the Shannon-Weaver information diversity index showed low values of 0.66-1.77. These indicated that stress of salinity conditions and unstable sediments are factors that make this estuary unfavorable for benthos. On the basis of trellis diagrams, the estuary was divided into three areas: an oligohaline zone dominated by Rangia cuneata and Nereis succinea; a mesohaline zone with a Macoma balthicaHeteromastus filiformis -Nereis succinea association; and a polyhaline zone at the mouth of the estuary characterized by a Macoma phenax-Mulinia lateralis-Glycera dibranchiata association. In the 1968-1969 sampling, thirty-six species were found. Changes in species composition showed significant seasonal cycles. (Jones-Wisconsin)
W72-11580

THE ECOLOGY AND PRODUCTION OF COPEPODS, PARTICULARLY THERMOCYCLOPS HYALINUS, IN THE TROPICAL LAKE GEORGE, UGANDA,
Royal Holloway Coll., Englefield Green (England). Dept. of Zoology.
M. J. Burgis.
Freshwater Biology, Vol. 1, p 169-192, 1971. 11 fig, 6 tab, 36 ref.

Descriptors: *Biological communities, *Copepods, *Tropical regions, *Life history studies, Ecological distribution, Animal populations, Lakes, Biomass, Standing crops, Zooplankton, Seasonal, Growth stages, Life cycles, Diurnal, Crustaceans.
Identifiers: *Thermocyclops hyalinus, *Lake George (Uganda).

Lake George, crossing the equator in Western Uganda, has stable environmental conditions. The population is mainly Thermocyclops hyalinus. Analysis of this population into the main development stages of its life history shows an almost constant age structure over the whole lake throughout the year. The development time of the Thermocyclops eggs is 1.5 days. This, plus mean development-times of 6 and 11 days for nauplii and copepodites respectively, has been used to determine the daily rate of recruitment from each life history stage to the next. The potential turnover time of population numbers was calculated to have a mean value of 4.2 days for the whole lake. With a constant population of stable age-structure the daily biomass production from the turnover time of numbers was estimated. Instantaneous birth rates, instantaneous rates of change in population numbers, and the instantaneous mortality rate have been calculated. The mean daily production level of Thermocyclops hyalinus in Lake George is among the higher values of zooplankton production available for comparison most of which are from temperate regions. (Jones-Wisconsin)
W72-11581

DISTRIBUTION OF EPILITHIC ALGAE ON THE UPPER REACHES OF YOSHII-GAWA RIVER: II. FURTHER ECOLOGICAL STUDIES OF EPILITHIC ALGAE IN THE KONGO-GAWA RIVER MITSUISHI-CHO, OKAYAMA PREFECTURE, (IN JAPANESE),
I. Imada.
Bull Jap Soc Phycol. Vol 19, No 2, p 56-64. 1971. Illus. Map. English summary.
Identifiers: *Algae, Bacillariophyceae, Chlorophyceae, Cyanophyceae, Distribution, Ecology, *Epilithic algae, Kongo-Gawa, Mitsuishi-Cho, Okayama, Oxygen, Prefecture, Reaches, Rivers, Temperature, Yoshii-Gawa, *Japan.

Cell numbers of epilithic algae were counted; water temperature, dissolved O2, KMnO4-consumption and pH were measured at 7 stations. The water temperature varied between 17.5 deg. C-18.5 deg. C, the dissolved oxygen, 3.61 ml/l - 10.74 ml/l, KMnO4-consumption, 29.54 mg/l - 46.11 mg/l, the pH, 7.1-7.2. The Bacillariophyceae were dominant at all stations, comprising about 78.9% of the total.

The maximum cell number of the Bacillariophyceae was 5300/mm2 and the minimum was 1450/mm2. The Cyanophyceae and the Chlorophyceae contributed 8.6-12.8% of the cell number. The maximum cell number of the Cyanophyceae was 1600/mm2. The maximum cell number of the Chlorophyceae was 500/mm2 and the minimum was 50/mm2.--Copyright 1972, Biological Abstracts, Inc.
W72-11588

THE ORIGIN OF DYSTROPHIC SWINGING BOGS IN AN ALKALINE LAKE: ECOLOGICAL-CENOLOGICAL STUDIES ON THE LAKE VELENCE (HUNGARY),
Eotvos Lorand Univ., Budapest (Hungary). Botanikus Kertje.
A. Borhidi, and M. Balogh.
Acta Bot Acad Sci Hung. Vol 16, No 1/2, p 13-31. 1970. Illus. English Summary.
Identifiers: Bolboschoenus-M, *Dystrophic bogs, Ecology, *Hungary, *Alkaline lake, Phragmites-M, Ruppia-M, Scirpus-M.

The reed-grass vegetation belongs to the Ruppietalia series in which several new communities may be differentiated. The alkaline reeds should be separated from the eutrophic-dystrophic Scirpo-Phragmitetum under the name Bolboschoeno-Phragmitetum. The alkaline water dystrophic so-called 'swinging bogs' are developing in the southwestern part of the lake. The separate ecosystem of these bogs forms by the productive activity of the reedy polycormic colony.--Copyright 1972, Biological Abstracts, Inc.
W72-11602

LIFE HISTORY AND BIOLOGY OF EINFELDIA SYNCHRONA (DIPTERA: CHIRONOMIDAE),
Department of Agriculture, Ottawa (Ontario).
H. V. Danks.
Can Entomol. Vol 103, No 11, p 1597-1606. 1971. Illus.
Identifiers: *Chironomidae, *Diptera, *Einfeldia-Synchrona, Larva, Photoperiod, Eutrophication.

Einfeldia synchrona Oliver is univoltine in a small, shallow, highly eutrophic pond near Ottawa (45 deg N.). Adult emergence is synchronized with slight protandry in May, and from this small pond exceeded 145,000 individuals in 1970. Emergence is inhibited experimentally at short photoperiods. More than 1 egg mass is produced, during a period of several days following emergence. First instar larvae, which lack ventral tubules, are at first pelagic but build cases before molting. The remaining 3 larval instars possess 1 pair of ventral tubules. Larvae show a preference for central areas of the pond over 40 cm deep, and show some mobility in response to seasonal depth changes. There are arrests in the development of larvae both in winter and during summer, with cessation of feeding, penetration into the mud, and construction in winter of special sealed cocoons. Marked year to year differences in the stage reached by winter, and in the larval population level, were detected. Many of these biological features are probably widespread in Chironomini and hence of some importance in the interpretation of studies of the bottom fauna.--Copyright 1972, Biological Abstracts, Inc.
W72-11682

MANMADE POLLUTION AND AMERICA'S 100,000 LAKES,
California Univ., Berkeley. Sanitary Engineering Research Lab.
P. H. McGauhey, E. J. Middlebrooks, and D. B. Porcella.
Public Works, Vol. 103, No. 3, p 87-88, March 1972.

Descriptors: *Sewage treatment, *Efficiencies, *Eutrophication, *Lakes, *Water pollution effects, Reclaimed water, Sewage effluents, Research and development, Nutrients, Nitrogen, Phosphorus, Algae, Plant growth, Water pollution treatment, Evaluation, Water quality.
Identifiers: Fate of pollutants.

To combat the problem of pollution of our lakes, it has been advised that research be done to determine several factors in relation to sewage effluents and their effects on the eutrophication process: (1) the concentration at which nitrogen and phosphorus will trigger or support substantial algal growth, (2) the growth stimulating effect of sewage that has had its P and N partially removed, and (3) the ability of nutrient removal processes to reduce N and P to levels below that critical to algal growth. In addition, it is felt that since increasing populations tend to accelerate pollution in lake basins, the need for pollution research takes on other aspects: (1) the residual ability of tertiary sewage effluents to stimulate algal growth; (2) the ultimate fate of nutrients removed from sewage in a basin; and (3) the effect of man's near-shore and shoreline modifications on the beauty and biology of the system. Lake Tahoe is cited as an example of efficient wastewater reclamation and treatment. (Mackan-Battelle)
W72-11702

BACTERIOPLANKTON QUANTITY AND BIOMASS IN FLOOD LAKES OF THE AMUR RIVER,
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
I. A. Matarueva.
Gidrobiol Zh. Vol 7, No 3, p 25-30, 1971, English summary.
Identifiers: *Amur River, Biomass, Flood lakes, *Plankton, Quantity, USSR.

Microbiological examination of 9 Amur flood lakes shows that they are characterized by a high quantitative development of bacterioplankton.--Copyright 1972, Biological Abstracts, Inc.
W72-11718

OSCILLATORY VARIATION OF A PHYTOPLANKTON POPULATION IN A TROPICAL OCEAN,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
D. M. Steven, and R. Glombitza.
Nature, Vol 237, No 5350, p 105-107, May 12, 1972. 4 fig, 1 tab, 9 ref.

Descriptors: *Variability, *Phytoplankton, *Depth, On-site investigations, *Population, Temporal distribution, Chlorophyll, Sampling, Mathematical studies, Atlantic Ocean, *Tropical regions, Marine algae, Spatial distribution, Fourier analysis, Biorhythms, Correlation analysis, Primary productivity.
Identifiers: *Periodicity, Trichodesmium thiebaudii, Barbados.

Trichodesmium thiebaudii, a tropical phytoplankter, exhibited oscillatory variations in productivity while under observation in the tropical western Atlantic. Sixty-five collections were made at regular intervals (August 29, 1967-June 4, 1970) at an oceanographic station about 9 km west of Speightstown, Barbados, at a depth of 460 m. Chlorophyll concentrations were measured at 5, 25, 50, 75 and 100 m in 2 liter samples the numbers of phytoplankton were estimated at 5, 50, and 100 m in 0.5 liter samples of water fixed with one percent neutralized formalin. The number of filaments of Trichodesmium and other common phytoplankton were counted. Raw data indicate that chlorophyll concentrations and the number of filaments of Trichodesmium at 5 m fluctuated regularly with a periodicity of between 3 and 4 months. Other phytoplankton was usually less numerous and did not show such variation. The association between chlorophyll and the Trichodesmium was studied by harmonic analysis and by auto- and cross-correlations. It was shown that chlorophyll and Trichodesmium oscillate in phase with a periodicity of about 105-120 days. A similar analysis applied to the combined data from all depths to 100 m revealed chlorophyll concentration increases with depth. This increase is deemed to be associated with other organisms, not Trichodesmium. (Snyder-Battelle)
W72-11719

HETEROTROPHY BY PLANKTON IN THREE LAKES OF DIFFERENT PRODUCTIVITY,
Oak Ridge National Lab., Tenn. Ecological Sciences Div.
R. H. Monheimer.
Nature, Vol 236, No 5348, p 463-464, April 28, 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Plankton, *Lakes, Productivity, Phytoplankton, Organic compounds, Metabolism, Radioactivity techniques, Sulfur, Sulfates, Inorganic compounds, Photoperiodism, Tracers, Absorption, Least squares method, *Eutrophication, Oligotrophy, Mesotrophy, *Primary productivity, Statistical methods, Photosynthesis, Regression analysis.
Identifiers: *Heterotrophy, Limnetic zone, S-35, Sulfur radioisotopes, Membrane filters.

A radioactivity technique similar to the C-14 method of measuring primary productivity was used with a heterogenous mixture of dissolved S-35-labeled organic compounds instead of C-14-labeled ones in order to determine the rates of uptake of labelled materials by plankton in a eutrophic, mesotrophic, and an oligotrophic system. Such rates were measured by using 2.0 ml of the organic tracer/300 ml BOD bottle with the collected plankton and incubating the plankton in transparent and opaque bottles at 15 cm depth. At intervals of 1,2,4, and 6 hr, the contents of 4 clear and 4 opaque bottles were passed through 0.45 micrometer membrane filters, washed, dried, and counted for radioactivity. Data were fitted to a linear regression by the least squares method and the regression slopes compared by the t-test. Uptake rates of S-35-labelled inorganic sulfate were also determined. It was found that the inorganic isotope was taken up at a higher rate when the plankton was light incubated and that the organic tracer was accumulated faster by dark-incubated plankton. Two important conclusions were made: (1) Heterotrophic (dark) processes are important in total uptake of inorganic materials by plankton; and (2) Phytoplankton may conduct up to 50 percent of the heterotrophic activity occurring in the limnetic zone during the dark. (Mackan-Battelle)
W72-11720

DIURNAL PH PATTERNS AS PREDICTORS OF CARBON LIMITATION IN ALGAL GROWTH,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
L. G. Rich, J. F. Andrews, and T. M. Keinath.
Water and Sewage Works, Vol 119, No 5, p 126-130, May 1972. 5 fig, 1 tab, 12 ref.

Descriptors: *Hydrogen ion concentration, *Algae, *Growth rates, *Limiting factors, *Diurnal distribution, Carbon dioxide, Nitrogen, Phosphorus, Light, Nutrients, Mathematical studies, Equations, Aquatic environment, Water properties, Algal control, Water analysis, Chemcontrol, Water pollution effects, Water quality, Carbon.

A mathematical study of diurnal pH patterns is presented as they relate to algal growth limiting factors, whether they are carbon dioxide nitrogen, phosphorus, or light. Such information might be of use in analyzing diurnal pH patterns in nature, thereby elucidating that particular factor controlling local algal growth. Data from computations conclude that fairly significant changes in pH magnitude in a diurnal period (of the order of several tenths of a pH unit) can occur only when CO2 is the limiting factor for at least a portion of the diurnal cycle. However, it must be remembered that tidal action and flow phenomena may also distort the pH patterns. (Mackan-Battelle)

W72-11724

TOXICITY OF MERCURY TO PHYTOPLANKTON,
New York Ocean Science Lab., Montauk.
R. Nuzzi.
Nature, Vol 237, No 5349, p 38-39, May 5, 1972. 3 fig.

Descriptors: *Phytoplankton, *Mercury, *Toxicity, Cultures, *Chlorella, Aquatic algae, Chlorophyta, Heavy metals, *Chlamydomonas, Inhibitors, *Lethal limit, Water pollution effects, Water pollution sources, Inhibition.
Identifiers: Phaeodactylum tricornutum, Phenylmercuric acetate, Mercury chloride, Phenylacetate, Mercury compounds.

Experiments were performed to determine the toxicity of mercury to three phytoplankton species at concentrations as low as 0.06 micrograms/liter. Phaeodactylum tricornutum, Chlorella sp., and Chlamydomonas sp. were grown and tested axenically in chemically defined media. Each was inoculated into two series of tubes containing HgC12 at concentrations ranging from 0.74-66.6 micrograms Hg/liter and phenylmercuric acetate (PMA) concentrations ranging from 0.66-15.0 micrograms Hg/liter. P. tricornutum was also tested against phenylacetate concentrations equivalent to the phenylacetate concentration in the PMA series of tubes. Cells were counted after 16 days incubation at 18 C and it was found that all the organisms had been inhibited by the mercury compounds. PMA was more toxic than mercury chloride, causing inhibition at concentrations as low as 0.06 micrograms Hg per liter. The inhibition of P. tricornutum by PMA at 3 micrograms Hg/l was almost completely reversed by the addition of 5 percent glutathione. Cells grown at sublethal concentrations showed increased incidence of morphological abnormalities with an increase in mercury content. (Snyder-Battelle)
W72-11727

ACCUMULATION OF CS-137 BY AEDED AEGYPTI LARVAE AND THE EFFECT OF POTASSIUM CONCENTRATION,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
J. E. Guthrie, and A. Z. Burzynski.
The Canadian Entomologist, Vol. 104, No. 3, p 411-416, March 1972. 3 fig, 14 ref.

Descriptors: *Bioassay, *Larvae, Larval growth stage, Mosquitoes, *Cesium, Radioactivity effects, Radiochemical analysis, Potassium, Radioactivity techniques, Water pollution effects.
Identifiers: *Cs-137, *Bioaccumulation, *Excretion, Aedes aegypti, Cesium radioisotopes, Chemical interference, Sample preparation.

Experiments have been conducted to study radioactive cesium accumulation by Aedes aegypti larvae and its subsequent elimination by the adults. Instar I larvae were hatched from eggs and reared at 20 and 25 degrees Centrigrade. The experimental groups were fed labeled, ground dog meal and samples of 6 larvae were taken every hour for the first 6 hours, at 24 hr, 30 hr, and daily thereafter until pupation. To determine the biological half-lives of Cs-137 elimination, the larvae were reared at 20 C and instar IV larvae transferred to distilled water to pupate. Sample preparation involved drying the specimens overnight over calcium chloride, weighing, and fastening to stainless steel planchets with a 1:10 solution of collodion in acetone. Total beta counting was used to measure the amount of radioactive cesium. Radiocesium accumulation was greater at 25 C, that at 20 C. The activity density (c.p.m./mg dry wt.) of the adults was the same for both sexes, as was the nuclide's elimination rate. The amount of Cs-137 accumulated by the larval instars was inversely proportional to the concentration of potassium in the rearing medium, the suppression of Cs-137 uptake being greater at 25 C than at 20 C. The possibility that larvae may accumulate Cs-137 via the anal papillae and the gut, is briefly discussed. (Synder-Battelle)
W72-11737

5D. Waste Treatment Processes

A FLUSHING SYSTEM FOR COMBINED SEWER CLEANSING.
FMC Corp., Santa Clara, Calif. Central Engineering Labs.

Copy available from GPO Sup Doc as EP2.10:11020, $1.75; microfiche from NTIS as PB-210 858, $0.95. Environmental Protection Agency, Water Pollution Control Research Series No. 11020 DNO, March 1972. 233 p, 30 fig, 25 tab, 7 ref. EPA Program 11020 DNO 03/72.

Descriptors: *Storm drains, *Cleaning, *Flow rates, Separated sewers, *Sewers, On-site investigations, Mathematical models, Storage, Suspended solids, Design criteria, Cost analysis, Water quality control, Waste water treatment.
Identifiers: *Flush waves, *Combined sewers, *Flushing systems.

Full-scale tests were conducted on two variable-slope test sewers (12- and 18- inch diameters), during which solids were first allowed to build up by passing domestic sewage through the sewers for durations of 12 to 40 hours and then were removed by hydraulic flushing. Test results demonstrated that flush waves generated using flush volumes ranging from 300 to 900 gallons at average release rates ranging from 200 to 3000 gpm removed from 20 to 90 percent of the solids deposited in the 800-foot long test sewers. Formulas were developed which gave satisfactory predictions of several cleansing efficiencies and wave depths for the flush waves and sewer sizes studied. Percent removal was shown to be a function of: flush volume; flush discharge rate; sewer slope; sewer length; sewage flow rate; and sewer diameter. A prototype flush station developed in this project can be inserted in a manhole to provide the functions necessary to pick up sewage from the sewer, store it in a coated fabric tank, and release the stored sewage as a flush wave upon receipt of an external signal. An estimate of costs of periodically flushing combined sewer laterals indicated a range of costs from $630 per acre to $1,275 per acre for average removal efficiencies of 61 percent and 72 percent, respectively. (Lowry-Texas)
W72-11089

FLUIDIC VORTEX BUBBLE GENERATOR.
Bowles Fluidics Corp., Silver Spring, Md.

Copy available from GPO Sup Doc as EP2.10:17030, $1.00; microfiche from NTIS as PB-210 808, $0.95. Environmental Protection Agency, Water Pollution Control Research Series No. 17030 FEB, February 1972. 75 p, 40 fig, 5 tab, 48 ref. EPA Program 17030 FEB 02/72.

Descriptors: *Flotation, *Bubbles, *Separation techniques, Laboratory tests, Flow rates, *Aeration, Effervescence, Baffles, Pressure, Design criteria, Operation and maintenance, *Waste water treatment, Water pollution control.
Identifiers: *Aspiration.

An engineering investigation and evaluation of vortex devices as bubble makers for use in the removal of suspended solids from wastewaters was conducted. Specific objectives included the development and test of bubble makers capable of generating bubbles having mean diameters of about 100 microns with vortex devices having minimum liquid passageways of 1/4 inch or greater. Bubbles having a mean diameter of 80 to 85 microns, with virtually no bubbles greater than 130 microns, were successfully produced. This mean size and size range are substantially the same as bubbles produced by pressurized water processes at similar operating pressures. Bubbles were produced both by aspirating atmospheric air directly into the vortex unit, and by aspirating atmospheric air at the suction side of the pump, dissolving it, and precipitating it or effervescing it at the vortex unit. The best vortex device tested produced bubbles at roughly one-sixth to one-seventh the rate per horsepower of comparable pressurized water equipment. Indications are, however, that this margin may be reduced by increasing vortex gain, and by aspirating air to the so-called outside of the vortex exit cone as well as the inside. Flotation testing was not successfully accomplished with any device or system during this investigation, due to test fixture problems. Sufficient data now exist, however, to design vortex systems for direct functional tests in conventional air flotation systems. (Lowry-Texas)
W72-11090

TREATMENT OF PARAMAGNETIC SLURRIES FROM STEEL MILL OPERATIONS BY DOUBLE FLOCCING,
Dravo Corp., Pittsburgh, Pa.
D. F. Peck, and T. J. McBride.
Iron and Steel Engineer, Vol 46, No 10, October 1969, p 79-83. 11 fig.

Descriptors: *Industrial wastes, *Mineral industry, *Flocculation, Suspended solids, Polymers, Separation techniques, Iron compounds, Color, Filtration, Sludge, Cost analysis, *Waste water treatment.
Identifiers: *Magnetic flocculation.

Field studies of the use of polymer flocculants with magnetic exposure for paramagnetic slurries have produced settling rates higher than for any other treatment or conditioning known for similar wastes. Advantages of such a system include: (1) smaller land and construction requirements; (2) possibility for use in correcting existing overloaded treatment facilities; (3) a reduction of polymer requirements over conventional flocculation alone; (4) a permanent magnetic backup should the polymer system fail; (5) a high degree of suspended solids and apparent color removal; and (6) improved sludge handling characteristics from the standpoint of tenaciousness and dewatering properties. However, for highly colored wastes requiring high quality discharges, a tertiary deep bed filter is recommended for final effluent polishing. (Lowry-Texas)
W72-11091

AERATED LAGOONS TREAT MINNESOTA TOWN'S WASTES,
Hinde Engineering Co., Highland Park, Ill.
J. B. Neighbor.
Civil Engineering, Vol 40, December 1970, p 59-61. 3 fig, 1 tab.

Descriptors: *Aerated lagoons, *Industrial wastes, *Municipal wastes, *Cost analysis, Construction costs, Operating costs, Dairy industry, Food processing industry, Bubbles, Mixing, Aeration, Sludge disposal, Mass transfer, Performance, Biochemical oxygen demand, *Waste water treatment, *Minnesota.
Identifiers: *Winsted (Minn), *Dairy processing wastes.

A multiple-cell aerated lagoon system was designed and constructed to treat municipal wastes from the town of Winsted, Minnesota, wastes from a small creamery, and washwaters from Minnesota's largest cheese producer. Three lagoons in series, equipped with difused air aeration, now handle 311,000 gpd of influent containing 3600 lbs BOD5. All three lagoons measure 120 ft. wide by 1070 ft. long by 10 ft. deep, with a combined holding capacity of 12,397,000 gallons and a total retention time of 46 1/2 days. During the past 2 years, removal of BOD has averaged 93 to 99% and removal of volatile dissolved solids has averaged 80 to 98%. Construction costs were only $224,000, as compared to $485,000 estimated for a

contact stabilization plant. Operating costs were $7000/yr as compared to $17,000/yr for the conventional plant. The lagoon system also produces no sludge handling problems and provides a consistently high degree of treatment to a widely varying waste. (Lowry-Texas)
W72-11092

EFFECTS OF SUSPENDED SOLIDS CONCENTRATIONS ON THE STRUCTURE OF TURBULENCE AND THE OXYGEN TRANSFER MECHANISM IN ACTIVATED SLUDGE,
Tokyo Univ. (Japan). Dept. of Urban and Sanitary Engineering.
T. Matsuo.
Preprint, presented at 6th International Water Pollution Research Conference, Session 8, Paper No 15, June 21, 1972. 14 p, 10 fig, 8 tab, 13 ref.

Descriptors: *Turbulence, *Mass transfer, *Oxygenation, Reaeration, *Activated sludge, Aeration, Bubbles, Suspended solids, Particle size, Sludge, Mixing, Biodegradation, Instrumentation, Laboratory tests, *Waste water treatment.
Identifiers: *Oxygen uptake rate.

A laboratory scale aeration tank of 35 liter capacity was used to determine the types of flow regions obtained in activated sludge systems, and to determine the effects of bubble size and suspended solids concentration both on the turbulence regime and the oxygen transfer characteristics. Initial results demonstrated that turbulence which is affected by suspended solids is in the 'micro-scale,' comparable to the size of the solids, and effects of suspended solids on 'macro-turbulence' patterns were not distinctly identified. However, further investigations demonstrated that the scale of turbulence having a direct effect upon 'KLa' or the oxygen uptake rate is also the 'micro-scale'. Because of the limitation of the measuring instruments, however, complete quantitative analysis of turbulence is not yet possible, but the shape, size, or concentration of suspended solids may be considered in obtaining a qualitative measure in order to characterize the structure of turbulence. For these reasons, in further testing, the concentration of suspended solids as well as the intensity of mixing must be accounted for to maintain biologically similar conditions. (Lowry-Texas)
W72-11095

THE DEVELOPMENT AND EFFECT OF CONSTRUCTION AND OPERATION COST IN BIOLOGICAL SEWAGE TREATMENT PLANTS,
Baubehorde (West Germany). Hauptabteilung Stadtenwasserung.
E. Sickert.
Preprint, presented at 6th International Water Pollution Research Conference, Session 7, Paper No 13, June 21, 1972. 15 p, 10 fig, 7 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Cost analysis, Construction costs, Operating costs, Operation and maintenance, Electric power costs, Instrumentation, Equipment, Automation, Optimization, *Sewage treatment, *Biological treatment.

The cost of wages in the wastewater treatment industry has risen 100% and cost of construction has risen 65% in the last ten years alone. One of the responsibilities of running a wastewater treatment plant is to keep both initial and operational costs to a minimum. First, larger plants cost less to build per unit of available capacity, and also cost less to operate, indicating centralization of facilities as a logical cost saving step. However, shared centralized facilities and manpower by many plants in a certain district can also realize cost savings. In addition, since power cost has been nearly stable and is predicted to continue similarly, replacement of labor by automation is another logical measure. By pointing out these measures and assigning a weight to their influence an even higher economy may be achieved. Although the list is far from complete, there are many fundamental possibilities of improvement which can benefit from previous experience and judgement. (Lowry-Texas)
W72-11096

CARPET MILL INDUSTRIAL WASTE SYSTEM,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
R. Stone.
Journal Water Pollution Control Federation, Vol 44, No 3, March 1972, p 470-478. 6 fig, 4 tab.

Descriptors: *Textiles, *Industrial wastes, *Dyes, Flow control, Storage, Construction costs, Operating costs, Cost analysis, *Waste water treatment, *California.
Identifiers: *Industry (Calif).

The Walter Carpet Mill in the City of Industry, California, includes an integrated tufting plant, dye house, warehouse, sales-showroom, and management offices. Plant industrial wastes are generated by steam boiler blowdown, the zeolite softeners and their sodium chloride regenerate, cooling tower blowdown facility and equipment cleanup, and dye works effluent. Sanitary wastes are segregated and discharged to the public sewer. A surge reservoir with a 200,000 gallon capacity and two dye beck basins with a total storage capacity of 85,000 gallons were constructed to store the wastes produced daily for automatic metering into the public sewer during the low flow night-time conditions. Concrete tilt-up panels were used for treatment basin construction, and a 0.5 inch thick flexible asphalt membrane was used in the surge reservoir. Total construction costs were $125,000, with operating costs including 20 year amortization at 7 1/2% interest averaging $25/day. Total unit cost was $0.025/1000 gallons. (Lowry-Texas)
W72-11097

ACTIVATED SLUDGE SYSTEM-CONTROL AND ANALYSIS,
Decatur Sanitary District, Ill.
J. F. Reynolds.
Water and Sewage Works, Vol 117, No 7, July 1970, p 251-259. 7 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Activated sludge, Oxygen requirements, Aeration, Mechanical equipment, Treatment facilities, Performance, Illinois.
Identifiers: Oxygen transfer, Decatur (Illinois), Oxygen uptake rates, Alpha factor, Spiral row aeration, Cross row aeration, Sparger diffusers.

System modification and control and analysis methods utilized by the Decatur, Illinois activated sludge system were presented. The stabilization section of the system was reduced from a detention time of 14 hr and a total capacity of 169,000 cu. ft. to a detention time of 5 hr and a total capacity of 56,000 cu. ft. The 113,000 cu. ft. of tankage obtained was placed in operation as additional aeration tanks. Also, the spiral roll aeration pattern was changed to a cross row aeration pattern and the number of sparger diffuser units was increased. The cross row system thus installed increased the capacity of oxygen transfer an additional 60 percent. Determinations of oxygen uptake rates, alpha factors and oxygen transfer efficiencies have been added to the control and analysis methods. The mean values of alpha, for the years 1965-69, for the primary effluent was 0.419 and the mean value for alpha in the final effluent was 0.857. Yearly averages of operating parameters for the years 1965-69 were presented. (Galwardi-Texas)
W72-11099

A SYMBIOTIC SYSTEM FOR ADVANCED TREATMENT OF WASTEWATER,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
F. J. Humenik, and G. P. Hanna, Jr.
Water and Sewage Works, Vol 117, No 6, June 1970, p 198-202. 6 fig, 11 ref.

Descriptors: *Waste water treatment, *Nutrients, *Algae, *Bacteria, *Symbiosis, Activated sludge, Nitrogen, Phosphorus, Chemical oxygen demand, Chlorella, Performance, Efficiencies, Laboratory tests, Laboratory equipment, Aeration, Dissolved oxygen, Aerobic conditions, Biomass, Respiration, Photosynthetic oxygen, *Tertiary treatment.
Identifiers: Organic nitrogen, Settling characteristics, Solids recycle, Solids control.

Under controlled environmental conditions a symbiotic algal-bacterial culture was developed and maintained which would efficiently remove nutrients from wastewater. The culture of the biomass growth system was a natural mixture of algae, predominantly Chlorella, and activated sludge in which the algae became enmeshed within the bacterial matrix. The algal-bacterial floc exhibited good settling characteristics under quiescent conditions. Maximum and most consistent removal of influent COD and organic nitrogen was obtained during unaerated operation with solids control and through daily harvest of excess biomass. COD removal for the reclarified supernatant averaged 82.5 percent with 88.2 percent as the maximum. Organic nitrogen removal averaged 85.3 percent. However, no appreciable removal of phosphorus was recorded. The symbiotic algal-bacterial system remained aerobic during unaerated periods as a result of a balance between respiration and photosynthetic oxygenation. An average value of 2 mg/l dissolved oxygen was reported. Supplemental aeration did not result in increased nutrient removal, and was therefore considered as a wasted energy input. (Galwardi-Texas)
W72-11100

CHARACTERISTICS OF YEASTS ISOLATED FROM PHENOL- AND CATECHOL-ADAPTED ACTIVATED SLUDGES,
Indian Inst. of Science, Bangalore.
B. V. Rao, and J. V. Bhat.
Antonie Leeuwenhoek J Microbiol Serol. Vol 37, No 3, p 303-312. 1971. Illus.
Identifiers: Activated sludges, Candida tropicalis, Catechols, Phenols, Sludges, Trichosporon cutaneum, *Yeasts, *Waste water treatment, Separation techniques.

Phenol- and catechol-adapted sludges contained large numbers of the yeasts, Candida tropicalis and Trichosporon cutaneum. Both were able to grow on a variety of aromatic compounds and utilized phenol and catechol at a high rate. This property was inducible. The feasibility of using these yeasts for removing phenols from waste waters is suggested.--Copyright 1972, Biological Abstracts, Inc.
W72-11102

ACCELERATED DIGESTION OF CONCENTRATED SLUDGE,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
A. Shindala, J. V. Dust, and A. L. Champion.
Water and Sewage Works, Vol 117, No 9, September 1970, p 329-332. 2 fig, 4 tab, 16 ref.

Descriptors: *Anaerobic digestion, *Sludge treatment, *Domestic wastes, Alkalinity, Hydrogen ion concentration, Efficiencies, Performance, *Waste water treatment.
Identifiers: Solids concentration, Volatile acids, Gas production, Loading rate, Volatile matter reduction.

A laboratory study was conducted to determine the effect of concentration of sludge on the anaerobic digestion of a domestic sludge. Sludge concentrations of 5, 15, 25, and 35 percent were used and a digestion temperature of 92 to 95F was maintained. Loading periods of 10, 15, 20, and 30 days were used. Gas production of all digesters was recorded and changes in pH, alkalinity, volatile acids, and reduction in volatile matter added to the digesters was observed every four days. Results showed that solids concentration

had a definite effect upon digestion as the percent reduction in volatile matter decreased with increased solids concentration for all loadings. Also, the volatile acids and alkalinity in general increased with the increase in solids concentration, however, the pH remained nearly constant. The maximum amount of gas per liter of sludge was produced at the 15 percent solids level while the 5 percent solids level produced the most gas per unit of dry solids. Loadings of concentrated sludges up to 10 mg/l per day produced an acceptable volatile solids reduction. (Galwardi-Texas)
W72-11104

SOLVENT EXTRACTION OF MERCURY FROM BRINE SOLUTIONS WITH HIGH-MOLECULAR-WEIGHT AMINES,
Oak Ridge National Lab., Tenn.
F. L. Moore.
Environmental Science and Technology, Vol 6, No 6, June 1972, p 525-529. 1 fig, 8 tab, 4 ref.

Descriptors: *Pollution abatement, *Mercury, *Solvent extractions, Solvents, Brines, Performance, Laboratory tests, Metals, Ions, Separation techniques, Copper, Cadmium, Zinc, Lead, *Waste water treatment.
Identifiers: High-molecular-weight amines, Quaternary amines, Regeneration, Nitric acid, Ethylenediamine, Propylenediamine, Aluminum, Reduction-precipitation, Industrial recovery, Arsenic.

The use of high-molecular-weight amines for the removal of mercury from brine solutions and other aqueous chloride solutions was investigated using solvent extraction techniques. Mercury was extracted at both the subnanogram and macro levels. Especially attractive were the commercially available quaternary amines, Aliquat 336 and Adogen 464, because of their ability to extract mercury from alkaline as well as acidic brine solutions. Regeneration of the amine solvent was readily achieved by stripping the mercury with aqueous solutions of nitric acid, ethylenediamine, or propylenediamine. Alternatively, the mercury can be stripped directly from the solvent by aluminum reduction-precipitation. A simple process was described for the abatement of mercury pollution in industrial brines and hydrochloric acid solutions. In addition to mercury the process was found to extract a number of other toxic metal ions: Cadmium, zinc, lead, arsenic and copper. (Galwardi-Texas)
W72-11107

INDUSTRIAL MANAGEMENTS' CONCERN,
General Motors Corp., Detroit, Mich.
W. A. Kemmer.
Waste Age, April 1970, p 26-28.

Descriptors: *Solid wastes, *Industrial production, *Salvage value, Natural resources, Management, Cost comparisons, Political aspects, Pollution abatement, Public health, Government supports.
Identifiers: *Reuse, Michigan State Chamber of Commerce.

There are several strong incentives for all of business to be concerned about and for it to contribute to the development and implementation of good solid waste management. The forces of competition require prudent business management to look continually for ways to reduce or eliminate waste. It is in the best interests of business and industry to conserve natural resources. Reclaiming or reprocessing of scrap for reuse is a demanding business. Moreover, when disposal of waste materials is necessary, it must be done in such a manner as to protect the quality of our environment. The Michigan State Chamber of Commerce recently released a policy statement on solid waste management which contains three key concepts. Solid waste management cannot be low cost without a minimum duplication of facilities and maximum of competition. Any determination of capacity and area served must be made by economic competition and not on the basis of political subdivisions. Solid waste management cannot be low cost without maximum salvaging and recycling. Control of the process so that the salvaged material meets the specification required for reuse must be included as part of the whole process. Finally, government's role in this endeavor should be that of protector of public health. However, government's role should not extend to the use of public funds for the operation of an enterprise requiring large capital investments, continuing research and development and marketing of end products. (Galwardi-Texas)
W72-11108

LIQUID WASTE DISPOSAL FROM A SLAUGHTER HOUSE,
Dutterer's of Manchester, Md.
E. S. Hopkins, and G. M. Dutterer.
Water and Sewage Works, Vol 117, No. 7, July-August 1970, p IW/2-IW/3, 1 fig, 1 tab.

Descriptors: *Industrial wastes, *Waste water treatment, *Treatment facilities, *Equipment, Performance, Biochemical oxygen demand, Hydrogen ion concentration, Oxidation lagoons, Flotation, Suspended solids, *Waste water disposal.
Identifiers: *Slaughter house wastes, Grease removal, Mechanical surface aeration, Equalization tank, Alum, Chemical treatment.

An automated 30,000 gallon per day, wastewater treatment plant was designed for a slaughter house waste. Analysis of the waste disclosed a BOD5 of 1700 mg/l; suspended solids, 1090 mg/l; grease, 90 mg/l and a pH value of 6.6. A flow diagram of the plant was presented along with the names and capacity of the units utilized. The processes included an equalization tank, vibration screen for solids removal, solid grease removal, chemical addition and mixing, grease flotation unit, holding tank, oxidation basin and chlorine contact tank. Alum was used to break a water-fat emulsion. The plant has operated on an average discharge of about 23,500 gpd using an alum dosage of 26 mg/l. The average characteristics of the effluent were: pH of 6.4; dissolved oxygen, 8.1 mg/l; BOD5, 10.1 mg/l; free residual chlorine, 0.3 mg/l; and coliform organisms, 220 per 100 ml. The oxidation basin motors were energized by an interval time clock and all probe controlled equipment was operated by fixed water levels in the tanks. (Galwardi-Texas)
W72-11109

STORM-WATER RETENTION CAN WORK,
Detroit Metro Water Dept., Mich.
G. Remus.
The American City, Vol 85, No. 10, October 1970, p 68-69, 2 fig.

Descriptors: *Storm runoff, *Pollution abatement, *Sewers, Water pollution, *Monitoring, Remote sensing, Remote control, Rain gauges, Sewage treatment, Storage capacity, Computers, Flowmeters, Flow measurement, Flow control, *Michigan.
Identifiers: *Combined sewers, Interceptor sewers, *Detroit (Mich).

The Detroit Metro Water Department has installed a monitoring system that allows it to apply such pollution control techniques as storm flow anticipation, first flush interception, and selective overflowing. The system helps prevent massive storm water pollution of the Detroit and Rouge Rivers by allowing for storage of storm-water in the sewer system and subsequent treatment. During a 0.47 inch rainfall over the Detroit area approximately 450 million gallons entered the sewer system and the sewage treatment plant processed about 365 million gallons in excess of average flow during the following 30 hours. The $2.1 million project included 14 telemetering tipping bucket rain gauges, 80 Meta-Meter telemeter sewer-level gauges in combined sewers and 40 Meta-Meter telemeter gauges located in interceptor sewers. The sensors were connected to a central computer, datalogger and operating console that activate seven pumping stations and three sluice gates. (Galwardi-Texas)
W72-11110

WASTEWATER TREATMENT WITH POWDERED ACTIVATED CARBON REGENERATED BY WET AIR OXIDATION,
Zimpro, Inc., Rothschild, Wis.
P. V. Knopp, and W. B. Gitchel.
Proceedings, Industrial Waste Conference, 25th, May 7-9, 1970, p 687-698, 8 fig, 6 tab, 9 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Municipal wastes, Performance, Efficiencies, Chemical oxygen demand, Temperature, Pressure, *Oxidation, Heat exchangers, Cost comparisons, Activated sludge, Installation costs, Operating costs.
Identifiers: *Powdered activated carbon, Regeneration, Primary sewage, Wet oxidation.

The use of powdered activated carbon for removing soluble organics from wastewater has been limited by the need for an economic and effective regeneration system. Results showed that partial wet air oxidation can effectively restore the adsorptive properties of powdered activated carbon without dewatering of the slurry. Spent powered activated carbon from a two stage counter-current contact system treating primary effluent sewage was successfully regenerated. The spent carbon slurry at approximately 6 to 8 percent solids was pumped along with air through a heat exchanger to a reactor designed to operate at a preselected temperature and pressure. Under these conditions the sorbed organics were selectively burned off the carbon. The regenerated carbon was returned through the heat exchanger, releasing its heat to the incoming slurry, and was conveyed to a storage tank. After 22 regenerations of the carbon there was no apparent diminution in the performance of the carbon. The system was operated with a 4.7 percent carbon makeup rate. Product water produced at carbon loading of .34 g COD adsorbed per g carbon was less than 20 mg/l. Total annual costs were estimated for 1, 10 and 100 MGD capacity at 28.5, 13.2 and 12.1 cents per thousand gal. treated which are approximately equivalent to conventional activated sludge treatment costs. (Galwardi-Texas)
W72-11111

FIELD STUDIES OF ARTIFICIAL AERATION USING A DOWNFLOW TUBE CONTACTOR,
Tufts Univ., Medford, Mass.
For primary bibliographic entry see Field 05G.
W72-11112

AERATED LAGOON TREATMENT OF WASTES FROM THE DOW CHEMICAL COMPANY, ZIONSVILLE, INDIANA,
Dow Chemical Co., Zionsville, Ind.
G. W. Mann.
Proceedings, Industrial Waste Conference, 25th, May 7-9, 1970, p 543-550, 8 fig, 1 tab.

Descriptors: *Oxidation lagoons, *Industrial wastes, *Chemical wastes, Performance, Aeration, Equipment, Freezing, Weather, Biochemical oxygen demand, Chemical oxygen demand, Chlorination, *Indiana, *Wastewater treatment.
Identifiers: Dow Chemical Company, *Zionsville (Ind), Capacity, Problems, Surface aerators. Compressed air.

In 1963, Dow Chemical Company constructed a 7 million gallong capacity aerated lagoon for the treatment of wastes from its Zionsville, Indiana plant. The aerated lagoon was designed with an average depth of 5 ft. to receive 160,000 gpd of waste which would have a detention time of 45 to 50 days. Aeration was provided by four 10 hp air

compressors through 25,000 linear ft. of slotted 0.5 in. tubing positioned across the lagoon. Plugging of the plastic tubing and freezing conditioners presented problems in 1964-65 and the winter of 1965. The aeration problem was solved with the installation of 8 floating aerators during the period from March 1966 to June 1967. Each aerator was a 5 hp, impeller type unit with a pumping rate of 2,000 gpm and a circulation radius of 250 ft. Chlorination of the effluent was required in late 1967. The lagoon again froze over in the winter of 1967. No serious problems occurred during the last nine months of 1968 and an acceptable effluent was achieved. (Galwardi-Texas)
W72-11113

OPERATING CHARACTERISTICS OF STRONG-BASE ANION EXCHANGE REACTORS,
New Mexico State Univ., University Park.
W. S. Midkiff, and W. J. Weber, Jr.
Proceedings, Industrial Waste Conference, 25th, May 7-9, 1970, p 593-604, 12 fig, 1 tab, 7 ref.

Descriptors: *Ion exchange, *Nitrates, *Phosphates, Pollution abatement, Selectivity, Flow rates, Length, Performance, Efficiencies, Laboratory tests, Resins, Bicarbonates, Sulfates, *Waste water treatment.
Identifiers: Hydraulic loading, Bed depth, Reverse exchange, Reaction zone, Dowex 21K, Anion resin.

The ion exchange reactions between a strongly basic highly reactive, anion resin, Dowex 21K, and aqueous solution of 3 x 10-3 M HCO-3, 1 x 10-3 M SO4 2-, 2.5 x 10-4 M HPO4 2- and 5 x 10-4 M NO3- were investigated in continuous flow columnar contacting systems. For the polyatomic anions studied, selectivity was found to be proportional to charge but inversely proportional to ionic radius that is, SO4 2-> HPO4 2-> NO3-> HCO3-. Results from hydraulic loading studies indicated that no significant difference in the breakthrough profiles can be attributed to changing flow rate in the range between 6.5 gpm/sq. ft. and 59 gpm/sq. ft. The effect of bed depth on ion exchange performance was also studied. Bed depths of 7, 14, 28, 56, and 84 cm were used. When the length of the column was less than the length of the reaction zone, leakage was immediate. The length of the reaction zone was defined as the region between five percent and 95 percent breakthrough. In very shallow resin beds, the phenomenon of reverse exchange increased in magnitude with increasing bed depth. Both reverse exchange and length of reaction zone appeared to stabilize in bed depths in excess of 75 cm. The depth of the resin bed, not the contact time, determined the efficiency of operation. The deeper the bed, the smaller the percentage occupied by the reaction zone, and the higher the percentage of the bed available for complete exhaustion prior to initiation of breakthrough. (Galwardi-Texas)
W72-11114

CONTINUOUS BREAKING OF EMULSIONS BY COALESCENCE ON SUPPORTED LIQUID FILMS,
Case Western Reserve Univ., Cleveland, Ohio. Div. of Chemical Engineering Science.
R. E. Sparks, and I. D. Stafford.
Proceedings, Industrial Waste Conference, 25th, May 7-9, 1970, p 745-756, 8 fig, 3 tab, 41 ref.

Descriptors: *Industrial wastes, *Emulsions, *Coalescence, Thin films, Laboratory tests, Test procedures, Performances, Flow rates, Materials, Viscosity, Wetting, Wettability, Viscous flow, *Wastes water treatment.
Identifiers: *Polyethylene cubes, Continuous operation, Roughness, Hexane, Glycol, Glycerine, Field studies.

An effective process for the continuous breaking of emulsions by coalescence on supported liquid films was developed. Rough sawed polethylene pieces approximately 1/4 in x 1/4 in x 1/2 in were found to give the best results. Wetting angles of smooth surfaces and liquid-liquid-solid contact angles for various substances and materials were reported. The effect of roughness of the material surface was investigated. For polyethylene, it was apparent that a 30 to 50 micron roughness was sufficient to obtain the desired effect. Some of the emulsions tested were: hexane in glycol, Bright Stock in water, and hexane in 81 percent glycerine. A LARGE SCALE TEST OF THE TECHNIQUE WAS SUCCESSFULLY CONDUCTED. The task involved removing a few percent of a low molecular weight organic material from a viscous aqueous stream. Polyethylene cubes were used on a 40,000 gal/day stream, operating at a fluid velocity of 0.5 cm/sec. Major advantages and some difficulties associated with the process were outlined. (Galwardi-Texas)
W72-11115

RECLAMATION AND WATER MANAGEMENT (MELIORATSIYA I VODNOYE KHOZYAYSTVO).
Ministerstvo Melioratsii i Vodnogo Khozyaistva Ukrainskoi, Kiev (USSR).

Melioratsiya i Vodnoye Khozyaystvo, No 17, Izdatel'stvo 'Urozhay', Alpat'yev, S. M., editor, Kiev, 1971. 172 p.

Descriptors: *Land reclamation, *Water management (Applied), *Hydraulic engineering, Hydraulics, Hydraulic design, Irrigation, Irrigation systems, Drainage, Drainage systems, Hydrogeology, Economics, Soils, Soil properties, Groundwater, Fertilizers, Crops, Crop production, Analytical techniques, Instrumentation, Computers.
Identifiers: USSR, *Ukraine, *Agrochemistry, Sod-Podzolic soils, Superphosphates, Top-dressing, Pot tests.

This collection contains 22 papers dealing with various aspects of irrigation, drainage, hydrogeology, hydraulic engineering, and economics of water projects in the Ukrainian SSR. Specific topics include: (1) irrigation with waste waters and fertilizers and their effect on quality of winter wheat; (2) sprinkler irrigation in areas with steep slopes; (3) drainage and its effect on oxidizing-reducing regime of soil of rice fields; (4) changes in properties of wet and excessively wet soils; (5) vapor diffusion in dessicated soils; (6) changes in nitrogen regime of Peat soil as a function of groundwater depth; (7) effectiveness of land reclamation and crop cultivation on saline calcareous Peat soils; (8) maximum water discharges in drained areas; (9) use of computers to calculate water distribution; (10) hydraulics of porous pipes; (11) flume designs for irrigation systems; and (12) techniques and instruments for determination of infiltration losses. (See W72-11121 thru W72-11126) (Josefson-USGS)
W72-11120

EFFECTS OF FERTILIZERS AND WASTE WATERS OF THE BORTNICHI IRRIGATION SYSTEM ON QUALITY OF WINTER WHEAT (VLIYANIYE UDOBRENIY I STOCHNYKH VOD BORTNICHSKOY OROSITEL'NOY SISTEMY NA KACHESTVO ZERNA OZIMOY PSHENITSY),
Ukrainskii Nauchno-Issledovatelskii Institut Fisiologii Rastenii, Kiev (USSR).
M. V. Kozinets, and O. P. Opanasenko.
In: Melioratsiya i Vodnoye Khozyaystvo, No 17, p 3-9, Izdatel'stvo 'Urozhay', Kiev, 1971. 3 tab, 4 ref.

Descriptors: *Return flow, *Fertilizers, *Wheat, *Grains (Crops), *Irrigation systems, Sprinkler irrigation, Irrigation practices, Inorganic compounds, Nitrogen compounds, Phosphorus compounds, Potassium compounds, Salts, Salinity, Precipitation (Atmospheric), Crop production, Crop response, Water analysis, Podzols.
Identifiers: USSR, *Ukraine, Kiev Oblast, Top-dressing.

Winter wheat in the vicinity of the Bortnichi irrigation system in the Borispol' Rayon of Kiev Oblast annually covers over 4,000 ha or about 20% of the entire cropland. Application of waste waters and fertilizers to coarse loam Podzolic soil during the 1968 dry season increased winter wheat yield from 38.2 cntr/ha to 64.7 cntr/ha, weight of 1,000 grains of wheat from 40.1 g to 44.0 g, and protein content from 10.7% to 12.2%. Application of large amounts of N120P90K90 to soils after leveling of land in 1969 more than doubled the wheat yield obtained from unfertilized plots and improved the nutritional and marketable qualities of the grain. (See also W72-11120) (Josefson-USGS)
W72-11121

EFFECTS OF WETTING ON DENSITY AND WATER PERMEABILITY OF FINE-TEXTURED SOILS (VLIYANIYE STEPENI UVLAZHNENIYA NA PLOTNOST' I VODOPRONITSAYEMOST' TYAZHELYKH POCHV),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11122

LABORATORY DETERMINATION OF THE VAPOR DIFFUSION COEFFICIENT IN DESSICATED SOIL (LABORATORNYY OPYT PO OPREDELENIYU KOEFFITSIYENTA DIFFUZII PARA V ISSUSHENNOY POCHVE),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11123

CHANGES IN NITROGEN REGIME OF PEAT SOIL AS A FUNCTION OF GROUNDWATER DEPTH (IZMENENIYE AZOTNOGO REZHIMA TORFYANOY POCHVY V ZAVISIMOSTI OT UROVNYA GRUNTOVYKH VOD),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11124

EFFECTS OF WETTING ON NITROGEN REGIME OF OLD-PLOWED PEAT SOIL, BASED ON POT TESTS (VLIYANIYE STEPENI UVLAZHNENIYA NA AZOTNYY REZHIM STAROPAKHOTNOY TORFYANOY POCHVY (PO DANNYM VEGETATSIONNOGO OPYTA)),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11125

METHODS FOR EFFECTIVE RECLAMATION OF SALINE CALCAREOUS PEAT SOILS IN THE UKRAINE (PRIYEMY EFFEKTIVNOGO OSVOYENIYA ZASOLENNYKH KARBONATNYKH TORFYANYKH POCHV USSR),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 02G.
W72-11126

APPARATUS FOR COLLECTING WASTE FROM THE SURFACE OF A BODY OF WATER,
For primary bibliographic entry see Field 05G.
W72-11135

METHOD FOR REMOVING PHOSPHATE FROM WASTE WATER,
Calgon Corp., Pittsburgh, Pa. (assignee).
H. G. Flock, Jr., and E. G. Rausch.
U. S. Patent No. 3,655,552, 4 p, 4 tab, 7 ref; Official Gazette of the United States Patent Office Vol. 897, No. 2, p 611, April 11, 1972.

Descriptors: *Patents, *Waste water treatment, *Phosphates, *Nutrient removal, Water pollution, Water pollution treatment, Water treatment, Water quality, Pollution abatement, Separation techniques, Municipal wastes, Industrial wastes.

The first step consists of forming an aqueous blend of a water-soluble, high molecular weight polymer consisting of nonionic polyacrylamide containing not more than about 3 per cent carboxyl groups and a water-soluble iron containing salt. The water is then treated with 0.5 to 3.0 parts per million of the liquid blend for every 1 part per million of dissolved phosphate present. Experimental data are given in support of the claims presented. (Sinha-OEIS)
W72-11138

UNDERWATER STORAGE SYSTEM,
Underwater Storage, Inc., Washington, D.C. (assignee).
H. G. Quase.
U. S. Patent No. 3,655,051, 4 p, 11 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 2, p 500, April 11, 1972.

Descriptors: *Patents, Water pollution, *Sewage systems, Waste storage, Pollution abatement, Separation techniques.
Identifiers: *Underwater storage tanks.

Automatic systems are provided for the storage of sewage waste during peak periods. The storage is in large felxible walled tanks having flat rectangular bottoms with horizontal oriented inlets and outlets. When the peak systems have passed the stored sewage automatically enters the treatment system. (Sinha-OEIS)
W72-11140

MEANS FOR AUTOMATICALLY OPERATING SEWAGE TREATMENT UNITS,
R. L. Fifer.
U. S. Patent No. 3,655,050, 3 p, 3 fig, 1 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 2, p 500, April 11, 1972.

Descriptors: *Patents, *Sewage treatment, *Activated sludge, Pollution abatement, *Waste water treatment, Separation techniques, *Aerobic treatment.

This invention provides means for automatically operating the sewage treatment units described in U.S. Pat. Nos. 3,476,250 and 3,460,677 which are incorporated in this patent by reference. Air for aerobic treatment is admitted to the aeration tank. After an aeration period the air inlet valve is activated to close the air diffuser conduit device and to open the conduit connected with the upper communication zone. During the second timed cycle, after a settling period the effluent outlet valve is opened, and the aeration tank vent valve is closed. This forces air into the upper portion of the tank above the liquid in the aeration chamber to drive the liquid into the effluent outlet. A chemical injector is connected to the purification tank. When the effluent enters the purification tank the purifying chemical is automatically injected. (Sinha-OEIS)
W72-11141

METHOD AND APPARATUS FOR TREATING AND DISPOSING OF SEWAGE,
N. F. Pergola.
U. S. Patent No. 3,655, 048, 4 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 2, p 499, April 11, 1972.

Descriptors: *Patents, *Sewage treatment, *Sewage disposal, Pollution abatement, Separation techniques, *Waste water treatment, Water pollution, Ships, Sea water, *Aeration, *Domestic wastes, Bacteria.

Liquid sewage separated from solid sewage is placed in a collection reservoir. The solid sewage is passed onto a filtration conveyor where the carry over liquid is filtered into a filtration reservoir and the solids transported to an incinerator. The filtered liquid is recirculated to the collection reservoir. Diffusion devices introduce air into the reservoir where suspended solids are forced to the surface and passed over a weir on to a filtration conveyor where the separation process is repeated. After recirculation the liquid passes through baffles into an effluent reservoir where it is treated to reduce the bacteria count. (Sinha-OEIS)
W72-11142

PROCESS FOR THE PURIFICATION OF WASTE WATER,
Corodex (N.V.), Zandvoort (Netherlands). (assignee).
M. Adegeest.
U. S. Patent No. 3,655,047, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 2, p 499, April 11, 1972.

Descriptors: *Patents, Waste water, *Waste water treatment, *Resins, *Phenols, Organic compounds, *Chemical wastes, *Industrial wastes, Pollution abatement, Water pollution, Water pollution treatment, Separation techniques, Water purification.
Identifiers: *Formaldehyde resins.

The molar ratio of phenol: formaldehyde is altered by adding phenol so that the formaldehyde will be bound by the phenol. The ratio is changed from 1:4.18 to from 1:1.02 to 1:1.12. As a result a thin, liquid resin mixture will be separated off and formation of a viscous product is avoided. Hydrogen chloride is added to maintain normality between 0.015 and 0.10 N. The fluid is heated at plus or minus 80 - 85 degrees C for 30 hours or several days so that volatile compounds will escape. The remaining liquid is heated to at least 5 degrees below the boiling point so as to evaporate the water and thus separate it from residual unwanted substances. (Sinha-OEIS)
W72-11143

MUNICIPAL WASTE DISPOSAL,
Fermbionics, Inc., Joplin, Mo. (assignee).
H. B. Trussell.
U. S. Patent No. 3,655,046, 3 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 2, p 499, April 11, 1972.

Descriptors: *Patents, *Municipal wastes, Separation techniques, Aeration, Waste disposal, *Sewage treatment, *Waste water treatment, Garbage, *Sewage disposal, Livestock, Bacteria, Water purification.

The garbage portion of the waste is pressed into a filter matrix against the surface of a screen-type conveyor belt. As the belt is moved, sewage is poured onto the matrix and the solids are carried away to be mixed with additional garbage. The liquid which passes through the filter is purified in a normal manner. The mixture of garbage and sewage solids is pasteurized and sent to a digester where bacteria speed dissolution of solids. The digested product may be fed to livestock in liquid, meal, or in pellet form. (Sinha-OEIS)
W72-11144

RADIATION TREATMENT OF MINE WASTE WATERS,
Atomic Energy Commission, Washington, D.C. (assignee).
M. Steinberg, and J. Pruzansky.
U. S. Patent No. 3,537,966, 2 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol. 880, No. 1, p 216, November 3, 1970.

Descriptors: *Patents, Waste water treatment, Pollution abatement, Treatment, *Acid mine water, Mine wastes, *Iron oxides, *Radiation, Irradiation, Ionization, Industrial wastes.

The process for treating acidic mine waters containing ferrous iron compounds consists of exposing the acidic solution to an ionizing irradiation field at an intensity of at least 1000 rads per hour while aerating it until the ferrous iron compounds are converted to ferric iron compounds. Calcium carbonate is used to precipitate ferric oxide out of solution. (Sinha-OEIS)
W72-11145

TREATMENT OF WASTE EFFLUENTS,
J. F. Gustafson.
U. S. Patent No. 3,537,655, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 880, No. 1, p 144, November 3, 1970.

Descriptors: *Patents, *Waste water treatment, *Fractionation, *Sewage treatment, *Ultrasonics, *Vibrations, Bacteria.

The effluent is divided by physical treatment (grinding then fractionating) and then partially sterilized by ultrasonic vibratory energy. The frequency at which the particular ultrasonic generator operates may be selected from a wide range extending into the megacycle band. Frequencies of the order of 20,000 cycles per second have been found effective to sterilize and fractionate the effluent. The spores of bacteria are usually sterilized in about 2 to 4 minutes. Some bacteria may require as much as 10 to 15 minutes exposure. (Sinha-OEIS)
W72-11146

APPARATUS FOR REMOVING SOLIDS FROM LIQUID SUSPENSIONS THEREOF,
Dryden Paper Co. Ltd. (Ontario).
E. G. MacDonald, and Per R. Berg-Johannessen.
U. S. Patent No. 3,537,584, 4 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 880, No. 1, p 128, November 3, 1970.

Descriptors: *Patents, *Pulp, *Bark, *Screens, *Waste water treatment, Pollution abatement, Equipment.

This invention uses a travelling screen onto which a suspension under treatment is fed for drainage. The screen consists of an endless belt of perforated plate of uniform thickness having continuous inner and outer surfaces. The apparatus also includes means for recirculating a portion of the filtrate and means for effectively cleaning the belt during its return path of movement. (Sinha-OEIS)
W72-11147

APPARATUS FOR PURIFYING WASTE WATERS,
Menzel and Co. (Germany). (assignee).
G. Waehner, and J. Zink.
U. S. Patent No. 3,537, 583, 2 p, 5 fig; Official Gazette of the United States Patent Office, Vol. 880, No. 1, p 127, November 3, 1970.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Aeration, Pollution abatement, Water pollution, Water pollution treatment.

The apparatus includes an aerating tank and a post settling tank linked with it. The aerating tank is connected through at least one conduit with an aerating blower. The run-off trough from the post settling tank is connected to a tank for thickening or concentrating the sediment or sludge. This device differs from others in having an automatic return of the water from the thickening tank into the aerating tank. The water which ascends in the thickening tank continuously runs off by itself while closed side of the discharge passage will assure that floating sediments will be retained within the space confined by the discharge passage. (Sinha-OEIS)
W72-11148

INCREASING PERMEABILITY OF REVERSE OSMOSIS MEMBRANES,
Canadian Patents and Development Limited, Canada (assignee).
For primary bibliographic entry see Field 03A.
W72-11150

SETTLING TANKS,
City of Detroit, Mich.
G. E. Hubbell.
U. S. Patent No 3,534,861, 3 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 879, No 3, p 790, October 20, 1970.

Descriptors: *Patents, Equipment, *Sewage treatment, *Activated sludge, *Waste water treatment, Pollution abatement, Separation techniques, Water treatment, Water pollution, Water pollution treatment.
Identifiers: Settling tanks.

The settling tank includes a continuous influent chamber which extends around the tank at the base of the wall structure. Discharge from the influent chamber is accomplished via alternately arranged longer and shorter discharge pipes which should assure uniform distribution of the influent throughout the tank. The influent flows along the bottom of the tank to assure rapid settling of solids. (Sinha-OEIS)
W72-11153

EXPANDABLE AEROTOR PLANTS FOR TREATMENT OF SEWAGE AND INDUSTRIAL WASTES,
Lakeside Equipment Corp., Bartlett, Ill. (assignee).
W. L. Berk.
U. S. Patent No 3,534,857, 4 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office Vol 879, No 3, p 789, October 20, 1970.

Descriptors: *Waste water treatment, *Patents, *Sewage treatment, *Industrial wastes, *Liquid wastes, *Aeration, Separation techniques, Equipment, Pollution abatement, Water purification, Water pollution treatment, *Rotors.
Identifiers: *Aerotors.

Tanks forming the various chambers are concentrically arranged around a central clarifying chamber. The waste flows from chamber to chamber. The invention provides for the vertical adjustment of the effluent weir in the final tank and also for the vertical adjustment of the cage rotor in the aeration chamber. A rotor mechanically agitates the liquid and keeps it flowing around the chamber. It can be vertically positioned so as to conform to the various levels of the liquid in the purification unit. The water level in the various chambers throughout the apparatus can be adjusted to meet load capacities now and in the future when increased capacity may be required. (Sinha-OEIS)
W72-11156

SEWAGE TREATMENT STRUCTURE,
FMC Corp., San Jose, Calif.
Q. L. Hampton.
U. S. Patent No 3,526,591, 3 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 878, No 1, p 152, September 1, 1970.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, Equipment, *Waste water treatment.
Identifiers: *Air lift.

This invention provides an improved trolley structure for supporting a traveling air lift upon a beam so that side to side movement is eliminated. An improved scum skimming mechanism travels with the air lift structure. Stirring devices are associated with the squeegees that scrape the inclined portions of the bottom wall of the tank. (Sinha-OEIS)
W72-11157

LIQUID WASTE TREATMENT APPARATUS,
J. M. Valdespino.
U. S. Patent No 3,659,714, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office Vol 898, No 1, p 117, May 2, 1972.

Descriptors: *Patents, *Liquid wastes, *Waste treatment, Equipment, *Waste water treatment, Sewage treatment, Pollution abatement, Separation techniques.

The apparatus comprises a rotatable filter drum with perforated walls along its periphery. The drum acts as a centrifuge when rotated. Rotation will force the liquid through the filter material. An electrical arc or torch is placed in the drum to burn solids. A vacuum may be provided for vacuuming the burned ash. A fixed nozzle issuing compressed air at a fixed point can be used to blow burned solids into a special container. (Sinha-OEIS)
W72-11159

CHEMICAL COAGULATION OF CARBON TREATED WASTE WATER,
Westvaco Corp., New York.
C. H. Huether.
U. S. Patent No 3,658,697, 5 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1366, April 25, 1972.

Descriptors: *Patents, Pollution abatement, *Activated carbon, anaerobic conditions, *Hydrogen sulfide, *Flocculation, *Biological treatment, *Sewage treatment, *Waste water treatment, Biochemical oxygen demand.

Sewage is treated by first removing a portion of the suspended solids from the raw sewage then passing the effluent through at least one bed of activated carbon. A chemical agent is used to induce flocculation. The supernatant liquid is then separated from the flocculant. Hydrogen sulfide is removed during flocculation. At least 75 parts per million of a water soluble iron salt is used to precipitate the dissolved hydrogen sulfide and at least 0.06 parts per million of an anionic polyelectrolyte flocculant to coagulate the precipitate. (Sinha-OEIS)
W72-11161

SEDIMENTATION SYSTEM,
Aktiebolaget Purac (Sweden).
For primary bibliographic entry see Field 05F.
W72-11165

OXYGENATION-OZONATION OF BOD-CONTAINING WATER,
Union Carbide Corp., New York.
J. R. McWhirter, and E. K. Robinson.
U. S. Patent No 3,660,277, 9 p, 4 fig, 1 tab, 16 ref; Official Gazette of the United States Patent Office, Vol 898, No 1, p 243, May 2, 1972.

Descriptors: *Patents, *Oxygenation, *Activated sludge, *Biochemical oxygen demand, Ozone, Pollution abatement, Treatment, Water treatment, Water pollution, Water pollution treatment, Biological treatment, *Bacteria, Aeration, Equipment, *Waste water treatment.
Identifiers: *Ozonation.

A system is provided for using both ozone and oxygen for the disinfection and DO-enrichment of effluent. The activated sludge step for the treatment of BOD-containing waste water uses oxygen-rich gas for aeration and delivers an effluent which is low in BOD, yet contains substantial quantities of bacteria potentially injurious to health. The effluent is then contacted with an ozone-oxygen gas mixture in a contactor. The O3 content is depleted and a spent gas containing at least 60 per cent oxygen is withdrawn. The oxygen is then used for aeration. The effluent is disinfected and is fortified with dissolved oxygen. (Sinha-OEIS)
W72-11167

PROCESS FOR PREPARING SPECIALLY ACTIVATED SLUDGE,
A. Mimura, T. Kawano, and K. Yamaga.
U. S. Patent No 3,660,278, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol 898, No 1, p 243, May 2, 1972.

Descriptors: *Patents, *Activated sludge, *Biological treatment, *Waste water treatment, Pollution abatement, Separation techniques, *Microorganisms, Domestic wastes, Industrial wastes, Liquid wastes, Aerobic conditions, *Chemical wastes, Sewage bacteria, Bacteria, *Poisons.

This invention presents seven examples illustrating methods of preparation of an activated sludge capable of being used in the biological treatment of waste waters containing poisonous substances. Cells of specific microorganisms are combined with an activated sludge in a short period of time. Among the poisons to be dealt with are: hydrogen cyanide, nitrite compounds, phenols, aldehydes, and petroleum. (Sinha-OEIS)
W72-11168

METHOD FOR WATER AND WASTEWATER TREATMENT,
T. R. Camp.
U. S. Patent No. 3,660,284, 6 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 898, No. 1, p. 245, May 2, 1972.

Descriptors: *Patents, Water quality, *Water treatment, *Waste water treatment, *Flocculation, Chemical reactions, Filtration, Water purification.
Identifiers: *Alum, *Ferric sulfate, Ferric chloride.

This invention claims increasing efficiency by mixing the water or wastewater with a floc forming chemical. The mixing is at a speed effecting a mean velocity gradient corresponding to a flow volume concentration less than 300 parts per million until flocculation is substantially complete. The liquid may be passed through a rapid filter or enter a second mixing stage at a lesser speed effecting a velocity gradient corresponding to a selected effluent floc volume concentration greater than 300 parts per million before passing on to subsequent treatment such as settling and filtering. (Sinha-OEIS)
W72-11169

SEWAGE TREATMENT PROCESS AND APPARATUS,
Pall Corp., Glen Cove, N.Y. (assignee).
M. E. Gilwood.
U. S. Patent No. 3,535,234, 7 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office Vol. 879, No. 3, p. 874, October 20, 1970.

Descriptors: *Patents, *Sewage treatment, Equipment, Treatment, *Wastewater treatment, Pollution abatement, Separation techniques, Water pollution, Water pollution treatment, *Activated sludge, *Aeration, Sedimentation, Vessels, Ships, Boats, Microorganisms, Biochemical oxygen demand.

This invention comprises equipment for comminuting influent sewage so as to reduce the solid particles to a size that can be digested in a heated aeration zone. The temperature is held within the range of from about 35 degrees C to about 55 degrees C to promote the growth of microorganisms therein and reduce the BOD of the mixture. Then by sedimentating out the suspended microorganisms from the mixture in the form of sludge, a clarified effluent remains. The clarified effluent is removed from the sedimentation zone and is disinfected. (Sinha-OEIS)
W72-11170

WASTE TREATMENT PROJECT IN SPENCER, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Kansas City, Mo.

Available from the National Technical Information Service as PB-203 316-D, $3.00 in paper copy, $0.95 in microfiche. October 4, 1971. 21 p, 4 fig, 2 tab.

Descriptors: *Iowa, *Environmental effects, *Sewage treatment, *Waste treatment, Anaerobic digestion, Aerobic treatment, Sewage lagoons, Trickling filters, Water pollution sources, Water pollution, Interceptor sewers, Storm drains, Disposal, Oxidation lagoons, Sewage effluents, Odor, Discharge (Water), Groundwater, Insect control, Vectors (Biological).
Identifiers: *Environmental Impact Statements.

The project will involve the construction of a waste treatment plant for Spencer, Iowa. The plant will accomodate waste from a packing house and a portion of the domestic population. It will consist of an anaerobic-aerated lagoon system, intercepting sewer, new pumping stations and force main, and odor treatment facilities. Treated effluent from the plant will discharge at a rate of 1.9. mgd. Environmental impacts include elimination of the current severe odor problem, reduction of overflows of sanitary wastes in the current intercepting sewer, reduction of organic discharges into the river, a higher BOD reduction, reduction of raw sewage discharge intothe river, and reduction of overflow bypassing. Adverse impacts include loss of 130 acres of farm land, temporary odor around the treatment plant, possible ground water contamination from the treatment plant, possible high nitrogen discharges, and odor and insect control problems due to the closeness of the plant to residential areas. Alternatives include expansion of existing facilities, stream reaeration, holding tanks and pretreatment of industrial wastes, and alternate sites. (Grant-Florida)
W72-11195

SEWAGE TREATMENT PROCESS,
Walco Chemical Co., Chicago, Ill.
F. N. Kemmer, R. S. Robertson, and R. Mattix.
U.S. Patent No. 3,637,487, 4 p, 1 fig, 4 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 894, No 4, p 1478, January 25, 1972.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, *Activated sludge, *Aeration, *Waste water treatment, Sludge, Water pollution, Water pollution treatment, Separation techniques.

An improve method for handling and treating sewage sludge is provided. A portion of the sludge is converted into an active substance which is thereafter used as an aid to improve the quality of waste effluent water. Heat treatment in the presence of a conditioning agent produces the active substance. Conditioning agents can consist of any organic or inorganic compounds that are acidic and produce acidic byproducts. The dosage should be from 0.1-50 per cent by weight based on the dry weight of the sludges. Experimental test data are tabulated. (Sinha-OEIS)
W72-11270

CONTINUOUS MICROBIOLOGICAL PURIFICATION OF WASTE-WATER FROM PAPER AND WALLBOARD INDUSTRIES,
Lund Inst. of Tech. (Sweden).
I. H. Sanick, and G. Sjostrom.
Acta Polytec Scand. Vol 86, p 3-30. 1969. Illus.
Identifiers: *Pulp wastes, Birch D, Coniophora cerebella, Industrial wastes, Microbiolgoy, Pine G, Water purification, Sclerotia, Turbidity, Ultrasound, *Waste water treatment.

The fast growing strain, Coniophora cerebella, called 'G' and isolated by ultrasound treatment of a suspension of the original strain, is tolerant to extreme environmental conditions. After more than 4 yr the 'G'-strain has not shown any tendency to degenerate in the presence of other soil microorganisms. The sclerotia formed quicker than with the original strain. The sclerotium was investigated by microphotography of frozen sections. It was found that the C. cerebella G grows twice as fast on cross cuts of pine as on cross cuts of common birch. In purification tests of wastewater in a pilot plant the pH rose from 3.8 to 5.9 and from 4.25 to 6.60 after a flow distance of 72 m over the bed. The BOD (biological oxidation demand) of waste-water after purification and correction for water evaporation dropped from 2150 mg/l to 234 mg/l after a flow distance of 104 m over the bed. The corresponding drop in COD (chemical oxidation demand) was from 5590 mg/l to 517 mg/l. The percentage of suspended fibres (turbidity) in waste-water after flowing a distance of 72 m over the bed dropped to 47 and to 33.3% of the original.--Copyright 1972, Biological Abstracts, Inc.
W72-11289

BREWERY EFFLUENT CONTROL, COMMENTS ON POLLUTION AND ITS ABATEMENT,
Kappele, Wright MacLeod Ltd., Toronto (Ontario).
W. Porter.
Wallerstein Lab Commun. Vol 34, No 114, p 125-143, 1971.
Identifiers: *Pollution abatement, *Brewery effluents, Canada, Water pollution control, Waste water disposal, Regulation, Effluents.

The characteristics of industrial wastes are described and discussed against the background of the need to conserve water and to meet waste disposal regulations in force in many communities of Canada and USA. Liquid brewery effluents can be classified as clear water wastes, organic wastes exhibiting a biochemical oxygen demand (BOD) and liquids containing inorganic suspended solids. The origins of such wastes in a hypothetical 500,000 barrel/yr brewery are traced, the treatment demands are listed and measures that can be taken to decrease water usage and BOD load of effluents are indicated. Eighteen of the more common tests for characterizing brewery effluents are given, accompanied by statements of reasons for making the test, sampling points and analysis and interpretation of results. A typical municipal by-law outlining sewage requirements is presented in an appendix.--Copyright 1972, Biological Abstracts, Inc.
W72-11308

THE SEPARATION OF IONIC AND ORGANIC MERCURY FROM WATER USING MILK PROTEINS, XANTHATES AND KERATIN,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Chemical Engineering.
J. A. Gideon.
M. S. Thesis, November 1971, 89 p, 4 fig, 7 tab, 74 ref. OWRR A-044-VA (1).

Descriptors: *Separation techniques, Mercury, *Water purification, Proteins, Waste water treatment.
Identifiers: *Milk protein, *Xanthates, *Keratin, *Mercury separation.

The interactions and removal of divalent mercury, monemethyl mercury and dimethyl mercury from water solutions with milk proteins, xanthates, and structural proteins have been investigated. Milk proteins, including lactalbumin, casein, whey and whole milk were tested in concentrations of one part protein per 500 parts water. Once filtered, these proteins removed up to 90% of divalent mercury from 10 ppm solutions, up to 80% of methyl mercury from a 6.5 ppm solutions and about 50% of dimethyl mercury from limited tests at 10 ppm (mercury concentrations expressed as Hg++). Using one part of sodium isopropyl xanthate per 2200 parts of solution followed by hexane extraction, removals of 98% (2 hexane washes) of divalent mercury from 10 ppm solutions and 95% removal of methyl mercury were achieved. The xanthates are commercially used as reagents in ore flotation, and removal by flotation would probably be more desirable in a practical waste treatment process using xanthates. Unusually good mercury removals were achieved using a sulfur containing structural protein, keratin (hair). Degreased human hair from a local barbershop achieved an 83% removal of divalent mercury from a 10 ppm solution using one part hair per 500 parts solution. When the solution was well agitated, one part of this hair per 500 parts solution removed 98% of the mercury from solutions containing 10 ppm. Removal was similar for monomethyl mercury and about 50% for dimethyl mercury. The use of these complexing agents for the removal of mercury from waste water is encouraging and likely similar removals would be expected for other trace metals.
W72-11317

POSSIBLE COMBINED USE OF INDUSTRIAL AND DOMESTIC SEWAGE AT AN ORE-ENRICHMENT COMBINE,
Gosudarstvennyi Meditsinskii Institut, Orenburg (USSR).
L. E. Olifson, E. N. Baltenko, O. V. Bukharin, V. N. Pozhar, and G. L. Turovets.
Gig Sanit. Vol 35, No 12, p 92-94. 1970.
Identifiers: Disinfection, Domestic wastes, Industrial wastes, Ore, Sewage disposal, Sewage treatment, *Waste water treatment, *Water reuse.

Clarified and disinfected (Chlorinated) domestic sewage may be safely used in the flotation cycle of an ore enrichment operation if it is first mixed in a ratio of 1:10 with acid (pH 2) or alkali (pH 11.0-13.5) process waters and allowed to stand for 2 days. If effected at the Gaysk Ore-Enrichment Combine, such a procedure would make use of 13,000 cu m of sewage daily.--Copyright 1972, Biological Abstracts, Inc.
W72-11343

REGIONAL SEWERAGE PLAN FOR AN 11,000--SQUARE-MILE AREA,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-11476

PAC-PCT PROCESS FOR WASTEWATER TREATMENT,
Envirotech Corp., Palo Alto, Cal.
G. L. Shell, and D. E. Burns.
Public Works, Vol 103, No 2, p 71-73, February 1972. 4 photo, 1 fig.

Descriptors: *Waste water treatment, *Research and development, *Feasibility studies, *Economics, *Municipal wastes, Effluents, Automation, Water quality control, Efficiencies.
Identifiers: *Physical chemical treatment (PCT), *Powdered activated carbon (PAC).

The Sanitary Research and Development Department of Envirotech Corporation is engaged in a comprehensive applied research study demonstrating the effectiveness and economics of treating municipal waste water by a variation of physical-chemical treatment (PCT), using powdered activated carbon (PAC) as a primary step in removal of organics. The processes which are being evaluated are: chemical precipitation of phosphorous compounds, coagulation-flocculation of suspended solids and gravity sedimentation in a solids-contact unit, the use of PAC in solids-contact treatment units for removal of soluble organic compounds, and a granular media filter to achieve final suspended solids removal. Physical-chemical treatment of waste water is basically a non-biological process involving liquid-solids separation, removal of organics and solids destruction. The advantages of this process over conventional biological methods are: (1) significantly reduced

land area is required, (2) treatment efficiency is not lost when biologically toxic wastes or high-strength wastes are encountered, (3) the ability to produce a high quality effluent, and (4) the possibility of increased automation with the PCT processes. (Strachan-Chicago)
W72-11479

MUNICIPAL WASTEWATER RECLAMATION,
Corps of Engineers, Stuttgart (West Germany). European Command.
W. B. Willard, Jr.
The Military Engineer, Vol 64, No 418, p 101-104, March-April 1972.

Descriptors: *Municipal water, *Reclaimed water, *Water reuse, *Water supply, *City planning, Recreation, Irrigation, Economics, Water quality control, Management, Administration.
Identifiers: *Metropolitan water resources management, Federal Water Quality Administration (FWQA).

Examples of water reuse are given. At Santee, California, waste water has been used for recreational purposes. Five bodies of water composed of reclaimed sewage were constructed in 1959. To delay eutrophication of Lake Tahoe new methods for waste water reclamation have been devised. The basic concept consists of collection of all waste water from individual and community systems within the Tahoe Basin, treatment to meet bacteriological standards for drinking water, and exportation for irrigation and recreation. It is a great economic saving to use reclaimed water in industry, but the conversion of waste water into high quality drinking water offers the greatest challenge. Groundwater recharge using municipal waste water is another means of water reuse. Waste water can be converted to potable water through the use of microorganisms. Direct cycle water reuse for municipal water supplies could come into existence by the end of this century, but only if the economics of the situation favor its use over some other method. Under the Advanced Water Treatment Research Program of the Federal Water Quality Administration (FWQA), processes have been developed and are available for the production of potable water, but some degree of overdesign must be incorporated until further full-scale testing and improvements in design, materials, and equipment are completed. It is believed that treated waste water will gain widespread acceptance as a true water source, and that the quality of the effluent will not be measured in the future by percent reduction, but will be based on more practical absolute values. (Strachan-Chicago)
W72-11483

SOLVING THE COMBINED SEWER OVERFLOW PROBLEM OF A MAJOR CITY,
Weston (Roy F.), Inc., Westchester, Pa.
For primary bibliographic entry see Field 05G.
W72-11488

THE FUTURE OF WASTEWATER TREATMENT - AN OPINION SURVEY.

Public Works, Vol. 103, No. 4, p 52-55, April 1972. 4 tab, 2 fig.

Descriptors: *Waste water treatment, *Sludge disposal, Engineering, Economics, Planning, Decision making, Technology.
Identifiers: *Opinion survey, Physical-chemical treatment.

Professional opinion was sampled by questionnaire on the future of wastewater treatment with emphasis on sludge disposal. The questionnaire was sent to city, county, and consulting engineers. Of 490 city and county officials canvassed, 190 replied. Of these, 164 were usable. The results indicate that physical-chemical and advanced wastewater treatment processes are being considered, although there is reluctance about discarding some older, tried methods. The consultants appear more willing to innovate than are the local engineers. There is a difference between what engineers think should be done, and what is actually designed. The decisions vary with respect to the economics and specifics of each situation. The more sophisticated methods could be generally applied if regulatory authority pressure demands it and economical and technological complications become less problematical in the future. (Strachan-Chicago)
W72-11493

HEALTH FACTORS AND REUSED WATERS,
Environmental Protection Agency, Washington, D.C.
W. N. Long, and F. A. Bell, Jr.
Journal of the American Water Works Association, Vol. 64, No. 4, p 220-225, April 1972. 2 photo, 19 ref.

Descriptors: *Public health, *Water reuse, *Viruses, *Bacteria, Consumptive use, Technology, Reclaimed water, Waste water treatment.
Identifiers: Viral detections, Viral properties, Virus removal.

Research regarding the determination of vital and bacterial disinfection of waters and the effects of unknown agent 'X' is needed before direct consumptive reuse of wastewaters can be sanctioned. More direct reuse of such waters is becoming a necessity in water-short areas that have growing populations and industrial requirements. Many health-related questions remain. Initiation of studies on viruses is recommended. These studies would examine: (1) the development of improved viral detection and enumeration methodology, (2) the exploration and definition of the basic properties of enteric viruses, (3) the provision of knowledge on transmission of viruses through the aquatic environment, (4) the definition of the impact of viral disease on man through associated epidemiological studies, and (5) the development of technology for the positive removal and inactivation of viruses. Additional studies are needed: (1) to investigate the potential problems from bacteria, (2) to identify and define the potential health effects of organic and other chemicals not removed by reclamation, (3) to increase reliability for wastewater-treatment plant operation, and (4) to use common sense in the approach to renovated wastewater. (Strachan-Chicago)
W72-11506

PALM BEACH COUNTY SEWAGE IMPROVEMENT PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.

Available from the National Technical Information Service as PB-205 588D, $3.00 in paper copy, $0.95 in microfiche. January 4, 1972. 186 p, 16 fig, 2 tab, 19 ref, 12 append.

Descriptors: *Florida, *Environmental effects, *Waste water treatment, *Water pollution control, *Sewage effluents, *Water quality control, Injection wells, Municipal wastes, Pumping plants, Recreation, Sewage districts, Sewage treatment, Waste treatment, Subsurface waters, Domestic water, Surface-groundwater relationships, Atlantic Ocean, Waste water disposal.
Identifiers: *Environmental Impact Statements.

The projects considered will form a regional system which will connect with one waste water treatment facility. One phase of the project would consist of construction of new and expanded secondary waste water treatment and disposal facilities to serve the central coastal region of Palm Beach County, Florida. Another phase would involve construction of interceptor sewers, major sewage pumping stations and force mains. The project will improve the water quality of the surface waters in Palm Beach County by removing many sources of sewage effluent from the inland waters and a number of raw discharges from the ocean environment. Unavoidable environmental effects will be those related to the actual construction of the facilities. The alternate methods considered are land disposal, disposal to nearby bodies of surface water, and deep well injection. The long-term effects of the pollution abatement program are beneficial from a water quality standpoint as the sewerage facilities will be used continuously. (Waldron-Florida)
W72-11555

GREELEY, COLORADO--EPA PROJECT NO. COLO-261 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Kansas City, Mo.

Available from the National Technical Information Service as PB-201 386D, $3.00 in paper copy, $0.95 in microfiche. July 29, 1971. 9 p, 2 tab.

Descriptors: *Environmental effects, *Colorado, *Waste treatment, *Sewage treatment, Sewage effluents, Sewage sludge, Sewage, Water pollution sources, Aerobic treatment, Anaerobic conditions, Environmental engineering, Sewage lagoons, Treatment facilities, Irrigation, Project planning, Water pollution control, Waste disposal.
Identifiers: *Environmental Impact Statements, *Greeley (Colo).

The proposed sewage waste treatment project for Greeley, Colorado, would relocate raw packinghouse wastes plus waste activated sludge from the existing plant, to a site approximately five miles east of the city. This site will serve as the future regional treatment plant site, and this project would be the initial step in the effort to centralize treatment facilities for the area's drainage basin. There may be short periods of odor nuisance during start-up, but normal operations should control ground water contamination and odor nuisance. The effluent will be discharged into the Lone Tree Creek. These waters will not be adversely affected to the extent that their intended irrigational use would be jeopardized. Alternatives considered include alternative sites, use of aerobic type treatment processes, and expansion of facilities at the existing plant. (Widman-Florida)
W72-11558

AERATION OF LIQUID POULTRY MANURE; A STABILIZATION PROCESS OR AN ODOUR CONTROL MEASURE,
Guelph Univ. (Ontario). Dept. of Microbiology.
R. G. Bell.
Poultry Science, Vol. 50, No. 1, January 1971. p 155-158. 3 fig, 9 ref.

Descriptors: *Farm wastes, Biochemical oxygen demand, *Odor, *Aeration, *Poultry, Anaerobic digestion, *Degradation (Decomposition), Liquid wastes, *Waste water treatment.
Identifiers: Fatty-acids.

The offensive odors associated with the storage of liquid manures are caused by the accumulation of the by-products of the anaerobic decomposition of fecal organic matter. A direct relationship has been observed between the concentration of one such group of by-products, the volatile fatty acids, and the odor quality of stored liquid poultry manure. It was suggested that a 0.1% fatty acid content was an acceptable level for new facilities and 0.2% was a minimum level for the initiation of prosecutions under any proposed air pollution legislation. Aeration, on purely theoretical grounds, must be a means of preventing stored liquid manure from acquiring a foul odor since anaerobiosis and the presence of free oxygen are incompatible. In practice it is now well established that aeration is an effective way by which to control the odor of liquid manure. The present study was undertaken to ascertain whether the fatty acid content remained a reliable odor assessment

criteria for aerated stored manure; and to observe whether an aeration rate sufficient to control odor would result in the stabilization of the manure. The fatty acid content was shown to provide a reliable assessment of the odor quality of stored aerated liquid poultry manure. For satisfactory odor control in the manure storage system containing 0.562 cu. ft. of water per hen it was only necessary to satisfy 37% of the daily applied BOD. Aeration as used in the experimental system must be considered as an odor control measure and not as a stabilization process. (Bundy-Iowa State)
W72-11583

ANIMAL WASTE HANDLING AND DISPOSAL IN CONFINEMENT PRODUCTION OF SWINE,
Purdue University, Lafayette, Ind. Dept. of Animal Science.
J. H. Conrad, and V. B. Mayrose.
Journal of Animal Science, Vol. 32, No. 4, April 1971. p 811-815. 22 ref.

Descriptors: *Farm wastes, *Confinement pens, *Swine, *Odors, Farm management, Irrigation, Biochemical oxygen demand, *Aeration, *Waste water treatment.
Identifiers: Slotted floors.

Farmer-producers are becoming larger and more specialized. An estimated twenty-five percent of the hogs are produced in total confinement and another fifty percent of the hogs produced by large producers are in partial confinement during the growing and/or finishing period. As confinement feeding increases, concern about the volume of wastes excreted does also. Some procedures of measuring and facts about fecal production are discussed. An ideal manure handling system should incorporate the ultimate in automation, oxidize volatile solids, require a minimum amount of maintenance and be economical to operate. Waste disposal systems discussed include; mechanical or hand scraping and cleaning in conjunction with total hauling and spreading, a combination of scraping and flushing the wastes into a lagoon or holding pit, a slotted floor over a pit, a slotted floor over a pit with oxidation wheel, slotted floor over a lagoon, slotted floors over a pit with oxidation wheels and a lagoon, and the plow-furrow-cover technique. Another problem with swine confinement is gas generation. Some of the gases generated are toxic while others cause offensive odors. Speculation into the future has come up with this system, perhaps with slight modifications, as an acceptable one. Animals will be reared in totally enclosed buildings on slotted floors. Wastes will be flushed by recycled lagoon water into the lagoon which contains a floating aerator. Effluent containing both liquid and suspended fine solids will be used for crop irrigation. (Bundy-Iowa State)
W72-11584

ECONOMIES OF RECOVERY AND DISTRIBUTION OF ANIMAL WASTE,
California Univ., Davis.
W. J. Clawson.
Journal of Animal Science, Vol. 32, No. 4, April 1971, p 816-820, 1 tab, 9 ref.

Descriptors: *Farm wastes, Economics, Cropland, California, Waste management, *Waste disposal, *Waste treatment, *Feed lots.

No one method will satisfy the need for suitable waste management in animal agriculture. Two basic pathways seem to be available for disposal of animal waste. The first is utilization of all or parts of the animal waste where a cost is incurred and a value for the product (s) is returned. The alternative may be outright destruction or degradation of animal waste where a cost is incurred and no return is evident. Acknowledgment must be made of the fact that agriculture will be forced to stop pollution and that the additional cost of this type of waste management may not be recovered from waste alone. Future research must help provide more methods of cleaning and transporting animal wastes. Another approach is to study methods which will permit the effective growth and fattening of animals in less confined areas than is currently the case. By treating the removal and distribution of animal wastes as an expense to the animal production industry, evaluation of waste disposal methods is improved and a more intelligent evaluation of alternative methods may be made by the animal industry. (Bundy-Iowa State)
W72-11585

ANIMAL WASTE VALUE-NUTRIENT RECOVERY AND UTILIZATION,
Alabama Agricultural Experiment Station, Auburn. Dept. of Animal Sciences.
W. B. Anthony.
Journal of Animal Science, Vol. 32, No. 4, April 1971. p 779-802. 46 ref.

Descriptors: *Farm wastes, *Poultry, Swine, Cattle, Feed lots, *Waste treatment, *Waste disposal.
Identifiers: *Packing house wastes.

Livestock organic waste far exceeds the organic waste output of the human population in the United States. Livestock waste can be converted into a great resource but most waste management research is concerned with humans. However, some research has been done on using poultry waste as a feed or feed component. Tests have been made on the feeding of autoclaved poultry manure (APW), cooked poultry manure (CPW), and soybean meal (SBM) to wethers and steers. Poultry manure has also been used indirectly for chick feed. In Britain, the feeding of poultry manure to sheep and cattle seems to have been widely accepted. In addition to poultry, waste management research has been carried out on pigs and cattle. Dried pig feces have been inserted into swine finishing rations and have been fed to swine. Steer manure has been an acceptable component of swine rations and in recent years has also been used for cattle feeding. The feeding of steer manure to cattle has proven satisfactory because it (1) largely eliminated noxious accumulation of manure in the feedlot, and (2) improved the efficiency of the cow as a converter of feed to human food. To avoid harvesting steer manure each day to blend with the grain prior to feeding, the wastelage concept was developed. Wastelage is the conversion of feedlot manure into silage. Manure may also be made useful for feed by yeast fermentation or by lactic acid fermentation. (Bundy-Iowa State)
W72-11586

HANDLING AND DISPOSAL OF CATTLE FEEDLOT WASTE,
Texas Tech Univ., Lubbock.
R. C. Albin.
Journal of Animal Science, Vol. 32, No. 4, April 1971. p 803-810. 2 tab, 71 ref.

Descriptors: *Farm wastes, *Feed lots, Cattle, Water pollution, Biochemical oxygen demand, *Waste disposal, *Oxidation lagoons, *Waste water treatment.
Identifiers: Liquid handling systems, Anaerobic lagoons.

The exponential expansion of cattle feeding in the United States during the last decade has created many challenges, among which are the handling and disposal of a by-product, feedlot waste. It can be categorized as solid or semi-solid waste and runoff water for most feedlots, or as a liquid suspension from confined feeding operations. The chemical and pollutional characteristics are variable. Numerous handling and disposal systems are available for management of cattle feedlot waste. The disposal system for a commercial feedlot could be characterized as a function of several parameters, such as climate, type of ration and cattle, feedlot surface, and cattle and human population densities, with the solution stated in economic equivalents. Final disposal of feedlot waste has been on the land in most instances. The oxidation ditch and a combination of aerobic and anaerobic systems offer possibilities. Socio-industry relationships might require ultimate disposal of runoff and effluent into streams with dehydration and/or incineration of the solid waste. Use of feedlot waste as a resource material offers unlimited possibilities as a conservation approach to feedlot waste management. The need for research in feedlot waste management is urgent. Critical evaluations of handling and disposal systems for cattle feedlot waste are needed in the areas of land use, socio-legal-industry relationships, environmental pollution, conservation and economics. (Bundy-Iowa State)
W72-11587

PUZZLED ABOUT SURCHARGES. HERE'S HOW DURHAM OPERATES,
North Carolina State Univ., Raleigh. Dept. of Economics.
J. A. Seagraves.
Water and Wastes Engineering, Vol. 9, No. 3, p B-11--B-13, March, 1972. 2 tab, 2 ref.

Descriptors: *Waste water treatment, *Pollution taxes (Charges), *Separable cost allocation, *Industrial wastes, Equity, Economic efficiency, Taxes, Water pollution, *North Carolina.
Identifiers: *Separate billing, *Surcharges, Incentives, *Durham (N.C.).

The trend in municipalities such as Durham, North Carolina, is to levy surcharges on monitored industrial wastes. Presumably, these surcharges promote equity and economic efficiency. However, as an alternative to levying surcharges, cities should consider the use of separate billing. This concept would involve simply billing industries separately for the various components in the monitored wastes. The bill from the city would list the water sold, the estimated cubic feet of waste, the pounds of BOD, suspended solids, grease, etc. Each would be multiplied by its unit cost of delivery or treatment, and the sum would be the amount owed to the city. The water and sewer rates for households and commercial establishments could be based on the same unit costs and on average waste concentrations. Separate billing would be more equitable than a surcharge because users would only pay for the costs they create. More importantly, separate billing would better promote economic efficiency. The defined normal BOD level in most surcharges gives firms a strong incentive to adjust wastes exactly to the defined normal level, even if the adjustment involves private waste dilution. Separate billing would eliminate this incentive. (Settle-Wisconsin)
W72-11593

DESIGN AND ECONOMICS OF JOINT WASTEWATER TREATMENT,
Vanderbilt Univ., Nashville, Tenn; and Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
W. W. Eckenfelder, Jr., and C. E. Adams, Jr.
Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 98, No. SA1, p 153-167, February, 1972. 6 fig, 7 tab, 8 ref, 4 append.

Descriptors: *Waste water treatment, *Treatment facilities, *Municipal wastes, *Industrial wastes, Capital costs, Economic feasibility.
Identifiers: *Combined treatment facilities.

In many instances, combined or joint industrial-municipal treatment facilities offer an effective economical alternative to individual treatment systems for each waste. Some pretreatment of industrial wastes may be required where acids, sulfides which will oxidize to sulfuric acid, and other chemicals which would be detrimental to the sewer structures or hazardous to humans are present. Pretreatment may also be desirable (1) to insure that the wastewaters will not have adverse effects on the operation of the combined waste-

water treatment facility, and (2) as an economic alternative to a surcharge. The need for a surcharge on industry stems from recent governmental legislation which provides that industry must pay its proportionate share for the capital and operating costs of a combined wastewater treatment facility. The factors which will significantly influence the cost of wastewater treatment are the flow rate, the concentration of BOD and suspended solids, and the biological reaction rate in the case of biological treatment facilities. Appendices provide examples of (1) capital cost development for combined treatment of municipal and industrial wastes, and (2) a cost comparison of a combined wastewater treatment plant with and without pretreatment of industrial wastes. (Settle-Wisconsin)
W72-11597

REVERSE OSMOSIS DEMINERALIZATION OF ACID MINE DRAINAGE.
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.

Copy available from GPO Sup Doc as EP 2.10:14010 FQR 03/72, $1.00; microfiche from NTIS as PB-211 020, $0.95. Environmental Protection Agency Water Pollution Control Research Series, March 1972, 110 p, 27 fig, 30 tab, 14 ref. EPA Program 14010 FQR 03/72.

Descriptors: *Acid streams, *Mine drainage, *Dissolved solids, *Separation techniques, *Reverse osmosis, *Membrane processes, Demineralization, Hydrogen ion concentration, Neutralization, Fouling, Calcium sulfate, Iron, Disinfection, Laboratory tests, On-site investigations, *Waste water treatment.

A two-phase study, involving both laboratory and field investigations, has demonstrated the feasibility of using reverse osmosis to provide potable water from acid mine drainage. The laboratory investigations involved the determination of methods for controlling iron fouling and the selection of a process flow sheet. During the field test, the process developed in Phase I was used to treat acid mine drainage from an underground abandoned anthracite coal mine. Treatment prior to reverse osmosis consisted of filtration (10 microns) followed by ultraviolet light disinfection. Brine from the RO unit was treated by neutralization, oxidation, and settling. Results obtained indicated that membrane fouling due to iron was satisfactorily controlled, but calcium sulfate fouling limited the recovery of product water to about 75%. Product water was of potable quality in all respects except for iron, manganese, and pH. Rejection of individual ions across the RO membranes ranged from 99.2 to 99.7% based on average brine concentrations. Product waters of 25 mg/l total dissolved solids were produced from a feed TDS level of 1319 mg/l. Calcium sulfate precipitate on the RO membrane was successfully removed using a solution of ammoniated citric acid at pH 8. (Lowry-Texas)
W72-11598

RECYCLE OF PAPERMILL WASTE WATERS AND APPLICATION OF REVERSE OSMOSIS,
Green Bay Packaging, Inc., Wis.
D. C. Morris, W. R. Nelson, and G. O. Walraven.
Copy available from GPO Sup Doc EP2.10:12040 FUB 01/72, $1.00; microfiche from NTIS as PB-211 021, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, January, 1972, 90 p, 29 fig, 7 tab. EPA Program 12040 FUB 01/72.

Descriptors: *Pulp and paper industry, *Industrial wastes, *Reverse osmosis, *Membrane processes, Pilot plants, Flow rates, Separation techniques, Dissolved solids, Operation and maintenance, Water reuse, *Waste water treatment.
Identifiers: *Flux.

Pilot plant reverse osmosis units were operated on weak waste waters from a pulp and paperboard mill to obtain further data on R.O. as an integral part of a closed water system within the mill. Of the many equipment types tested, the one selected was capable of concentrating a stream containing 1% dissolved solids to 99% less volume containing 10% dissolved solids. Product water thus separated was of high quality, suitable for use for stock dilution, pump shaft seal lubrication, etc. Overall flux rate for the operating portion of a plant performing to these standards was about 7 gallons/sq ft/day. The cellulose acetate membranes exhibited no significant deterioration, and a conclusion that the membranes are capable of providing a minimum of one year of continuous service is encouraged. Limited testing at higher temperatures indicated that the membranes do not deteriorate as rapidly as predicted. It is concluded that further development and commercialization will result in plants that approach the performance of industrial process equipment. (Lowry-Texas)
W72-11599

CLOSED SYSTEM WASTE MANAGEMENT FOR LIVESTOCK,
Michigan State Univ., East Lansing. Dept. of Agricultural Engineering.
P. O. Ngoddy, J. O. Harper, R. K. Collins, G. D. Wells, and F. A. Heidar.
Copy available from GPO Sup Doc EP2.10:13040 DKP 06/71, $1.25; microfiche from NTIS as PB-211 022, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, June 1971, 110 p, 28 fig, 21 tab, 19 ref. EPA Program 13040 DKP 06/71.

Descriptors: *Farm wastes, *Water reuse, *Separation techniques, Screens, Suspended solids, Particle size, Sludge, Odor, Economic feasibility, Technical feasibility, Performance, Cattle, Hogs, Analytical techniques, *Waste water treatment.
Identifiers: *Waste management.

A vibrating screen separator has been developed for liquid-solid separation of livestock wastewater. Pilot tests on swine and beef cattle wastewater have shown that the resistant or slowly biodegradable solids are effectively removed on vibrating screens ranging in mesh size from no. 60 to no. 120. Although measurably less efficient than conventional dewatering devices such as centrifuges and vacuum filters, the gravity dewatering vibrating screen separation is better suited to the economic scale of the average livestock operation. The removal of resistant solids from wastewater prior to stabilization substantially improves the performance of biological treatment systems by enhancing the controlling transport and kinetic mechanisms in such processes. Screened solids are odorless, stable, and storable over long periods without an odor nuisance or pollutional problem. The liquid fraction can be partially reclaimed by biodegradation and recycled as transport water. A number of candidate livestock waste management designs integrating the salient features of the study have been proposed. (Lowry-Texas)
W72-11600

ELIMINATION OF WATER POLLUTION BY PACKINGHOUSE ANIMAL PAUNCH AND BLOOD.
Beefland International Inc., Council Bluffs, Iowa.

Copy available from GPO Sup Doc SOD no.: EP2.10:12060 FDS 11/71, $0.50; microfiche from NTIS as PB-211 023, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, November 1971, 41 p, 15 fig, 10 tab, 6 ref. EPA Program 12060 FDS 11/71.

Descriptors: *Food processing industry, *Dehydration, *Cattle, Biochemical oxygen demand, Chemical oxygen demand, Proteins, Byproducts, Analytical techniques, Cost analysis, *Waste water treatment, *Denver.
Identifiers: *Dehydrators, Blood, Paunch, Rumen, Slaughtering plants, Dryers, Dehydration costs, Feed additives, *Council Bluffs (Iowa).

The operation of two dehydrating machines, for the drying of cattle whole blood as well as paunch contents (rumen), at the Beefland International, Inc., slaughtering plant at Council Bluffs, Iowa, was studied. The BOD5 and COD of the blood and rumen were established. The mean BOD5 of the whole blood and rumen was determined as 156,500 ppm and 50,200 ppm, respectively. The mean COD of the blood and rumen was established as 218,300 ppm and 177,300 ppm, respectively. The economics of the drying process in costs per ton of dried product, per 1000 lbs live kill weight (LWK), and per animal were determined. The dehydrating costs per ton of dehydrated product were found to be $43.75/ton for blood and $38.46/ton for rumen. The average cost (blood and rumen) was $40.93/ton. Laboratory studies were carried out on the dried whole blood and rumen with a view toward their actual and potential use as legally accepted feeds or feed additives. Percent moisture, protein, fat, carbohydrate, and other analyses of the dried products are reported. (Lowry-Texas)
W72-11601

AEROBIC DIGESTION OF ORGANIC WASTE SLUDGE.
Oklahoma State University, Stillwater. School of Civil Engineering.

Copy available from GPO Sup Doc EP 2.10:17070 DAU 12/71, $1.50; microfiche from NTIS as PB-211 024, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971, 175 p, 64 fig, 96 tab, 23 ref. EPA Program 17070 DAU 12/71.

Descriptors: *Sludge digestion, *Aerobic digestion, *Pilot plants, Laboratory tests, Analytical techniques, Domestic wastes, Aeration, Monitoring, Sewage sludge, *Waste water treatment.
Identifiers: *Aerobic sludge digestion.

Pilot plant aerobic sludge digesters were used to treat sludge from a two stage trickling filter plant. Primary sludge only, mixed primary and secondary sludge, and secondary sludge only, were digested at detention periods ranging from 2 to 36 days. The digesters received air from air diffusers located near the tank bottom. Physical and chemical analyses were made on the feed, mixed liquor, four hour settled sludge, and filtered (paper and sand bed) sludge. Most of the work involved feeding the digesters once or twice daily, although the initial runs were made using a time clock and one run was made on a batch basis. The measuring pumps clogged so frequently that actual aeration tank loadings were not accurate enough to obtain meaningful data. Data indicated considerable variation in concentration of the various parameters with aeration time and sludge source, with general trends indicating the active organisms to be in a state of flux. Results showed that aerobic digestion was a highly variable process which could produce excellent results in some cases, while yielding highly undesirable results in similar cases. (Lowry-Texas)
W72-11603

CHARACTERIZATION OF TASTE AND ODORS IN WATER SUPPLIES,
Connecticut Univ., Storrs. Regulatory Biology Section.
For primary bibliographic entry see Field 05A.
W72-11604

SLUDGE MATERIAL RECOVERY SYSTEM FOR MANUFACTURERS OF PIGMENTED PAPERS.
Scott Paper Co., Westbrook, Me. S.D. Warren Div.

Copy available from GPO Sup Doc EP2.10:12040, $1.00; microfiche from NTIS as PB-211 026, $0.95. Environmental Protection Agency Water Pollution Control Research Series, July, 1971, 95 p, 3 fig, EPA Program 12040 FES 07/71.

Descriptors: *Pigments, *Vacuum drying, *Incineration, Pulp wastes, Color, Pulp and paper industry, Sedimentation, Sludge, Temperature, Particle size, Dispersion, Economic feasibility, *Waste water treatment.
Identifiers: *Retention time, *Grit removal.

Sludges resulting from primary treatment of wastewaters generated during the manufacture of coated and/or filled papers were diluted to 0.75% solids, and subjected to pilot scale treatment involving centricleaning, dewatering by vacuum filter to 30% solids, shredding, drying, and incineration in a rotary kiln. By carefully controlling both temperature and retention time in incineration, the resulting ash produced was in the form of a mixed pigment of 84-85% G.E. brightness and acceptably low abrasiveness. Grinding and classifying in a Bauer Pulverizer produced a pigment of acceptable particle size, suitable for use as a wet end filler for the paper machines. Reuse of the reclaimed pigment as a coating pigment is not feasible because of pigment dispersion problems. The process was shown to be economically unfeasible at the present time, and future work should be directed at making the reclaimed pigment suitable for replacing the more expensive coating pigments. (Lowry-Texas)
W72-11605

AMENABILITY OF REVERSE OSMOSIS CONCENTRATE TO ACTIVATED SLUDGE TREATMENT,
Rex Chainbelt, Inc., Milwaukee, Wis. Ecology Div.
M. Gupta, and D. G. Mason.
Copy available from GPO Sup Doc as EP2.10:17040 EUE 07/71, $1.25; microfiche from NTIS as PB-211 027, $0.95. Environmental Protection Agency Water Pollution Control Research Series, July 1971, 119 p, 29 fig, 38 tab, 25 ref. EPA Program 17040 EUE 07/71.

Descriptors: *Reverse osmosis, *Membrane processes, *Desalination processes, Laboratory tests, Cellulose, Permeability, Organic compounds, Separation techniques, Chemical precipitation, Brines, Suspended solids, Aeration, *Waste water treatment.

Pilot scale tubular and spiral wound Reverse Osmosis (RO) units were utilized to establish the feasibility of renovating municipal sewage. Results indicated that prior treatment with ferric chloride and alum will be necessary even when utilizing the tubular RO system. RO produced an approximate 100 mg/ TDS of inorganic ions in the effluent, but an estimated 40 to 50% of the soluble organic material permeated the membranes at high feed water recoveries. Approximately 70% of the organic material passing the membrane was ethanol, but other organics may pass through the membranes from other sewages. 92% water recovery rates, with no precipitation problems in the RO concentrate, were achieved, but RO product waters would require further treatment for organic removal prior to discharge. The feasibility of biodegrading RO concentrates was also established, with TOC removals of 87 to 93% obtained in 4-10 hours, depending upon the suspended solids level maintained. (Lowry-Texas)
W72-11606

EFFLUENTS FROM FRUIT AND VEGETABLE PROCESSING-PART I,
S. D. Holdsworth.
Effluent and Water Treatment Journal, Vol 10, No. 3, March 1970, p 131-137, 2 fig, 2 tab, 3 ref.

Descriptors: *Industrial wastes, *Effluents, *Canneries, Fruit crops, Vegetable crops, Biochemical oxygen demand, Water reuse, Recirculated water, Cooling water, Solid wastes, Screens, Landfills.
Identifiers: Marine disposal, Spray irrigation, Characterization, Composting, Counter-current rinsing, United Kingdom.

The nature and composition of effluents from fruit and vegetable processing industries were summarized. Production figures for some processed foods and typical production and corresponding effluent characteristics from various canning factories were arranged in tabular form. A survey carried out recently with vegetable canners alone showed that the level of annual water usage was in excess of 750 million gallons, corresponding to a production of over 700 thousand tons of vegetables. General operations were similar for every process, although each product has its own special equipment. Points of effluent origin in a canning line were illustrated. Wastes from processing fruits and vegetables were described as being low in nitrogen compounds, having a BOD up to 8,000 ppm, having relatively high suspended solids and being putrefactive. Methods which utilize water reuse and recirculation have increased, especially the use of counter-current methods for washing and cooling. A typical water recirculation system used for pea freezing was illustrated. Methods of disposal of solid wastes including composting, landfill, spreading over the land and comminution followed by either marine disposal or spray irrigation were pointed out. Since soluble solids are the major form of pollution, screening does not remove substantial quantities of pollution but does prevent excessive pollution from developing. The use of a rotary screen of 10 mesh wire led to a 35% reduction of suspended solids and a 27% reduction in BOD. (See also W72-11609) (Galwardi-Texas)
W72-11608

EFFLUENTS FROM FRUIT AND VEGETABLE PROCESSING-CONCLUSION,
S. D. Holdsworth.
Effluent and Water Treatment Journal, Vol 10, No. 5, May 1970, p 265-268, 28 ref.

Descriptors: *Industrial wastes, *Canneries, *Waste water treatment, Fruit crops, Vegetable crops, Biochemical oxygen demand, Performance, Efficiencies, Activated sludge, Anaerobic digestion, Chemical precipitation, Oxidation lagoons, Trickling filters, Organic loading, Food processing industry.
Identifiers: Spray irrigation, Oxidation ditches, United Kingdom.

Various methods for the treatment of effluents from fruit and vegetable processing industries were reviewed. Methods presented included activated sludge, oxidation ditches, biological filters, spray irrigation, lagoons, chemical treatment and anaerobic treatment. Treatment of potato wastes with activated sludge showed BOD removals of up to 95% were obtained at loadings of 80 lb BOD per 1,000 lb of mixed liquor suspended solids per hour. Oxidation ditches have been used on effluents from pea, carrot, celery, beans and potato processing and results have shown that for effluents containing between 300 and 1,000 ppm BOD, the reduction in BOD ranged from 30 to 75%. Performance data for a biological filter using plastic media showed that for a BOD load which varied from 50-150 lb/1000 ft3/day an 80% reduction in BOD was obtained. An example was presented of spray irrigation in which an average BOD reduction of 97.3% was obtained. Also, chemical precipitation of carrot wastes using lime and ferrous sulfate resulted in BOD reductions ranging from 50 to 75%. Several cases were reported in which BOD reductions ranging from 80-90% were obtained using anaerobic digestion. (See also W72-11608) (Galwardi-Texas)
W72-11609

INFLUENCE OF MICROBIAL WASTE PRODUCTS ON METABOLIC ACTIVITY OF HIGH SOLIDS ACTIVATED SLUDGE,
Rensselaer Polytechnic Inst., Troy, N.Y.
J. C. Young.
Master's Thesis, May 1969, 93 p, 24 fig, 16 tab, 22 ref.

Descriptors: *Activated sludge, *Metabolism, *Food chains, *Membrane processes, Inhibitors, Laboratory tests, Separation techniques, Instrumentation, Performance, Permeability, Technical feasibility, *Waste water treatment.
Identifiers: *Metabolic end products, *Ultrafiltration.

A membrane ultrafiltration unit is currently being considered as an effluent separation device for a high solids activated sludge system. This type of separation would result in considerable metabolic end product (MEP) retention. An open reactor was operated on a feed consisting of glucose, yeast extract, ammonium phosphate and ammonium acetate, to determine the effects of MEP accumulation on the high solids microbial system activity. As predicted, a decrease in metabolic activity was observed with increased MEP content. The compounds which interfered with the culture's aerobic activity were apparently in the molecular range of 700. Organic gases or vapors produced during anaerobic decomposition resulting from culture conglomeration were large enough to significantly affect the oxygen uptake measurements. However, results were definite enough to show that some planned wasting of recirculated mixed liquor will be required for a high solids activated sludge system in order to maintain the culture's high activity levels. (Lowry-Texas)
W72-11610

AN ASIAN TECHNOLOGICAL APPROACH TO WATER REUSE SERIES FILTRATION USING LOCAL FILTER MEDIA,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 05F.
W72-11613

DEVELOPMENT OF NUMERICAL FJORD-MODELS FOR THE FUNCTIONAL PLANNING OF A REGIONAL WASTE WATER DISPOSAL SYSTEM,
Norsk Institutt for Vannforskning, Blindern.
T. Simensen, and H. Munthe-Kaas.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 10, Hall B, Paper No 20, June 21, 1972. 10 p, 8 fig, 1 tab, 8 ref.

Descriptors: *Regional analysis, *Mathematical models, *Water quality control, Sampling, Monitoring, Digital computers, Data processing, Technical feasibility, Economic feasibility, Nutrients, Eutrophication, Phosphorus, Design criteria, Cost analysis, *Waste water treatment.
Identifiers: *Norway, *Regional wastewater disposal, *Submarine outfalls.

An extensive physical/chemical program over a 4-year period, totalling more than 600,000 observations, was the background for the assessment of a tentative mass balance in Oslo Fjord. The mass balance, combined with statistical treatment of data, formed the basis for empirical relationships (mathematical models) which could be generalized and used to predict changes in the pollution situation resulting from the use of various alternative treatment methods for the wastewaters. Regression analysis techniques were used to determine the correlation between secchi disc depth observations and phosphate levels. In the technical-economical analysis of various alternatives to the regional wastewater disposal system, computer programs have been made for all necessary calculations. 16 main alternatives have been studied, but with some basic variable manipulation, more than 50 alternatives have been handled. The final design selected involved: (1) 50 km of tunnel to transport most of the wastewater to a disposal site far south in the inner basin; (2) use of mechanical treatment and submarine outfall facilities at the tunnel end on the west side of the fjord, with provisions made for initiating chemical treatment

as soon as possible. Total initial and running cost of the 140 mgd plant was estimated at $70 million. (Lowry-Texas)
W72-11614

POWDERED ACTIVATED CARBON APPLICATION, REGENERATION AND REUSE IN WASTEWATER TREATMENT SYSTEMS,
Envirotech Corp., Salt Lake City, Utah. Eimco Process Machinery Div.
G. L. Shell, and D. E. Burns.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 10, Hall C, Paper No 20, June 21, 1972. 10 p, 2 fig, 3 tab, 11 ref.

Descriptors: *Activated carbon, *Particle size, *Performance, *Cost comparisons, Technical feasibility, Economic feasibility, Pilot plants, Operation and maintenance, Temperature, Incineration, Vacuum drying, Adsorption, *Waste water treatment.
Identifiers: *Granular carbon, *Powdered carbon, Carbon regeneration.

Analysis of existing operating data and cost estimates indicated that the greatest potential application of powdered activated carbon (PAC) systems is for: (1) moderate to weak soluble organic wastes; (2) moderate quality effluent requirements; and/or (3) plant sizes less than 5 mgd. A 2 year study of a 100 gpm pilot plant was conducted to evaluate the applicability of PAC for municipal wastewater treatment by: (1) establishing gravity thickening and vacuum dewatering characteristics and operating parameters; (2) establishing fluidized bed regeneration operating parameters; (3) determining the regenerated PAC effectiveness by reuse. With a sand bed temperature of 1540F, the resulting freeboard temperature was 1510F, furnace operation was stable, and carbon losses amounted to 17%. Six week averages of pilot plant operation comparing virgin carbon with once to twice regenerated carbon showed essentially no degradation of the carbon with regard to COD removal effectiveness. The major problem encountered with the fluidized bed regeneration furnace, that of non-preferential ignition of bed injection gas in deference to carbon, must be solved before any further progress can be made. (Lowry-Texas)
W72-11615

A RATIONAL DESIGN PROCEDURE FOR AERATED LAGOONS TREATING MUNICIPAL AND INDUSTRIAL WASTEWATERS,
Vanderbilt Unit., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
W. W. Eckenfelder, Jr., C. D. Magee, and C. E. Adams, Jr.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 10, Hall A, Paper No 20, June 21, 1972. 11 p, 5 fig, 1 tab, 22 ref.

Descriptors: *Aerated lagoons, *Design criteria, *Kinetics, Anaerobic conditions, Aerobic conditions, Aeration, Mixing, Depth, Biochemical oxygen demand, Suspended solids, Temperature, *Waste water treatment.
Identifiers: *Active mass, *Detention time, *Power levels.

An investigation of the kinetics of aerated wastewater treatment lagoons has shown that the effluent BOD is independent of the initial BOD concentration. This conclusion was reached after examination of various data revealed that higher initial concentrations resulted in higher equilibrium biological solids levels and, hence, higher overall BOD removal rates. However, the unit BOD removal rate remains proportional to the BOD concentration in the lagoon. In addition, the direct influence of biological solids has been eliminated in favor of the active mass concept, since the active mass portion of the biological solids changes with detention time. The benefits of multi-stage systems relevant to single basins were found to be marginal in warm climates treating relatively low strength wastes, but of greater importance in colder climates attributed to thermal effects. A step by step design procedure, developed from the various data collected and studied, is also presented. (Lowry-Texas)
W72-11616

INFLUENCE OF TEMPERATURE AND TURBULENCE ON THE OXYGEN TRANSFER IN WATER,
For primary bibliographic entry see Field 05G.
W72-11618

PROBLEMS IN THE OPERATION OF PLANTS TREATING MIXED INDUSTRIAL WASTES,
Research Inst. for Water Resources Development, Budapest (Hungary).
P. Farkas.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 11, Hall C, Paper No 22, June 22, 1972. 15 p, 5 fig, 4 tab, 16 ref.

Descriptors: *Industrial wastes, *Activated sludge, *Mathematical models, *Metabolism, Biodegradation, Kinetics, Design criteria, Organic loading, Toxicity, Chemical oxygen demand, Biochemical oxygen demand, Monitoring, Analytical techniques, Costs, *Waste water treatment.
Identifiers: *Treatability, Formaldehyde.

The three conditions of trouble-free plant operation include: (1) effluent quality (BOD5 or COD) should not exceed the limiting value prescribed; (2) no great fluctuations in waste load should be tolerated; and (3) poisoning should be avoided since it may make an entire new start-up necessary. Industrial wastes, however, can create problems in each of these areas which can also cause considerable economic and legal entanglements. A rigorous mathematical analysis of the biodegradation mechanisms with reference to readily removable substrates, removable but toxic substrates, and poisonous substrates was conducted. These models, along with other data, were then used to develop formulas for effluent quality predictions. Examples of experimental results with formaldehyde, slaughterhouse blood discharge, and mixtures of acetate and copper are presented as examples of the types of systems encountered. (Lowry-Texas)
W72-11619

REUSE, RECOVERY LOWER POLLUTION FROM BREWERY.

Environmental Science and Technology, Vol 6, No 6, June 1972, p 504-505. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Water reuse, Activated sludge, Organic loading, Nutrients, Carbohydrates, Sludge treatment, Treatment facilities, Vacuum drying, Dewatering, Proteins, By products.
Identifiers: Brewing industry, Adolph Coors Company, Product recovery, By-product production, Livestock feeds.

The Adolph Coors Co., has been able to cut pollution considerably by reusing water and reclaiming brewing by-products, rather than discharging them directly to their treatment plant. Beer has a BOD of more than 125,000 mg/l, and by cooling waste beer in evaporative condensers, Coors not only reduced their organic loading considerably, but produced a syrup which could be used as a binder to form livestock pellets from spent grains and hops. Waste yeast was also dried and made into a high-protein poultry feed supplement. With such recovery procedures, Coors was able to reduce plant loading from about 4,000 mg/l BOD to roughly 1600 mg/l. Due to the high carbohydrate content of its waste, Coors has modified their activated sludge system by injecting small amounts of highly digested sludge directly into the activated sludge return. This procedure has stopped the rapid growth of Spherotilus natans. Also, nitrogen and phosphorus must be added to the waste prior to treatment. Coor's waste sludge has been dewatered by a vacuum filter and the dewatered sludge has been mechanically turned into nearby land. Experiments are being conducted to test the feasibility of drying the sludge further as the sludge contains 44% protein making it an ideal candidate for use in animal feeds. (Galwardi-Texas)
W72-11620

THE COMPLETE TREATMENT OF RAW SEWAGE WITH SPECIAL EMPHASIS ON NITROGEN REMOVAL,
National Inst. for Water Research, Pretoria (South Africa).
W. A. Pretorius.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 10, Hall C, Paper No 21, June 21, 1972. 6 p, 1 fig, 4 tab, 14 ref.

Descriptors: *Nitrification, *Denitrification, *Aerobic conditions, *Anaerobic conditions, Nitrates, Ammonia, Pilot plants, Sampling, Laboratory tests, Methane, Chemical oxygen demand, *Waste water treatment.

A three-stage experimental wastewater treatment unit was assembled, utilizing an anaerobic stage, an aerobic nitrification stage, and an anaerobic denitrifying stage for the removal of nitrogenous compounds. The anaerobic stage consisted of a Sedigester and Biophysical Filter (BPF), the aerobic nitrifying stage consisted of a rotating disc unit (RDU), and the final stage consisted of another RDU provided with an airtight hood. Samples taken twice daily from the influent and effluent of each unit were analyzed for total COD, BOD, Kjeldahl nitrogen, ammonia, nitrates, and orthophosphate. Use of the anaerobic stage as an integral part of the system accomplished a lowering of the COD loading on the subsequent aerobic stage, as well as supplying electrodonors for denitrification. Although all of the chemical conditions for denitrification were met, complete denitrification of the final effluent was not obtained. The nitrate concentration was reduced by the nitrifying RDU at a rate independent of the incoming concentration, indicating that either the disc surface area, or hydrogen donor transfer rate, or both, were limiting. These preliminary results have demonstrated the technical feasibility of producing from raw sewage a water with low COD and nitrogen concentrations. (Lowry-Texas)
W72-11621

THE FULL SCALE REFINEMENT OF PURIFIED SEWAGE FOR UNRESTRICTED INDUSTRIAL USE IN THE MANUFACTURE OF FULLY BLEACHED KRAFT-PULP AND FINE PAPER,
National Inst. for Water Research, Pretoria (South Africa).
L. R. J. VanVuuren, J. W. Funke, and L. Smith.
Preprint, presented at Sixth Internation Water Pollution Research Conference, Session 11, Hall B, Paper No 22, June 22, 1972. 10 p, 2 fig, 3 tab, 5 ref.

Descriptors: *Flotation, *Flocculation, *Aluminum, *Polyelectrolytes, Separation techniques, Domestic wastes, Industrial water, Water reuse, Pulp and paper industry, Pilot plants, On-site investigations, Heavy metals, *Waste water treatment, Treatment facilities.

Following extensive pilot plant testing, a full scale water reclamation plant was constructed to produce 32,000 m cu/day of municipal wastewater for unrestricted reuse by ENSTRA mill of South African Pulp and Paper Industries, Ltd. The treatment units included full stream aeration and flotation using alum, caustic soda, and polyelectrolytes. Although the removal of heavy metals

with alum was not as high as the removals achieved with lime, subsequent investigations showed that the 100 mg manganese and 30-50 mg iron/kg of bone dry pulp attributed to contamination from other sources was far greater than the amounts contained in the recycled effluent. The water quality criteria as reported in the literature for recycling systems were not correct in this instance, and it is suggested that they must be evaluated for each individual case. While demonstrating the alum flotation process on a large scale as capable of producing from purified sewage a process water suitable for unrestricted industrial use, it was further demonstrated that a cost savings of 2 c/m cu as compared with RWB water would be realized. (Lowry-Texas)
W72-11622

ASPECTS OF SLUDGE DISPOSAL IN GREATER LONDON,
Greater London Council (England). Dept. of Public Health Engineering.
S. H. Dainty.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 7, Hall B, Paper No. 14, June 21, 1972. 12 p, 1 fig, 1 tab, 11 ref.

Descriptors: *Sludge disposal, *Administration, *Sedimentation, Activated sludge, Vacuum drying, Filtration, Incineration, Sludge digestion, Dewatering, Operation and maintenance, Odor, *Waste water treatment, Waste disposal.
Identifiers: *Ocean dumping.

A review of sludge accumulation, separation, transportation, and disposal within the greater London area is presented. Factors which influence volume and quality of the sludge, including primary sedimentation and sludge return, were discussed. The conclusions were that primary sedimentation is an indispensable facet of sludge disposal, both from an economic and technical viewpoint. Similar attention was given to sludge separation, automated sludge separation, and pumping. The reasons for digesting sludge were given as: (1) weight reduction of solid matter requiring disposal; (2) to render the sludge relatively inoffensive; (3) to reduce the risk of pathogens; (4) to reduce the fat/grease content; (5) to produce methane for power production; and (6) to assist subsequent dewatering. Other sludge treatment and disposal methods currently practiced include dewatering, mechanical treatment (vacuum filtration, etc.), incineration, land spreading, and disposal to sea. Studies are currently underway to evaluate the effects of all types of sludge disposal, and especially in regards to ocean dumping, more complete co-operation between nations for informational exchange in such fields is being sought. (Lowry-Texas)
W72-11623

SELF-PURIFYING ACTIVITY OF SEA WATER: PROPOSAL FOR LOW COST TREATMENT OF A WELL DEFINED AREA,
Naples Univ. (Italy). Istituto di Igiene.
For primary bibliographic entry see Field 05G.
W72-11626

EFFICIENCY OF FE3+ AND AL IN PHOSPHORUS REMOVAL FROM MUNICIPAL WASTEWATERS. PRACTICAL COMPARISON AT A TREATMENT PLANT,
Solvay et Cie., Brussels (Belgium).
P. Dalcq, and R. Rutschi.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 9, Hall B, Paper No 18, June 21, 1972. 9 p, 6 fig, 5 tab, 6 ref.

Descriptors: *Phosphorus, *Chemical precipitation, *Salts, *Aluminum, *Iron, Domestic wastes, On-site investigations, Laboratory tests, Sedimentation, *Waste water treatment.

Effluent from a Swiss waste water treatment plant treating domestic wastes from 220,000 inhabitants was subjected to full scale testing of both iron and aluminum salts as methods of chemically precipitating phosphorus. The tests were performed on the entire 1.13 mcu/sec dry weather flow after mechanical treatment and primary settling. Test effluents were analyzed for permanganate value, total P, ortho P, and pH, both before and after chemical addition. Molecular yields of P elimination of more than 0.9 were obtained in practice with the simultaneous process, with these yields depending naturally on contact time, making it justifiable to recycle the sludge in the physical purification stage with similar PO4 concentrations in sewage. Al produced lower elimination molecular yields than Fe3+, this also having been observed in sewage works which have used the two reagents successively. In the simultaneous process, a molar ratio of Al/Fe3+ of 1.3 to 1.5 was computed. Thus the choice of the reagent will depend on the respective costs of Al and Fe3+ salts in ready to use solutions. (Lowry-Texas)
W72-11627

DESIGN OPTIMIZATION FOR ACTIVATED SLUDGE AND EXTENDED AERATION PLANTS,
National Inst. for Water Research, Pretoria (South Africa).
J. L. Barnard.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 4, Hall B, Paper No 7, June 20, 1972. 9 p, 7 fig, 1 tab, 8 ref.

Descriptors: *Activated sludge, *Synthesis, *Sludge digestion, Suspended solids, Biodegradation, Laboratory tests, Mathematical models, Solubility, Organic loading, Nitrification, Temperature, Analytical techniques, Regression analysis, Design criteria, *Waste water treatment, *Aeration.
Identifiers: *Sludge production, *Sludge age.

Four laboratory scale activated sludge units, of 10 liters each, were fed skimmed milk and powdered milk solutions to obtain data needed for the experimental verification of a mathematical sludge production model. Data from previous work on synthetic sewage of egg albumin and beef extract, as well as data obtained from a soluble organic chemicals waste water were also correlated with the model. The equation for sludge production which was developed is: delta Xv = Xo (l-f) + a Sr - Kb x Xv, where delta Xv = change in volatile sludge mass, Xo = non-soluble material mass, Sr = synthesis, Xv = volatile sludge mass in the reactor, and f, a, Kb, and x are co-efficients whose values can be determined experimentally in the laboratory. For F/M ratios in excess of 0.5 to 1.0, the active mass is considerably decreased, as is X, the active mass coefficient. The equation then reduces to: delta Xv = a Sr - bXv. However, at the lower loadings used for extended aeration plants, the previous equation must be used to accurately predict excess sludge production and sludge age. Further study is needed to determine the variability in the coefficients Kb and a for different waste waters. (Lowry-Texas)
W72-11628

EFFECT OF DISSOLVED SALTS ON THE FILTRATION OF COLIFORM BACTERIA IN SAND DUNES,
Ambient Purification Technology, Inc., Riverside, Calif.
J. Goldshmid, D. Zohar, Y. Argaman, and Y. Kott.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 9, Hall C, Paper No 18, June 21, 1972. 9 p, 7 fig, 1 tab, 12 ref.

Descriptors: *Coliforms, *Filtration, *Dissolved solids, *Water reuse, Disinfection, Sands, Particle size, Coagulation, Colloids, Hydrogen ion concentration, Separation techniques, Salts, *Waste water treatment.
Identifiers: *Agglomeration.

Plans for the Dan Sewage Reclamation Project call for infiltration through sand dunes, followed by a 400 to 800 day lag period, as the final treatment step before pumping the reclaimed sewage from the aquifer into the drinking supply. Bacterial filtration experiments were carried out in a 3.9 cm diameter Perspex pipe filled with dune sand to a 10 cm height and the sand compressed by tapping on the pipe wall. The bacterial suspension was pumped through at a constant rate of 1 ml/min. Results indicated that an increase in cation concentration and valence increased filtration efficiency of coliform bacteria through dune sand, the effect being similar to that predicted from Shulze-Hardy laws regarding coagulation of colloids. Further results included: (1) the presence of oxidation pond effluents caused a requirement for more cations to achieve the same filtration efficiency; (2) bacteria were found to stay alive even after attachment to the sand particles; (3) no bacterial agglomeration was observed; (4) pH decrease from 9.3 to 3.9 increased filtration efficiency; and (5) cation concentration effect on filtration efficiency was found to be reversible. (Lowry-Texas)
W72-11629

THE EFFECT OF VARYING FOOD-TO-MICROORGANISM RATIOS ON PHOSPHATE UPTAKE IN AN ACTIVATED SLUDGE ENVIRONMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
M. R. Collins.
Master's Thesis, March 1972. 48 p, 14 fig, 5 tab, 31 ref.

Descriptors: *Activated sludge, *Separation techniques, *Phosphate, Kinetics, Adsorption, Solubility, Sludge, Aeration, Analytical techniques, Hydrogen ion concentration, Laboratory tests, *Waste water treatment.
Identifiers: *Food to microorganism ratio, *Acclimatization.

Two laboratory scale batch studies were conducted to clarify the importance of the Food-to-Microorganism (F/M) ratio and to evaluate the nature of phosphate uptake in the activated sludge environment. F/M values used were 0.20, 0.75, 1.25, and 2.00. Phosphate concentration was allowed to vary in the first batch study, but was held constant during the second. Soluble COD, pH, and soluble PO4 measurements were taken for all sludge samples, while sludge total phosphorus content measurements were performed on selected samples. Results demonstrated: (1) phosphate removal in an activated sludge environment is primarily biochemical in nature; (2) total phosphorus content of activated sludge cells increases directly as the F/M ratio increases; (3) the primary phosphate uptake mechanism in activated sludge is not adsorption; (4) aeration times required for substrate stabilization and maximum soluble phosphate uptake increase as the F/M ratio increases; (5) optimum soluble phosphate removal occurred at F/M ratios of 0.75 to 1.25; and (6) initial sludge phosphate content is pH dependent. (Lowry-Texas)
W72-11630

AN EVALUATION OF VACUUM ROTARY THIN-FILM EVAPORATION FOR THE CONCENTRATION OF TRACE ORGANICS,
Rensselaer Polytechnic Inst., Troy, N.Y.
P. E. Fredette.
Master's Thesis, November 1968. 41 p, 1 fig, 6 tab, 12 ref.

Descriptors: *Analytical techniques, *Organic compounds, *Volatility, *Vapor pressure, Radioactive isotopes, Temperature, Evaporation, Distillation, Laboratory tests, Taste, Odor, *Waste water treatment, Water quality control.
Identifiers: *Trace organics.

Radioactive glycerol, acetic acid, and acetone samples of 1 part per billion concentration were prepared for testing to evaluate rotary thin-film

evaporation as a method for concentrating trace dissolved organics without degradation or polymerization. The system used was a thin-film rotary evaporator operating under vacuum with traps at various temperatures, each colder than the previous trap. These traps served as the means of selectively trapping and differentiating compounds by their degree of volatility. Percent recovery was then determined by liquid scintillation counting. The percent recovery was shown to vary for each experiment and compound. Thin-film evaporation can be used, however, to concentrate trace organics at a 1 ppb initial concentration provided their volatility is low. Those compounds with low vapor pressures can be expected to have a high percentage of recovery, and conversely. (Lowry-Texas)
W72-11631

COMPARISON OF THIN-FILM EVAPORATION AND FREEZE DRYING METHODS OF CONCENTRATION OF ORGANICS IN WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 05G.
W72-11632

THE EFFECT OF SLUDGE WITHDRAWALS ON THE OPERATION OF SMALL ACTIVATED SLUDGE PLANTS,
Rensselaer Polytechnic Inst., Troy, N.Y.
K. E. Drautz.
Master's Thesis, June 1969. 111 p, 15 fig, 34 tab, 17 ref.

Descriptors: *Activated sludge, *Sludge digestion, *Operation and maintenance, *Design criteria, Monitoring, Sampling, Laboratory tests, Biochemical oxygen demand, Chemical oxygen demand, *Waste water treatment.
Identifiers: *Process control, *Sludge withdrawals, *Dehydrogenase activity.

The effects of sludge withdrawals, under both normal and abnormal conditions from the aeration basin of two extended aeration activated sludge plants were evaluated. The parameters used included: (1) BOD; (2) carbon content, (3) COD, (4) plate count; (5) total volatile suspended solids; and (6) dehydrogenase activity. From the data at different time intervals in addition to volume of flow it was then possible to compare the effect of sludge withdrawals on the process. Results indicated that: (1) periodic sludge withdrawals are more beneficial to the proper operation of activated sludge plants than daily sludge transfers; (2) large or excessive sludge withdrawals do not hurt the process, and in some cases may actually increase treatment efficiency by stimulation of organism growth; and (3) in the case of abnormal transfers, results showed a definite trend toward the return of the biological system to normalcy in a brief time span. (Lowry-Texas)
W72-11633

TREATMENT OF METAL PROCESSING WASTES,
Rensselaer Polytechnic Inst., Troy, N.Y.
R. W. Landis.
Master's Thesis, January 1971. 62 p, 12 fig, 15 tab, 14 ref.

Descriptors: *Minerals industry, *Separation techniques, *Chemical precipitation, Sedimentation, Chelation, Flocculation, Coagulation, Hydrogen ion concentration, Chemical oxygen demand, Laboratory tests, *Waste water treatment, *Ohio.
Identifiers: *Metal hydroxides, *Metal finishing wastes, *Elyria (Ohio).

The effectiveness of various treatment methods for metal finishing wastes from the Fisher Body Plant at Elyria, Ohio was investigated. Various problems occurred in the treatment processes, primarily hindered settling of metallic hydroxide floc particles in the clarifier. Various treatment parameters were altered during laboratory tests using the same treatment methods as were employed in the Fisher Plant. Methods found to increase the settling rate included lowering the pH to 7.0 and increasing the dosage of coagulant aid. The decrease in pH, however, resulted in incomplete precipitation of the metal hydroxides and was therefore abandoned. BOD test results were inconclusive due to incompatibility of the seed with the liquid wastes, but COD tests indicated that the plant is discharging an effluent with a significantly reduced COD content. (Lowry-Texas)
W72-11634

THE REMOVAL OF COPPER IONS FROM SOLUTION USING A FLUIDIZED BED OF ION EXCHANGE RESIN,
Rensselaer Polytechnic Inst., Troy, N.Y.
T. C. Miller.
Master's Thesis, August 1967. 55 p, 5 fig, 7 tab, 21 ref.

Descriptors: *Copper, *Separation techniques, *Ion exchange, *Resins, Laboratory tests, Sampling, Analytical techniques, Kinetics, Mixing, Density, Heavy metals, *Waste water treatment.
Identifiers: *Fluidized beds, *Elution, *Exhaustion.

Dilute solutions of copper sulfate were prepared and pumped through beds of cation exchange resin at velocities sufficient to fluidize the bed, to determine the feasibility of applying fluidized bed ion exchange for cooper ion removal. Samples of resin withdrawn from various depths in the bed and analyzed for copper content demonstrated that saturated particles will be located at the bottom of the bed while unsaturated particles will remain near the top. This principle could be utilized for the removal of exhausted resin on a continuous basis, provided a removal mechanism could be devised. It was also demonstrated that beds using larger particles exhibited leakage much sooner than beds using smaller particles, largely accounted for by the higher velocities necessary to keep the larger particles fluidized. Parallel investigations with fixed bed reactors using the same resin showed no advantage for the fluidized bed operation. (Lowry-Texas)
W72-11635

REDOX POTENTIAL-A GUIDE TO OXIDATION POND PERFORMANCE,
Auckland Univ. (New Zealand).
O. D. Brockett, and P. Welsby.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 10, Hall A, Paper No 19, June 21, 1972. 9 p, 5 fig, 2 tab, 3 ref.

Descriptors: *Oxidation-reduction potential, *Oxidation lagoons, *Monitoring, Performance, Instrumentation, Aerobic conditions, Anaerobic conditions, Depth, Metabolism, Sludge digestion, Nutrients, *Waste water treatment.

Measurements of oxidation-reduction potential were made in a full scale oxidation pond at various depths. An area was selected which contained a thick layer of digesting sludge which was also close to a power supply. The three important zones selected for study were the sludge, sludge-liquor interface, and pond top liquor 10-15 cm below the surface. Collection of data was restricted to two seasons, winter when oxidation pond activity is at a minimum, and summer when activity is at a maximum. Allowing for minor variation, the redox potentials of oxidation pond liquor and sludge-liquor interface show a distinctly diurnal pattern. The duration of electropositive values in pond top liquor corresponds to hours of sunshine. Positive peaks in the interface data are of shorter duration with a suggestion of a lag until evening in reaching the maximum in winter time. The sludge was always electronegative with remarkably constant values. Since pond deterioration must be assumed to be largely associated with weather conditions, redox potentials, while not providing a remedy, may be useful as an early indicator of pond instability. (Lowry-Texas)
W72-11636

COMBUSTION DISPOSAL OF MANURE WASTES AND UTILIZATION OF RESIDUE,
Tuscaloosa Metallurgy Research Lab., Ala.
E. G. Davis, J. H. Brown, and I. L. Feld.
Available from the National Technical Information Service as PB-206 892, $3.00 in paper copy, $0.95 in microfiche. Bureau of Mines Solid Waste Research Program, Technical Progress Report No 46, January 1972. 9 p, 1 fig, 5 tab.

Descriptors: *Farm wastes, *Solid wastes, Incineration, Evaporation, Drying, Temperature, Ammonia, Phosphorus, Potassium, Fertilizers, *Waste treatment.
Identifiers: *Soil conditioners, *Combustion.

Samples of horse, hog, dairy cow, broiler chicken, and egg farm chicken manures, as well as feed lot cattle manures were collected and incinerated in both a fluidized bed reactor and a rotary kiln. These tests involved drying of the beed at 90C, size reduction to pass through 10 mesh, and preheating of both the reactor and the fluidizing air for the fluidized bed reactor. These tests demonstrated that the oven dried animal manures would support combustion and be self-sustaining when using air preheated to 250C. Reductions of 90% in weight and 85% in volume were obtained in both reactors. Heat balance calculations revealed that there is sufficient heat to preheat the air and dry the wet manure prior to feeding to the fluid bed when operating on the dried manure. All of the nitrogen can be recovered as ammonia from the exhaust gases, and the potassium and phosphorus concentrate in the solid residue. The residues produced were suitable for use as soil conditioners. (Lowry-Texas)
W72-11637

COMPARISON OF DISCHARGES FROM URBAN STORMWATER RUNOFF, MIXED STORM OVERFLOW AND TREATED SEWAGE,
Allmanna Ingenjorsbyran, Stockholm (Sweden).
G. Soderlund, and H. Lehtinen.
Preprint, presented at Sixth International Conference on Water Pollution Research, Session 9, Hall A, Paper No 17, June 21, 1972. 10 p, 7 fig, 4 tab, 12 ref.

Descriptors: *Combined sewers, *Separated sewers, *Sampling, Storm drains, Storm runoff, Rainfall intensity, Rainfall-runoff relationships, Instrumentation, Suspended solids, Biochemical oxygen demand, Nitrogen, Phosphorus, Water quality control, Waste water treatment.
Identifiers: *Stockholm.

Two urban drainage districts with separated sewer systems, located in Stockholm, were sampled to determine the pollutional content of storm runoff coming from specific installations within a drainage system, as well as from the drainage system as a whole. Rainfall intensity and total rainfall were measured on pluvigraphs, and flow in the storm water sewers was continuously monitored. Results showed that storm water runoff contained considerably greater amounts of suspended solids, but lesser amounts of BOD, phosphorus and nitrogen than the treated sewage. Over a 600 hour period, contribution by storm-water runoff was 20 times the suspended solids, twice the BOD, and 15 percent of the phosphorus and nitrogen contributed by the treated sewage. These results demonstrated also that the pollution potential of flows from separated sewers is just as great as the pollution potential of flows from combined sewers. (Lowry-Texas)
W72-11638

MODEL IDENTIFICATION OF WET-AIR OXIDATION PROCESS THERMAL DECOMPOSITION,
T. Takamatsu, S. Sioya, and I. Hashimoto.
Water Research, Vol 4, 1970. p 33-59, 20 fig, 5 tab, 10 ref.

Descriptors: *Sludge treatment, *Mathematical models, *Oxidation, *Heat treatment, Statistical methods, Activated sludge, Regression analysis, Weight, *Chemical oxygen demand, Temperature, Pressure.
Identifiers: *Wet-air oxidation process, *Thermal decomposition, Reaction rates, Method of steepest descent.

The thermal decomposition reaction by the wet-air oxidation of artificially grown activated sludge was investigated. Experiments to measure the thermal decomposition reaction in which sludge is decomposed without oxygen were conducted in a magnetically stirred autoclave at a temperature range of 170-250C and a pressure range of 60-130 hg/cm2-gage. During these batch experiments the weight or the COD value of the solid matter greatly decreased, but the weight or the COD value of the soluble matter increased. Measurements of changes in weight and COD values versus reaction time were conducted. A mathematical model of the thermal decomposition process with respect to weight changes and COD values was developed. Variables considered in the models were COD and weight of solid matter, soluble nonevaporative matter and soluble evaporative matter. The parameters of the mathematical model were estimated from experimental data by using the steepest descent method. Finally, the prediction of the change of COD was made by linear regression models after the weight of each variable was calculated from the model of the thermal decomposition process based on weight. (Galwardi-Texas)
W72-11640

THE DAN REGION LARGE SCALE OXIDATION PONDS,
Water Planning for Israel Ltd., Tel-Aviv. Dan Region Sewage Reclamation Project.
Y. Folkman, M. Kremer, and P. G. J. Meiring.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 7, Hall C, Paper No 15, June 21, 1972. 12 p, 4 fig, 2 tab, 14 ref.

Descriptors: *Oxidation lagoons, *Municipal wastes, *Water reuse, Algae, Photosynthesis, Dissolved oxygen, Aerobic conditions, Anaerobic conditions, Organic loading, Odor, Sludge, Cost analysis, Nitrogen, Clays, *Waste water treatment.
Identifiers: *Recirculation ratio, *Israel (Dan region).

Although most designers relegate oxidation lagoons to only the smallest installations, large scale oxidation lagoons designed to handle 22,000 cu. m. per day of raw sewage have been giving satisfactory performance with excellent reductions of all indicators of pollution. The ponds are presently operating at their overall design load of 230 kg BOD/day/hectare of surface area, but loading is to be increased quite gradually. The performance of the primary ponds depends almost entirely on the 1.5 to 1 recirculation rate of effluent from the last pond in the recirculation pond system back to the primary pond. No odor problems or sludge build-up problems have been encountered. Cost of sewage treatment in the secondary ponds was increased to 2.6 U. S. cents per cubic meter treated because of the quantities of sand dunes to be moved, as well as the necessity of lining the bottoms. However, a 65 to 70% reduction of an average 90 mg/l total nitrogen influent is accomplished at this price, far less than the cost of removing nitrogen by any other biological means. (Lowry-Texas)
W72-11642

SPENT COFFEE GROUNDS TURNED TO PROFIT,
Western Kentucky Univ., Bowling Green.
M. T. Bond, and L. W. Canter.
Water and Sewage Works, Vol 117, No 3, March-April 1970. p IW/11-IW/15, 6 fig, 13 ref.

Descriptors: *Solid wastes, *Industrial wastes, *Mechanical equipment, Time, Temperature, Incineration, Lime, Nutrients, Fertilizers, Laboratory equipment, Laboratory tests, Economics, *Waste treatment.
Identifiers: *Coffee grounds, *Composting, Windrow composting, Thermophilic heat recovery, Soil conditioner.

Based on production of soluble coffee, approximately 144,000 tons of solid waste as spent coffee grounds were produced annually on a national basis. Spent coffee grounds can be incinerated after drying with an economic benefit resulting if heat recovery principles are utilized as spent coffee grounds have a heat value of approximately 9,000 BTU/lb. The use of spent coffee grounds as a composted soil conditioner was investigated by laboratory simulation of both mechanical composting and windrow composting. It was shown that composting could be accomplished with the addition of 1.0 lb of lime as a buffer and 0.25 lb of a balanced 8-8-8 fertilizer per 100 lb of spent coffee grounds. Due to the fineness of the particles, a mechanical composting process was recommended. A time interval of approximately two weeks was required before the temperature inside the mechanical composter dropped below the thermophilic level; therefore, two weeks was the suggested time interval for composting. Approximately 35 percent of the dry solids would be removed during a 2 week compost cycle and thus a yield of about 47 lb of dry composted material from each 132 lb sack of green beans used in the manufacture of soluble coffee could be obtained. (Galwardi-Texas)
W72-11643

MARINE DISPOSAL OF DIGESTED SCREENED WASTEWATER SOLIDS,
For primary bibliographic entry see Field 05E.
W72-11644

FORMAL DISCUSSION OF 'MARINE DISPOSAL OF DIGESTED SCREENED WASTEWATER SOLIDS',
Pomeroy, Johnston, and Bailey, Pasadena, Calif.
For primary bibliographic entry see Field 05E.
W72-11645

FORMAL DISCUSSION OF 'MARINE DISPOSAL OF DIGESTED SCREENED WASTEWATER SOLIDS',
Rofe and Raffety, London (England).
For primary bibliographic entry see Field 05E.
W72-11646

REVERSE OSMOSIS FOR WATER RECLAMATION,
General Dynamics, San Diego, Calif. General Atomic Div.
V. Merten, and D. T. Bray.
Advances in Water Pollution Research, Vol 3, 1966. p 315-325, 5 fig, 2 tab, 18 ref.

Descriptors: *Reverse osmosis, *Water reuse, *Municipal wastes, *Equipment performance, *Membranes, Size, Permeability, Selectivity, Retention, Calcium magnesium, Phosphates, Sulfates, Chemical oxygen demand, Alkylbenzene sulfonates, Dissolved solids, Ammonia, Nitrogen, Time, *Waste water treatment.
Identifiers: *Cellulose acetate membrane, Multivalent ions, Univalent ions.

A reverse osmosis system for water reclamation was investigated. Previous studies in this area and the characteristics of cellulose acetate membranes were reviewed. The reverse osmosis system consisted of five spiral-wound membrane modules operating in parallel. Each module was 30 cm long and contained about 5,000 sq cm. of active membrane area. Feed water consisted of municipal waste water which had received secondary treatment and had been passed through a diatomaceous earth filter. Three different membrane types were utilized. All were of cellulose acetate, but the final heat treatment was varied so that membranes of various permeabilities and selectivities were obtained. Analytical results obtained for three of the modules tested were arranged in tabular form. Retention of the multivalent ions calcium, magnesium, the phosphates and sulfate were excellent, but univalent ions were not as well retained by the high-selectivity membranes. Sharp reductions in COD, ABS and total dissolved solids were obtained with the more selective membranes, but the reduction of ammoniacal nitrogen was not as good although the most selective membrane effected a fivefold concentration reduction. The flow behavior of the high-selectivity modules indicated a 20 percent decline in permeability over the 1,500 hour test period. (See also W72-11648 and W72-11649) (Galwardi-Texas)
W72-11647

FORMAL DISCUSSION OF 'REVERSE OSMOSIS FOR WATER RECLAMATION',
Polytechnic Inst. of Brooklyn, New York.
H. P. Gregor.
Advances in Water Pollution Research, Vol 3, 1966. p 326-327.

Descriptors: *Reverse osmosis, *Water reuse, *Municipal wastes, Membranes, Performance, Hydrogen ion concentration, Porosity, Organic matter, Dissolved solids, Chemical oxygen demand, Selectivity, Costs, *Waste water treatment.
Identifiers: Cellulose acetate membranes, Leob-type membranes, Power consumption.

The effects of hydrogen-bonding, pH of influent water, porosity, and contamination by organic matter on cellulose acetate membranes used in reverse osmosis systems for water reclamation were discussed. It was reported that power requirements consumption at approximately three or four times the theoretical is not uncommon and the cost of equipment is still largely an unknown factor. Limited information on the operation of reverse-osmosis devices has been available. However, a unit using the Leob-type membranes was operated for over 600 hr with more than 90% desalinization of a 1500 mg/l influent and more than 90% rejection of COD from an initial level of 80. It would appear that only the product water from the moderate and highly selective membrane modules would be satisfactory. (See also W72-11647 and W72-11649) (Galwardi-Texas)
W72-11648

FORMAL DISCUSSION OF 'REVERSE OSMOSIS FOR WATER RECLAMATION',
Washington State Univ., Pullman.
E. Hindin.
Advances in Water Pollution Research, Vol 3, 1966. p 327-331, 2 tab, 7 ref.

Descriptors: *Reverse osmosis, *Water reuse, *Municipal wastes, Performance, Sodium, Pressure, Time, Enteric bacteria, Bacteriophage, Efficiencies, Membranes, Laboratory tests, Permeability, Biological treatment, Effluents, *Waste water treatment.
Identifiers: Flux, Inorganic cations, Organic anions, Cellulose acetate membrane.

Studies at Washington State University have shown the feasibility of using the principles of reverse osmosis as a means of reclaiming potable water from biologically treated effluents. A Schleicher and Schuell Co. type B-18 membrane was found the most satisfactory of the commercially available cellulose acetate membranes examined with removals of 66-89% of sodium from a 1,000 mg/l sodium ion saline solution at a flux of 8-25 gpd/sq. ft. and a pressure of 105 atm. After 312

hr. of continuous use the flux decreased 35 percent and the ability to remove sodium ions decreased 27 percent. Results from permeation studies of 12 inorganic ions and ABS conducted on a reverse osmosis unit operated at a pressure of 102 atm and flux of 20 gpd/sq. ft. were arranged in tabular form. Also, the permeation of nine inorganic cations and five organic anions was investigated. In most cases the percent reduction decreased with increase in concentration. Each cation in an aqueous mixture of the chlorides of ammonium, calcium, magnesium, sodium, and potassium had greater retention than each cation when present singly in an aqueous solution. Also, enteric microorganisms, serratia marcescens, and two types of phage did not pass through the membrane. (See also W72-11647 and W72-11648) (Galwardi-Texas)
W72-11649

VIRUS REJECTION BY THE REVERSE OSMOSIS-ULTRAFILTRATION PROCESSES,
Texas Univ., Austin. Center for Research in Water Resources.
C. A. Sorber, B. P. Sagik, and J. R. Malina, Jr.
Available from the National Technical Information Service as AD-735 750, $3.00 in paper copy, $0.95 in microfiche. Technical Report to the U. S. Army Mobility Equipment Research and Development Center, 1971, EHE-71-9, CRWR-82, 86 p, 13 fig, 19 tab, 67 ref. DAAK 02-71-C-0145.

Descriptors: *Viruses, *Separation techniques, *Membrane processes, Laboratory tests, Analytical techniques, Polyelectrolytes, Hydrogen ion concentration, Temperature, *Reverse osmosis, Public health, *Waste water treatment.
Identifiers: *Ultrafiltration.

Various concentrations of coliphage T2 and poliovirus were inoculated in the feed water of a bench scale ultrafiltration-reverse osmosis unit to determine the efficiency of commercial grade asymmetrical cellulose acetate membranes in rejecting viruses. The insoluble polyelectrolyte virus concentration technique was used to allow determinations of small initial viral titers. Waters used were Phosphate Buffered Saline (PBS) and lake water, both for testing the efficiency of the insoluble polyelectrolyte method, and for use as feed to the reverse osmosis ultrafiltration units to be tested. The cellulose acetate membranes rejected from 99.2 to over 99.999 percent of the coliphage T2 and poliovirus present in the feed solution. Penetration of the membranes by the viruses was shown to be a random phenomenon over a broad range of feed water virus concentrations. (Lowry-Texas)
W72-11650

5E. Ultimate Disposal of Wastes

BURYING YOUR PICKLE LIQUOR DISPOSAL PROBLEM,
Kaiser Engineers, Inc., Chicago, Ill.
R. D. Smith.
Civil Engineering, Vol 39, November 1969, p 37-38. 1 fig, 4 ref.

Descriptors: *Acid streams, *Deep wells, *Waste water disposal, Mineral industry, Geologic mapping, Permeability, Suspended solids, Diatomaceous earth, *Ohio, Filtration, Instrumentation.
Identifiers: *Waste pickle liquor, *Subsurface injection, *Rock strata, *Middletown (Ohio).

Armco Steel Corporation's strip rolling and processing complex at Middletown, Ohio, will produce up to 100 gpm of spent acid pickle liquor containing 0-1% hydrochloric acid, 20-25% ferrous chloride, 0-2% ferric chloride, and a temperature of 200F. Deep well disposal was the most feasible method of providing indefinite isolation at a reasonable cost. After intensive testing to further insure safety, feasibility, and efficiency, a system was developed to first filter the waste through diatomaceous earth precoat filters to remove suspended solids, with an in-line turbidimeter automatically diverting liquor with detectable solids to avoid plugging of the sandstone pores. This deep well system meets the following essential criteria: (a) a permeable injection zone compatible with the spent liquor; (b) a sufficiently large reservoir volume; (c) an injection zone isolated by rock strata above and below; (d) no known geological faults or improperly plugged wells; (e) satisfactory injection pressures at desired flows; and (f) existing brines in the area were of no practical value. (Lowry-Texas)
W72-11094

INDUSTRIAL MANAGEMENTS' CONCERN,
General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Field 05D.
W72-11108

METHOD AND APPARATUS FOR TREATING AND DISPOSING OF SEWAGE,
For primary bibliographic entry see Field 05D.
W72-11142

MUNICIPAL WASTE DISPOSAL,
Fermbionics, Inc., Joplin, Mo. (assignee).
For primary bibliographic entry see Field 05D.
W72-11144

SUPERVISOR OF THE HARBOR PERMIT PROGRAM FOR WASTE DISPOSAL IN THE ATLANTIC OCEAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 05G.
W72-11265

OCEAN OUTFALL EXTENSION PROJECT, CARMEL SANITARY DISTRICT, CARMEL, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, San Francisco, Calif., and California State Water Control Board, San Francisco.

Available from the National Technical Information Service as PB-202 585D, $3.00 in paper copy, $0.95 in microfiche. September 1971. 20 p, 3 fig, 58 ref.

Descriptors: *California, *Outfall sewers, *Environmental effects, *Discharge (Water), *Sewage effluents, Wastes, Effluents, Eutrophication, Sewers, Conveyance structures, Engineering structures, Nozzles, Waste water (Pollution), Waste disposal, Pipes, Irrigation, Evaporation, Percolation.
Identifiers: *Environmental Impact Statements.

This project would involve the construction of an ocean outfall sewer extension in Carmel Bay off the central coast of California. The project is an interim solution to an immediate pollution problem in the area and the ultimate long term solution will be the complete discontinuance of discharging effluents into Carmel Bay. The wastes are currently being discharged through a cast-iron pipe terminating 200 feet from shore. The proposed outfall would extend this 895 feet. The principal environmental impact will be to lower existing conditions of pollution near the shore line in Carmel Bay. Temporary biological damage can be expected along the route of the trench in which the outfall pipe will be placed. Creation of a long waste plume would represent an undesirable adverse aesthetic effect. Alternatives to the project include a longer outfall sewer extending seaward beyond Carmel Bay, and land disposal by irrigation and evaporation-percolation ponds. The extension and land disposal were rejected as too expensive. Percolation would lead to accelerated eutrophication of Carmel River. (Nielson-Florida)
W72-11266

HYDRODYNAMICS IN DEEP AQUIFERS OF THE ILLINOIS BASIN,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02F.
W72-11291

WASTEWATER MANAGEMENT PROJECT MUSKEGON COUNTY, MICHIGAN,
Illinois Univ., Chicago. Center for Urban Studies.
For primary bibliographic entry see Field 03F.
W72-11381

ACID-IRON WASTE DISPOSAL AND THE SUMMER DISTRIBUTION OF STANDING CROPS IN THE NEW YORK BIGHT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W72-11570

ASPECTS OF SLUDGE DISPOSAL IN GREATER LONDON,
Greater London Council (England). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 05D.
W72-11623

MARINE DISPOSAL OF DIGESTED SCREENED WASTEWATER SOLIDS,
N. B. Hume, and W. F. Garber.
Advances in Water Pollution Research, Vol 3, 1966. p 243-257, 8 fig, 4 tab, 19 ref.

Descriptors: *Sludge disposal, *Oceans, *Municipal wastes, *Ultimate disposal, Screens, Sludge digestion, Anaerobic digestion, Aesthetics, Public health, Public benefits, Ecological distribution, Coliforms, Depth, Discharge lines, Surveys, *California.
Identifiers: Marine disposal, *Los Angeles (Calif), Hyperion Waste Water Treatment Plant, Santa Monica Bay.

Development of the Los Angeles metropolitan area has made ocean disposal of waste water and treated solids the most logical alternative. The City of Los Angeles has carried on a comprehensive oceanographic program for the past 10 years in order to insure the preservation of all beneficial uses of Santa Monica Bay. Examination of the substantial amounts of data obrained has indicated that the public health, aesthetic and ecological values of the receiving waters have been little affected by the discharge from a complex carefully engineered to prevent degradation of these values. The Hyperion Treatment Plant of the City of Los Angeles has discharged 325,000 lb/day of digested solids into 300 ft. of seawater 7 miles from shore. Approximately 300 mgd of mixed effluents with their residual solids have been discharged into 210 ft. of seawater 5 miles from shore. Coliform levels at all survey stations have been well within prescribed public health limits. All solids have received a 2-pass screening through 7 mesh screens prior to discharge. Although 160 tons/day of digested solids have been discharged at a single point, essentially no buildup has been recorded. An increase in volatile matter was noted in the first inch of bottom sands from 1.4 percent to a value which has leveled off at 2.2 percent. Results from bottom organic matter studies conducted over the 225 sq. mile monitor area over a 6 year period were arranged in tabular form. (See also W72-11645 and W72-11646) (Galwardi-Texas)
W72-11644

FORMAL DISCUSSION OF 'MARINE DISPOSAL OF DIGESTED SCREENED WASTEWATER SOLIDS',
Pomeroy, Johnston, and Bailey, Pasadena, Calif.
R. D. Pomeroy.
Advances in Water Pollution Research, Vol 3, 1966. p 257-259, 1 ref.

Descriptors: *Sludge disposal, *Oceans, *Municipal wastes, *Ultimate disposal, Settling basins,

Overflow, Skimming, Stratification, Thermocline, Depth, Distance, Winter, Summer.
Identifiers: Marine disposal, Los Angeles, Overflow rates, Floatable material, Isothermal.

Deep skimming baffles and efficient facilities for the removal of floatable material should be given prime consideration in the design of plants to treat sewage for marine disposal. The new sedimentation tanks constructed by the City of Los Angeles when the new sewage outfall was placed in use were designed for a rate of 2,000 gpd/sq. ft. The coast of California has been a favorable place for disposal of sewage with only primary treatment, because fairly deep water can be reached at a moderate distance and density stratification helps to keep the sewage field mostly submerged. It was reported that the sewage field over a 35 m deep ocean outfall was more dilute and had a lower bacterial concentration in the summer, when the thermocline developed at a depth of about 10 m, than in the winter, when the sea was nearly isothermal. (See also W72-11644 and W72-11646) (Galwardi-Texas)
W72-11645

FORMAL DISCUSSION OF 'MARINE DISPOSAL OF DIGESTED SCREENED WASTEWATER SOLIDS',
Rofe and Raffety, London (England).
C. B. Townsend.
Advances in Water Pollution Research, Vol 3, 1966. p 259-261.

Descriptors: *Sludge disposal, *Oceans, *Municipal wastes, *Ultimate disposal, Sludge digestion, Costs, Operating costs, Anaerobic digestion, Activated sludge.
Identifiers: Marine disposal, United Kingdom, London, Manchester.

The effects brought about by each state of improvement by the City of Los Angeles covering screening, chlorination, primary and secondary treatment with both high-rate and standard-rate aeration, as well as extensions of outfall lengths, have been shown clearly. These developments in ocean discharge were of great interest with respect to the maritime conditions of the United Kingdom, where no less than 30 percent of the country's waste waters are finally discharged to tidal waters. Sixteen percent of all sludges from treatment plants have been barged to sea for ultimate disposal. Costs were reported for London as being $3-5/1000 lb of dry solids on the daily production of 950,000 lb and for Manchester as being $6.25/1000 lb on the smaller output of 156,000 lb. When both Manchester and London progressed to full activated sludge treatment, they also had to adopt digestion in order to minimize sludge volumes, and thus the costs of their shipping operations. (See also W72-11644 and W72-11645) (Galwardi-Texas)
W72-11646

5F. Water Treatment and Quality Alteration

NEW YORK COMMUNITY IMPROVES WATER SUPPLY SYSTEM,
Metcalf and Eddy, New York.
G. P. Fulton.
Water and Sewage Works, Vol 117, No 5, May 1970, p 144-147. 1 tab.

Descriptors: *Water treatment, *Filters, Pumping plants, Automatic control, Treatment facilities, Sludge treatment, Sludge disposal, Settling basins, Freezing, Chlorine, *New York.
Identifiers: *Rapid sand filters, Anthrafilt, Alum, *Auburn (NY).

The City of Auburn, New York has completed improvements to its water supply system which included additions and alterations to the existing upper raw water pumping station and to the lower booster pump station delivering treated water to the distribution system. The major system improvement was the addition of a 5 mgd rapid sand filter plant to operate in parallel with the existing slow sand filter facilities. Improvements to the pumping stations consisted of control equipment for automatic operation and for remote supervisory control. Also, two 16 mgd electric motordriven booster pumps were installed. The rapid sand filter plant consists of chemical feed equipment for alum and chlorine, a 72 ft. diameter clarifier and three, 15 ft. x 26 ft. anthrafilt filters. A control console monitors all filter plant equipment operation. A distinguishing feature of the new filtration plant facilities was that the building and structures were of a design compatible with a neighborhood zoned exclusively for residential development. A turbine headrace at the lower pumping station has been converted to a waste handling facility to receive clarifier sludge blowdown and filter backwash flows. The raceway was divided in half with one section to serve as a settling basin. The settled sludge will periodically be transferred to the adjoining basin by portable pump during winter months. The amount withdrawn should be such that it will freeze thoroughly by layers. The granular consistency of the accumulated solids should permit easy disposal as landfill. (Galwardi-Texas)
W72-11103

SEDIMENTATION SYSTEM,
Aktiebolaget Purac (Sweden).
L. G. Malm.
U. S. Patent No 3,659,720, 3 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 898, No 1, p 119, May 2, 1972.

Descriptors: *Settling tanks, *Patents, *Water purification, Sewage treatment, Sedimentation, Separation techniques, *Water treatment, *Waste water treatment, Pollution abatement, Water pollution, Water pollution treatment, Water quality.

This invention utilizes the vertical sedimentation principle in sedimentation basins having large diameters. This is done by placing one or more concentrically positioned elements in the basin to draw off the clear water phase. One or more fall pipes interconnect the elements with discharge pipes that are placed in connection with the bottom of the basin. (Sinha-OEIS)
W72-11165

METHOD FOR WATER AND WASTEWATER TREATMENT,
For primary bibliographic entry see Field 05D.
W72-11169

STANDARDS FOR ESTIMATION OF DRINKING AND INDUSTRIAL WATER WITH A STRESS ON WATER REHABILITATION PROCESSES BY TREATMENT WITH OZONE (OZONIZATION) AND WITH CHLORINE DIOXIDE TO IMPROVE THE TASTE AND SMELL OF WATER,
State Inst. of Hygiene, Warsaw (Poland).
J. Kelus, and C. Sikorowska.
Biul Sluzby Sanit Epidemiol Wojewodztwa Katowickiego. Vol 14, No 2, p 113-118. 1970.
Identifiers: Chlorine, Criteria, Potable water, Industrial water, *Organoleptic properties, Ozonization, Water purification, *Standards, Taste, Odor, *Water quality.

The most widely used and established standards are the organoleptic criteria, i.e. the taste and flavor of water. The original 5-grade criterion of smell intensity has now been improved by the introduction of the so-called threshold flavor. A water sample is diluted until the smell disappears; the estimation is based on the multiple of dilution.--Copyright 1972, Biological Abstracts, Inc.
W72-11212

ATTITUDE OF US PUBLIC HEALTH SERVICE IN DEVELOPMENT OF DRINKING WATER STANDARDS, 1961,
Public Health Service, Washington, D.C. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 05G.
W72-11394

DETERMINATION OF OPTIMUM STORAGE IN DISTRIBUTION SYSTEM DESIGN,
Dallas, City Water Utilities, Tex.
For primary bibliographic entry see Field 04A.
W72-11395

WATER QUALITY STANDARDS,
For primary bibliographic entry see Field 05G.
W72-11396

TOXICOLOGIC METHODS FOR ESTABLISHING DRINKING WATER STANDARDS,
Robert A. Taft Sanitary Engineering Center, Cincinnatti, Ohio.
For primary bibliographic entry see Field 05G.
W72-11397

ACTION NOW - A VIEW FROM CHICAGO,
Chicago Dept. of Water and Sewers, Ill.
J. W. Jardine.
Journal of the American Water Works Association, Vol 64, No 5, p 271-274, May 1972. 3 photo.

Descriptors: *Water management (Applied), Water resources development, *City planning, *Water treatment, Financing, Technical societies, *Illinois, *Treatment facilities.
Identifiers: *Metropolitan water resources management, *Chicago.

Chicago has an 'Action Now' program, not only for its water system, but concerning all facets of its development. Since 1955, 'Action Now' has invested over $320,000,000 in the Chicago water system for the improvement of plants and facilities. The service area has increased by 100 square miles. At present, the water system serves about 4,500,000 people residing in Chicago and 72 suburban communities, i.e., over 41% of the population of Illinois. The central water filtration plant is the largest single addition to the water system. The problem of water treatment plant waste disposal has been studied, funded, and put into the 'Action Now' phase. Two new electrically operated stations have been placed in service, so that the water system is not dependent upon a single private utility for its energy requirements. Chicago's present 5-year capital improvement program allocates money for new feeder mains, small-main extensions, and the cleaning and lining of existing water mains. 'Action Now' can be a continuing program. One of the key elements for a successful improvement plan is participation through technical associations with others having common interests. (Strachan-Chicago)
W72-11477

PROTECTING COMMUNITY WATER SUPPLIES,
Environmental Protection Agency, Washington, D.C.
R. D. Lee.
Journal of the American Water Works Association, Vol 64, No 4, p 216-219, April 1972. 3 photo, 5 ref.

Descriptors: *Water supply, *Water quality control, Water treatment, *Utilities, *Public health, Management, Monitoring, Protection.
Identifiers: *Community Water Supply Study, Surveillance.

Frequent laxity of standards and slipshod practices by some water utilities have been revealed by the Community Water Supply Study. An assessment of public health protection provided by a

water supply is based on the overseeing by a public agency of the monitoring activities every water utility should conduct to produce and deliver safe, wholesome, and potable water to its customers. Such surveillance includes regular engineering evaluations of sources of supply, treatment facilities, adequacy of operation, and protection in the distribution systems. Additionally, the surveillance agency should require the utilities to furnish, for its review, the results of bacteriological and chemical monitoring tests that have been performed in approved laboratories. Agency failure to provide laboratory services does not relieve the utility from its monitoring responsibilities. The utility should conduct sanitary surveys of water sources, treatment plants, and distribution systems to be sure it can continuously discharge its responsibility to deliver safe water. Cross-connection control is an integral part of the sanitary surveys and the utility management must diligently pursue every possibility to detect and eliminate the hazards. Better methods of quality surveillance and greater responsibility for safe water on the part of the utilities are needed. (Strachan-Chicago)
W72-11480

HEALTH FACTORS AND REUSED WATERS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-11506

AN ASIAN TECHNOLOGICAL APPROACH TO WATER REUSE SERIES FILTRATION USING LOCAL FILTER MEDIA,
Asian Inst. of Tech., Bangkok (Thailand).
R. J. Fraenkel, and A. S. Sevilla.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 11, Hall B, Paper No 21, June 22, 1972. 9 p, 5 fig, 1 tab.

Descriptors: *Water treatment, *Filtration, *Porous media, Laboratory tests, Flotation, Oil, Sands, Turbidity, Color, Biochemical oxygen demand, Coliforms, Separation techniques.
Identifiers: *Rice husks, *Coconut husks.

Four columns, 13.5 cm square by 2 meters deep, were used in laboratory scale filtration tests on both raw and burnt rice husks, coconut fiber, and locally obtainable charcoal and pea gravel. The charcoal was discarded as useless, but % removal efficiencies for the other products tested on a 100-400 JTU influent were: (1) pea gravel, 30-60% for a 72 hour run; (2) raw rice husks, 65-95% for a 90 hour run; (3) burnt rice husks, 93-99% for a 16 hour run; and (4) shredded coconut husks, 93-99% for a 120 hr. run. Higher head losses occurred more quickly in the burnt rice husks, indicating their possible use in tertiary or polishing filters. A water treatment scheme employing a shredded coconut husk roughing filter, providing removals of BOD, turbidity, color, and coliforms ranging from 30-80%, followed by a burnt rice husk or combination burnt rice husk/sand filter provided total removal efficiencies that approach 99% for color, turbidity, and coliforms, and possibly 95% for BOD. Savings anticipated will arise from chemical coagulant elimination, reduced chlorine demand, design and structure simplicity of the filter units, reduced labor requirements, lower level of operator training required, and reduced operation and maintenance costs. Pilot scale investigations are proceeding. (Lowry-Texas)
W72-11613

THE ROLE OF THE WATER FACTOR IN THE SPREAD OF INTESTINAL INFECTIONS,
For primary bibliographic entry see Field 05B.
W72-11692

5G. Water Quality Control

A FLUSHING SYSTEM FOR COMBINED SEWER CLEANSING.
FMC Corp., Santa Clara, Calif. Central Engineering Labs.
For primary bibliographic entry see Field 05D.
W72-11089

FLUIDIC VORTEX BUBBLE GENERATOR.
Bowles Fluidics Corp., Silver Spring, Md.
For primary bibliographic entry see Field 05D.
W72-11090

THE PRODUCTION OF CHARCOAL FROM BAGASSE,
Hawaii Univ., Honolulu. School of Public Health.
R. F. McCauley, N. C. Burbank, Jr., and R. H. F. Young.
Proceedings, Industrial Waste Conference, 25th, May 7-9, 1970, p 551-558. 1 tab, 6 ref.

Descriptors: *Industrial wastes, *Sugar cane, *Economic feasibility, Cost comparisons, Cost analysis, Temperature, Compaction, Fuels, Market value, *Hawaii, Waste treatment.
Identifiers: Charcoal production, *Bagasse, Briquettes, Heat value, Power production.

The production of charcoal from bagasse, a solid waste resulting after the extraction of sugar from sugar cane was investigated. Bagasse can be utilized as fuel for the operation of sugar mills and in terms of fuel oil of equal heat value, wet bagasse now has a value of $8 to $10 per wet ton. Charcoal was produced in laboratory studies by two methods: (1) in a specially constructed pipe retort; and (2) by use of open 300 ml containers. Charcoal yields averaged 29 percent at distillation temperatures between 425 and 600C. Tar and distillate averaged 36 percent and gas production, having a heat value of 300 BTU/ft3 averaged 10 liters/100 g of bagasse. With open 300 ml containers, the charcoal yield varied from 24.4 percent at 600C to 31 percent at 400C. Briquetting problems were solved y the use of Swift's protein colloid, Fluid Z-2236 Binding Acid, a moisture content of 60 to 62 percent and a compaction process. Several commercially available binding agents which are dust inhibitors were test sprayed on the briquettes so as to provide a coating. The least value of the bagasse charcoal briquettes was established as 15,000 BTU/lb. An economic analysis for the production and marketing of bagasse charcoal was presented. Charcoal production would be a feasible outlet for excess bagasse selling for $2 to $4 per wet ton. Hawaii has an annual bagasse waste of 7 million tons of which 4.2 million tons is burned for power and the rest poses serious disposal problems. A survey revealed that the lowest retail price for charcoal in Hawaii was 7.7 cents per pound. (Galwardi-Texas)
W72-11098

EFFLUENT STANDARDS FOR INDUSTRIAL RIVERS,
Mersey and Weaver River Authority (England).
C. Lumb.
Water Pollution Control, Vol 68, Part 3, 1969, p 300-306. 2 tab, 12 ref.

Descriptors: *Effluents, *Standards, *Regulation, *River systems, *Industrial wastes, Aerobic conditions, Biochemical oxygen demand, Oil, Toxicity, Heavy metals, Color, Temperature, Dissolved oxygen, Suspended solids, Water quality control.
Identifiers: Effluent standards, Industrial rivers, Sewage fungus, Grease, England.

Some general considerations of water quality requirements in relation to parameters of pollution and appropriate effluent standards for industrial rivers were discussed. Maintenance of aerobic conditions, freedom from sewage fungus, freedom from oil, grease and floating scum, freedom from toxic substances, and limitation of suspended solids were considered essential. An effluent standard in the range of 20-40 mg/l BOD was considered technically feasible in most cases. However, the BOD of the receiving water should be considered in establishing a permissible BOD effluent load. Also, the concept that purified sewage effluents discharged to industrial rivers should include a minimum content of nitrate was presented. The control of the oxygen consuming properties of storm-sewage discharges presented a problem in establishing effluent standards. Sewage fungus growth was reported to be significant only when the BOD values of the river water were in excess of 10 mg/l. Suspended solids limitations of 30 mg/l from purified sewage effluents and 100 or 120 mg/l from storm-sewage tank effluents were deemed reasonable. Effluent standards of 5 to 10 mg/l of free oil and that the content of toxic heavy metals in the receiving water shall not exceed 1 mg/l were reported. Temperature limitations from 30 to 32.5C for effluent discharges were also reported. (Galwardi-Texas)
W72-11106

STORM-WATER RETENTION CAN WORK,
Detroit Metro Water Dept., Mich.
For primary bibliographic entry see Field 05D.
W72-11110

FIELD STUDIES OF ARTIFICIAL AERATION USING A DOWNFLOW TUBE CONTACTOR,
Tufts Univ., Medford, Mass.
J. J. McKeown, G. W. Gove, and A. H. Benedict.
Proceedings, Industrial Waste Conference, 25th, May 7-9, 1970, p 865-884, 20 fig, 2 tab, 14 ref.

Descriptors: *Dissolved oxygen, *Aeration, *Artificial use, *Oxygen, *Transfer, Temperature, Depth, Mixing, Flow characteristics, Velocity, Ponds, Efficiencies, Performance, Oxygen requirements, On-site investigations.
Identifiers: Downflow bubble tube contactor, Surface aerators, Penstocks.

The effects of artificial aeration on a 60 ft. deep pond formed by a power dam using a downflow tube contractor were investigated. The contractor pumped surface waters into contact with air and discharged the air/water mixture at various depths below the pond surface. Downflow tubes having lengths of 10, 20 and 40 ft. were used. The experimental contactor consisted of an axial flow pump which delivered 4,850 gpm at a total dynamic head of 7.7 ft. Power consumption was 14.2 hp. Surveys which were conducted to define the zone of influence of the contactor utilized the determination of temperature and dissolved oxygen with depth at sampling locations in the pond surrounding the contactor. Also, velocity and direction of flow measurements were made in the pond using a directional rotor current meter. Mixing characteristic, recycle effects, changes in pond dissolved oxygen and surface bubble patterns were noted for a two month period. The influence of nearby surface aerators and the powerhouse penstocks was also noted. Results from oxygen transfer computations were arranged in tabular form. The downflow bubble contactor was capable of providing D. O. concentration levels of 5 to 8 mg/l in water having initial D. O. levels of 0 to 4 mg/l. It also has the capability of discharging near the bottom of lakes, which may be desirable in certain cases. Oxygen transfer was observed to be 1.1 to 1.4 lbs O2/hp-hr in the downflow tube. (Galwardi-Texas)
W72-11112

APPARATUS FOR COLLECTING WASTE FROM THE SURFACE OF A BODY OF WATER,
J. F. Walton.
U. S. Patent No. 3,656,624, 4 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 3, p 884, April 18, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Flotsam, Pollution abatement, Separation techniques, Water pollution treatment, Water pollution, Equipment, Waste treatment.

This invention consists of a waste collecting vessel which includes an impeller assembly. The assembly comprises a cylindrical support and flexible, circumferentially supported blades. Blades are detachable and may be folded when the support is rotated. There is a skimmer plate for engaging the blades when the support is rotated in the other direction. A pipeline system is used to remove material from the deep well of the tank. (Sinha-OEIS)
W72-11135

LIQUID SEPARATION APPARATUS,
Underwater Storage, Inc., Washington, D.C. (assignee).
H. G. Quase.
U. S. Patent No. 3,656,623, 4 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 897, No 3, p 884, April 18, 1972.

Descriptors: *Patents, *Flotsam, *Oil spills, *Oil pollution, Separation techniques, Water pollution treatment, Pollution abatement, Water pollution, *Liquid wastes, Equipment.

The liquid separation apparatus comprises a floating platform designed for use in cleaning any body of water. Polluted water is drawn into separation tanks. Screens prevent the outflow of the waste. The main separation tanks have liquid level control devices. These provide a constant ballast and hence constant submergence of the platform. Skimmer devices may be included within the separation tanks to remove and hold collected oil. (Sinha-OEIS)
W72-11136

APPARATUS AND METHOD FOR REMOVING FLOATING POLLUTANTS FROM A BODY OF WATER,
D. J. Ryan, W. P. Ledet, and J. R. Colvin.
U. S. Patent No. 3,656,619, 4 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 897, No. 3, p 883, April 18, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution, Water pollution treatment, Pollution abatement, Equipment, Separation techniques, Flotsam.

This apparatus is adapted to move along in a body of water and pick up oil or other floating pollutants on the surface of the water. It comprises a hull with an inlet opening in one wall. Separator units are arranged for receiving the liquid. These are conventional centrifugal separators. Water separated from the mixture passes into a water compartment which has a tubular discharge pipe. The flow through the pipe is increased by reduced pressure at the rear of the hull due to the movement of the vessel to thereby increase the flow of the liquid through the separator units. (Sinha-OEIS)
W72-11137

RADIATION TREATMENT OF MINE WASTE WATERS,
Atomic Energy Commission, Washington, D.C. (assignee).
For primary bibliographic entry see Field 05D.
W72-11145

APPARATUS FOR REMOVAL OF OIL FLOATING ON WATER OR THE LIKE,
Gulf Research and Development Co., Pittsburgh, Pa.
R. C. Amero, and G. I. Karner.
U. S. Patent No 3,534,859, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office Vol 879, No 3, p 790, October 20, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Equipment, Separation techniques, Water pollution, Water pollution treatment.

The apparatus comprises an inner flotation member, an outer member surrounding it and a device for joining them. These float with the uppermost portion of the inner flotation member at a predetermined level with respect to the interface between the water and the liquid floating on it. A collection vessel extends downward from the inner member and has a means to transport the liquid into the vessel away from the apparatus. (Sinha-OEIS)
W72-11154

POLLUTION CONTROL DEVICE,
J. W. Harrington.
U. S. Patent No 3,534,858, 3 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office Vol 879, No 3, p 790, October 20, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Separation techniques, Water pollution, Water pollution techniques, Pollution abatement, Waves (Water), Ocean waves.

This invention comprises a flexible suction hose connected with a suitable vacuum source and a floatable skimmer. These are able to move with the varying wave motions so that suction apertures in the skimmer are maintained within the layer of the pollutant. A bed comprising headers connected with a manifold to a common suction pump is utilized. Individual suction lines are tied together so as to allow freedom of movement by the individual units. These function as a sweeping unit to cover a large area. (Sinha-OEIS)
W72-11155

VALVE ASSEMBLY AND SELF-CLEANSING BRINE WELL SCREEN,
R. E. Marsh.
U. S. Patent No 3,534,856, 5 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office Vol 879, No 3, p 789, October 20, 1970.

Descriptors: *Patents, *Water softening, Equipment, Demineralization, Water treatment, Brine, Saline water.

This invention provides for a water conditioner brine supply assembly and screening member for the valve thereof. The assembly includes a brine tank, a cylindrical, ported, brine well mounted in a tank, and a valve. The valve is mounted within the well by a support which screens solid particles from liquids passing from the tank into the well and into the valve. (Sinha-OEIS)
W72-11158

METHOD AND APPARATUS FOR RECOVERING IMPURITIES FROM THE SURFACE OF A LIQUID,
Tetradyne Corp., Dallas, Tex.
F. N. Mueller.
U. S. Patent No 3,659,713, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 898, No 1, p 117, May 2, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Flotsam, Pollution abatement, Water pollution control, Water pollution treatment, Equipment, Separation techniques.
Identifiers: *Booms.

The vessel used in this invention has a pair of elongated booms which extend forward and outward. Each boom extends above the water and carries nozzles which emit a continuous elongated gaseous stream. The floating impurities are forced to concentrate between the booms where special inlets are provided for their collecting. (Sinha-OEIS)
W72-11160

UNDERWATER OIL LEAKAGE COLLECTING APPARATUS,
T. O. Blair.
U. S. Patent No 3,658,181, 3 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1251, April 25, 1972.

Descriptors: *Patents, *Oil pollution, *Leakage, Drilling, Oil fields, Water pollution control, Water pollution treatment, Equipment, Pollution abatement, Separation techniques.

Perforate cones are disposed at spaced intervals along an elongated core extending downward from a collecting chamber. The lowermost cone is placed over the underwater source of leakage. The oil is directed upward in a column about the core for collection in the chamber adjacent to the surface of the water. (Sinha-OEIS)
W72-11162

POLLUTION CONTROL DEVICE,
J. E. Turbeville.
U. S. Patent No 3,657,119, 4 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 897, No 3, p 995, April 18, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Separation techniques, Water pollution treatment, Water pollution control, Oil wastes.

Water resistant ferromagnetic particles are distributed over the oil spill. The buoyant particles adhere to the oil. A magnetic field generated by a magnetic net or parallel series of magnetic grids is then applied to collect the oil coated particles from the surface of the water. (Sinha-OEIS)
W72-11163

APPARATUS FOR REMOVING OIL FLOATING ON WATER,
Stackpole Carbon Co., St. Mary's, Pa.
A. J. Shaler, and W. E. Clancy.
U. S. Patent No 3,659,715, 3 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 898, No 1, p 117, May 2, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Burning, Pollution abatement, Water pollution, Water pollution treatment, Separation techniques.

An elongated porous device is impregnated with a combustible fluid and floated in an upright position to an area of an oil slick. The upper portion extends above the water line. The upper portion is ignited to produce a flame. The fire is fed by the combustible fluid moving up by capillary action. The oil (combustible fluid) is gradually burned up. (Sinha-OEIS)
W72-11166

THE ENERGY-ENVIRONMENT CONFLICT: SITING ELECTRIC POWER FACILITIES,
Virginia Univ., Charlottesville. School of Law.
For primary bibliographic entry see Field 06G.
W72-11172

FORT SCOTT LAKE, MARMATON RIVER, KANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-11180

A LEGISLATOR'S VIEW OF IMPENDING AMENDMENTS TO THE WATER POLLUTION CONTROL ACT,
Congress, Washington, D.C.; and Senate, Washington, D.C.
E. S. Muskie.
Boston College Industrial and Commercial Law Review, Vol. 13, p. 629-631 (1972). 3 p.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Water quality control, *Water pollution control, Water law, Legal aspects, Water policy, Regulation, Administration, Law enforcement, Water pollution, Pollution abatement, Water quality, Water resources, Research and development.

The Senate has approved a bill amending the Federal Water Pollution Control Act and the House is considering a very similar bill. The Senate bill is designed to correct certain flaws in the Water Pollution Control Act and will provide an explicit policy objective absent in the original Act. All aspects of water pollution control--research, planning programs, construction and regulation--are directed towards this overall policy objective. The absence of a policy objective allowed various states and the federal administrative agency to develop differing interpretations of the existing law's requirements, which consequently assisted in frustrating pollution control efforts. The existing law also has proved to be unsatisfactory in its regulatory procedures by providing ways for polluters to avoid or mitigate compliance with control measures. Another defect in the existing law is that it requires the government to prove a cause-and-effect relationship between the violation of an ambient water quality standard and a particular source of discharge. The senate bill establishes a new concept of control to correct this defect. The senate bill provides a better set of tools to manage our activities within the environment. (Brackins-Florida)
W72-11185

PHOSPHATES AND PHOSPHATE SUBSTITUTES IN DETERGENTS (PART 2).
Committee on Government Operations (U.S. House).
For primary bibliographic entry see Field 05C.
W72-11186

PUGET SOUND OCEANOGRAPHIC RESOURCES.
Committee on Commerce (U.S. Senate). Subcommittee on Oceans and Atmosphere.
For primary bibliographic entry see Field 06G.
W72-11187

LAND AND WATER POLLUTION FROM RECREATIONAL USE.
National Industrial Pollution Control Council, Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $0.25. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price 25 cents. National Industrial Pollution Control Council--Sub-Council Report, December 1971. 24 p, 8 photo.

Descriptors: *Water quality control, *Environmental effects, *Recreation, *Land development, Land managment, Land use, Boating, Camping, Water skiing, Water sports, Multiple-purpose projects, National parks, Recreation demand, Recreation wastes, Social aspects, Water pollution sources, Boats, Urbanization, Urban sociology, Waste treatment, Long-term planning.

No industry has so large a stake in clean water as the outdoor recreation industry. The Nation has about 186 million acres of primary recreation land over 85% of which is publicly owned. However, water recreation activities tend to take place in concentrated areas surrounding larger cities. This has a profound impact upon water quality. Some possible points for action include increased emphasis by recreational equipment manufacturers to reduce the pollution caused by their products, educational campaigns and biodegradable packaging by manufacturers of non-polluting recreational products, and general public education on water quality preservation. The leisure sub-council recommends manufacturers continue to minimize product pollution, outdoor recreational education continue, establishment of a federal demonstration project area for sound environmental practices, and distribution of a self-help analysis forum to trade associations to aid in pollution identification. Some of the questions raised by sub-council members include the setting aside of unspoiled and virgin land, the setting aside of urban land for recreational uses, and the need for federal land planning. (Grant-Florida)
W72-11188

ENVIRONMENTAL ACTIVISM: THERMAL POLLUTION--AEC AND STATE JURISDICTIONAL CONSIDERATIONS.
State Univ., of New York, Buffalo.
R. I. Reis.
Boston College Industrial and Commercial Law Review, Vol. 13, p. 633-684 (1972). 204 ref, 1 append.

Descriptors: *Thermal pollution, *Administrative decisions, *Environmental effects, *Water pollution sources, Regulation, Administrative agencies, Judicial decisions, Decision making, Heat water, Water pollution, Radioactive wastes, Radioactive waste disposal, Nuclear energy, Nuclear powerplants, State governments, Federal government, Legal aspects, Permits, Legislation, Water quality, Water quality standards.
Identifiers: *Atomic Energy Commission, *National Environmental Policy Act.

Prior to 1971 environmental effects of operation and construction of nuclear power facilities were given only limited attention due to judicial restraint and reluctance of the Atomic Energy Commission to consider questions of the non-radiological environmental harm and thermal pollution. Following litigation based on the National Environmental Policy Act, the Commission was forced to issue revised regulations in September 1971. Although providing for full environmental review the rules left the Commission with the discretion to determine whether a project would have a significant effect on the environment. The availability of judicial remedies does not appear to offer the requisite environmental protection to compensate for the Commission's abstention from complete environmental jurisdiction. Hence it might be beneficial to subject the Commission to review by the Council on Environmental Quality. Perhaps most significant in the Commission's environmental decision making will be the watchdog role played by environmental interest groups. A review of the technological and ecological problems surrounding thermal pollution is included. (Brackins-Florida)
W72-11193

SFI DIRECTORS RESOLUTIONS--WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, TEMPORARY EXEMPTION OF EPA FROM ISSUANCE OF ENVIRONMENTAL IMPACT STATEMENTS AND NATIONAL ENVIRONMENTAL RESEARCH CENTER.

Sport Fishing Institute Bulletin, No. 235, p. 1-2, Washington, D.C., June 1972.

Descriptors: *Legislation, *Water quality control, *Water pollution control, *Environmental control, Federal Water Pollution Control Act, Thermal pollution, Pollution abatement, Research and development, Federal government, Water pollution, Legal aspects, Effluents, Waste disposal, Water quality, Water Quality Act, Permits, Water law.

The Board of Directors of the Sport Fishing Institute adopted several resolutions dealing with environmental legislation at their May 1972 meeting. The Board urges the Congressional Conference Committee on the Federal Water Pollution Control Act Amendments of 1972 to set aside partisan differences and enact a new law promptly. The Senate version is favored by the Board. The Board objected to the House version which would exempt thermal discharges from provisions of the Water Quality Act of 1965. The Board urges support of a House bill which would exempt the effluent discharge permit issuance program of the Environmental Protection Agency from the environmental impact statement requirements imposed by the National Environmental Policy Act. The exemption would be temporary and only for that specific program in order to avoid delay in its implementation. The Board also endorses the establishment of a National Environmental Research Center to be administered by the Environmental Protection Agency and directed to undertake investigations into the effects of man's alterations of the environment. (Brackins-Florida)
W72-11196

ENVIRONMENTAL LAW--NATIONAL ENVIRONMENTAL POLICY ACT OF 1969--PROCEDURAL REQUIREMENTS OF THE ACT MUST BE FOLLOWED IN GOOD FAITH--CALVERT CLIFFS' COORDINATING COMMITTEE, INC. V. ATOMIC ENERGY COMMISSION,
For primary bibliographic entry see Field 06E.
W72-11197

LOCAL WARS ON POLLUTION.
U.S. News and World Report, February 9, 1970. p. 22-25, 4 p, 9 photo.

Descriptors: *Pollution abatement, *Pollutants, *Environmental effects, *Waste treatment, Water pollution control, Water quality standards, Water pollution, Economics, Legal aspects, Government finance, Governmental interrelations, Local governments, State governments, Federal government, Air pollution, Air pollution effects, Radioactive wastes, Nuclear power plants, Water pollution sources.

Citizen groups are using different methods to wage the local wars against pollution. Citizen actions to fight pollution include the cleanup of Los Angeles Harbor through revised standards for water quality, stringent guidelines for development of the San Francisco Bay shoreline, and litigation to stop radioactive discharge into waters by a nuclear plant at Calvert Cliffs, Md. Interior Secretary Hickel will implement the President's proposed clean-waters program by setting up guidelines for solving the water-pollution problem. State and local governments will then plan for their needs within these guidelines. Once these federal guidelines have been satisfied, the federal government will agree to pay capital costs of pollution abatement projects over a period of 30 years. (Ilkson-Florida)
W72-11198

ENVIRONMENT REPORT/EPA AND JUSTICE DEPARTMENT CLASH OVER ANTI-POLLUTION ENFORCEMENT,
R. S. Frank.
National Journal, Vol. 3, p. 2048-2053 (1971). 6 p, 4 photo.

Descriptors: *Rivers and Harbors Act, *Penalties (Legal), *Pollution abatement, *Federal government, *Governmental interrelations, Administration, Legal aspects, legislation, Federal jurisdiction, State jurisdiction, State governments, Regulation, Permits, Air pollution, Water pollution, Judicial decisions, Law enforcement.

Differences exist between the federal government's lawyers and its environmental specialists as to whether and when to use their legal tools to halt pollution and punish polluters. The Justice Department seeks to take polluters to court while the Environmental Protection Agency (EPA) believes that other means are more effective in ending pollution. The rediscovery of the Refuse Act has allowed increased criminal prosecutions by requir-

ing federal permits to discharge into the nation's waterways. The Jutice Department wants more suits to be brought and more actions of citizen's complaints. EPA is less eager to go to court and believes a more systematic approach to pollution abatement is needed. EPA seeks voluntary compliance which is the object of any regulatory program. EPA perfers to take only major polluters to court because about 10 per cent of the polluters cause about 90 per cent of the pollution. The Justice Department is attempting to increase suits by making exceptions to the requirement that complaints by citizens be referred to EPA. New federal air and water quality bills may increase the number of cases the government brings to court, but that will depend on what is settled between the EPA and the Justice Department. (Nielsen-Florida)
W72-11199

RESCUING THE ENVIRONMENT--THE PRESIDENT'S PROGRAM.
U. S. News and World Report, p. 93-97, February 23, 1970. 5 p.

Descriptors: *Water pollution control, *Water pollution sources, *Industrial wastes, *Municipal wastes, *Chemical wastes, Agricultural chemicals, Water pollution treatment, Water quality control, Water quality standards, Navigable waters, Economics, Legal aspects, Penalties (Legal), Effluents, Pesticides, Governments, Administration, Legislation, Waste treatment, Law enforcement, Industries, Pollutants.

The President outlines his comprehensive program to deal with pollution. Water pollution has three principal sources: municipal, industrial and agricultural wastes. The most troublesome to control are those from agricultural sources: animal wastes, eroded soil, fertilizers and pesticides. Intensified research is needed to develop new methods of reducing agricultural pollution while maintaining productivity. Federal funding is needed to provide means with which cities can build municipal waste treatment plants. To meet the goal of erecting secondary waste treatment plants three proposals are set forth: Authorization of 4 billion dollars to be allocated on a matching fund basis, establishment of an Environmental Financing Authority to finance waste treatment plants, and giving priority to those areas where facilities are most needed. The President proposes a seven point program to deal with industrial pollution. This program will consist of precise effluent standards, making violation of standards illegal, giving the Secretary of the Interior powers to proceed swiftly in enforcement actions, imposing fines up to $10,000 per day for violating water quality standards, authorizing Secretary of the Interior to seek immediate injunctive relief in emergencies, extending the federal program to all navigable waters, and enlarging the funding of pollution control enforcement agencies. The President proposes the establishment of a National Industrial Pollution Control Council to mobilize industry's resources to fight pollution. (Ilkson-Florida)
W72-11200

NATO EXPERTS RECOMMEND INTERNATIONAL ACTION ON OCEAN OIL SPILLS,
Department of Transportation, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11203

THE USE OF 'DOFILTR', A MASS COMPOUND, FOR MANGANESE AND ACID REMOVAL FROM DEEP FLOWING IRON--FREE WATER,
Polish Association of Sanitary Engineering and Technology, Warsaw (Poland).
F. Ewertowski, and W. Ewertowska.
Gaz Woda Tech Sani. Vol 44, No 11, p 375-377. 1970.

Identifiers: *Acidic water, Acids, Calcium, Carbon, Carbonates, Corrosion control, Dofiltr, Equilibrium, Hardness (Water), Iron-free water, *Manganese, Minerals, Oxides, *Water purification.

The use of 'dofiltr' for removal of manganese (Mn) from deep flowing iron-free water or from which iron has been removed by adsorption, gives good results. Filters of 'dofiltr' can be used for very soft and medium hard water with high Mn content. The rate of filtration must be experimentally determined and depends upon several factors, but can be fairly rapid due to the high activity of 'dofiltr.' The compound binds mineral acids and CO2 at high filtration rates. There is a correlation between adsorbed CO2 and water hardness. On the basis of analysis one can select a suitable rate of filtration at which the water will lose its corrosive properties and at the proper pH will be in a state of CO3Ca equilibrium.--Copyright 1972, Biological Abstracts, Inc.
W72-11214

MODELING PROBLEMS AND PROBLEM AVOIDANCE IN WATER RESOURCE MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Graduate School of Business and Public Administration.
For primary bibliographic entry see Field 06A.
W72-11225

DECOMPOSITION AND MULTILEVEL TECHNIQUES FOR WATER QUALITY CONTROL,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
Y. Y. Haimes.
Water Resources Research, Vol. 8, No. 3, p 779-784, June, 1972. 1 fig, 1 tab, 14 ref.

Descriptors: *Water quality control, *Water pollution control, *Model studies, Optimization, Effluents, Waste water treatment, Pollution abatement, Taxes, Computers, Comparative benefits, Dissolved oxygen, Biochemical oxygen demand, *Pollution taxes (Charges).
Identifiers: *Effluent charges, Modeling techniques, Miami River.

Discussed are the advantages of a system of effluent charges to control water quality and abate pollution. The imposition of a tax would tend to encourage plants to make changes that in many cases reduce the volume of effluents, as well as the water intake. Therefore, the economic incentive not to pollute would be very strong, and the responsibility for pollution control would be assigned to those who are responsible for the pollution. A decomposition and multilevel optimization approach that is capable of handling large-scale and complex nonlinear systems is reported to be successfully applied to problems of water quality control, and a related simple example is presented to demonstrate the methodology of the multilevel approach. The concept of this approach is based on the decomposing of large-scale systems and the subsequent modeling of the system into independent subsystems. Advantages over conventional methods of solving complex optimization problems are enumerated. For example, conceptual simplification is achieved, and the computational effort involved is reduced. A summary of computational experience in comparing the multilevel approach with the Dantzig-Wolfe and quadratic programming methods as applied to the Miami River data is given. (Bell-Cornell)
W72-11226

ILLINOIS V. CITY OF MILWAUKEE, WISCONSIN (POLLUTION OF INTERSTATE WATERS INVOLVES FEDERAL QUESTION UNDER FEDERAL COMMON LAW).
For primary bibliographic entry see Field 06E.
W72-11259

SUPERVISOR OF THE HARBOR PERMIT PROGRAM FOR WASTE DISPOSAL IN THE ATLANTIC OCEAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-204 264D, $3.00 in paper copy, $0.95 in microfiche. November 2, 1971. 30 p, 1 fig, 4 tab.

Descriptors: *New York, *Permits, *Environmental effects, *Waste disposal, *Waste dumps, Sludge disposal, Industrial wastes, Chemical wastes, Aquatic environment, Regulation, Sewage sludge, Sludge, Oxygen demand, Chemical oxygen demand, Project purposes, Project benefits, Oceans, Atlantic Ocean, Water pollution, Water quality, Recreation, Toxicity, Eutrophication, Sediments.
Identifiers: *Environmental Impact Statements.

The action involves the continuation of the permit program under which permits are issued for the disposal of various types of wastes at designated dumping grounds in Outer New York Harbor. The continuation of this disposal method will have an adverse impact on water quality as a result of the dumping of spoil deposits, sewage wastes, wrecked vessels and chemical wastes. The New York Harbor status, as one of the more intensely polluted water areas of the nation, renders it difficult to evaluate the relative effects of the individual pollution sources, such as wastes dumped under the permit program. The pollution will adversely affect recreation, marine life and the regional economy. Alternatives consist of either cessation of the permit issuance program or alternate dump sites. Alternatives for sewage sludge, dredge spoils, and industrial wastes, are included in separate tables listing alternatives, beneficial impacts, detrimental impacts, and factors unfavorable for implementation. The favorable impact involves the economic benefits associated with a low cost means of waste disposal for sewage authorities, industrial processing concerns, and the construction industry. (Brackins-Florida)
W72-11265

THE RIVER BASIN MODEL: MUNICIPAL SERVICES DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11271

THE RIVER BASIN MODEL: SCHOOL DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11272
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11273

THE RIVER BASIN MODEL: ECONOMIC SECTOR.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11274

LIMITATIONS AND EFFECTS OF WASTE DISPOSAL ON AN OCEAN SHELF.
Florida Ocean Sciences Inst., Deerfield Beach.
For primary bibliographic entry see Field 05B.
W72-11275

A HYDROLOGICAL-METAL POLLUTION STUDY, HEATH STEELE MINES AREA, NEW BRUNSWICK, CANADA,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05B.
W72-11300

ON THE EXPERIMENT ON DESTRATIFICATION OF RESERVOIR WATER BY AIR--BUBBLING, (SECOND REPORT), (IN JAPANESE),
T. Arai.
Misc Rep Res Inst Nat Resour. Vol 75 p 50-60. 1971. Illus. Map. (Engl. summ.).
Identifiers: Air bubbling, *Destratification, *Water treatment, Reservoirs.

The need for further studies on destratification methods is indicated in view of the unsatisfactory results obtained by the air-bubbling method under Japanese conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-11326

WATER RESOURCE PROJECTS AND ENVIRONMENTAL IMPACTS: TOWARDS A CONCEPTUAL MODEL,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 06B.
W72-11385

THE DESIGN OF A CONTINUOUS FLOW BIOLOGICAL EARLY WARNING SYSTEM FOR INDUSTRIAL USE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., R. E. Sparks, and W. T. Waller.
Paper presented at the 27th Purdue Industrial Waste Conference, May 2-4, 1972, at Purdue University, 21 p, 6 tab, 7 fig. OWRR A-039-VA (1).

Descriptors: *Monitoring, Fish behavior, *Industrial wastes, *Water pollution control, Toxicity, Water quality, Water pollution effects.
Identifiers: Biological monitoring, In-plant monitoring, Fish respiration.

All ecosystems should be managed on a regional basis. Proper management will insure that benefits are optimized and that each system serves a variety of uses. Management of aquatic ecosystems requires a clear understanding of the goals to be achieved, appropriate information and the means to achieve the goals. Control measures applied to aquatic ecosystems, in the absence of information on the condition of the system, are apt to be inappropriate and thus may overprotect the receiving system at times and underprotect it at other times since the ability of ecosystems to receive wastes is not constant. A major determinant of the effectiveness and efficiency of ecological quality control is the lag time in the feedback of information. If the lag is too great, the control measures may repeatedly overshoot or undershoot the desired goal. Present techniques for measuring the responses of aquatic organisms and communities require days or weeks, whereas information for ecosystem quality control and prevention of ecological crises should be generated in minutes or hours as is the case for other quality control systems. A biological monitoring system has been developed to generate information rapidly. The system measures changes in the movement and breathing of fish in order to provide an early warning of developing toxicity in the wastes of an industrial plant.
W72-11393

ATTITUDE OF US PUBLIC HEALTH SERVICE IN DEVELOPMENT OF DRINKING WATER STANDARDS, 1961,
Public Health Service, Washington, D.C. Div. of Water Supply and Pollution Control.
O. C. Hopkins.
Journal of the American Water Works Association, Vol. 53, No. 8, p. 946-950, August 1961, 2 ref.

Descriptors: *Standards, *Water quality standards, Water management (Applied), *Public health, *Potable water, Regulation.
Identifiers: Quality limits, Quality safety.

Domestic water supplies should protect the health and promote the well-being of individuals and of the community. Proposed standards are minimum requirements for reaching this goal. Minimum requirements should be based in part on compliance with good practices so as not to encourage any unnecessary contamination of drinking water. In many areas, it will be necessary to use and reuse the same water, and to maintain quality as well as quantity. Good management and qualified operators are essential for a good product. (Britton-AWWARF)
W72-11394

WATER QUALITY STANDARDS,
R. L. Derby, O. C. Hopkins, O. Gullans, J. R. Baylis, and E. L. Bean.
Journal of the American Water Works Association, Vol. 52, No. 9, p. 1159-1188, September 1960. 4 tab, 72 ref.

Descriptors: *Standards, *Water management (Applied), Water quality control, Water analysis, Water supply systems, *Potable water, *Water quality standards.

A symposium at the 1960 Annual Conference of the American Water Works Association, Bal Harbour, Florida produced a group of papers on the value, use and development of water quality standards. Standards have played a major role in the detection and control of pollution and at the present time very few cities have records of recent serious illness traceable to their water supplies. New USPHS standards are discussed including the original requirements, source and protection aspects, bacteriologic quality, physical characteristics, radiologic quality, chemical characteristics, proposed changes, and new substances. From the Operator's viewpoint, turbidity measurements, the need for high-grade employees, the need for research, employee-training courses, promotion and salary, unfiltered surface water, and the practical value of USPHS limits are described. Rating systems, industrial and domestic needs, point of applicability, functional aims of standards and legal aspects of enforcing the standards also are discussed. (Britton-AWWARF)
W72-11396

TOXICOLOGIC METHODS FOR ESTABLISHING DRINKING WATER STANDARDS,
Robert A. Taft Sanitary Engineering Center, Cincinnatti, Ohio.
H. E. Stokinger, and R. L. Woodward.
Journal of the American Water Works Association, Vol. 50, No. 4, p. 515-529, April 1958. 6 tab, 10 ref.

Descriptors: *Toxicity, *Toxins, *Standards, Water quality control, Test procedures, Water management (Applied), Pesticides, *Potable water, *Water quality standards, Lethal limit.
Identifiers: *Threshold limits, *Toxicologic classification.

A rather large background of toxicologic information and practical health safety limits are used in other fields and may be advantageously used in the development of drinking water standards. Aspects discussed are the safe limits of toxic substances in the air of industrial environments, toxicologic information on which pesticide residue tolerances for foods are based, toxicologic information developed from nutritional studies, and toxicity classifications based on chemical structure relationships. A variety of modifying factors must be applied in developing a standard for water. Major factors are the difference of susceptibility of the very yound, the aged, and debilitated individuals; carcinogenic agents; and the possible modification of toxic response as a result of combinations of substances. (Britton-AWWARF)
W72-11397

TURBIDITY MEASUREMENT,
Florida State Game Freshwater Fish Commission, Eustis.
For primary bibliographic entry see Field 02J.
W72-11432

WATER MEASUREMENTS OF COASTAL LOUISIANA,
Louisiana Wild Life and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 02L.
W72-11446

GROUND-WATER INVESTIGATIONS IN OKLAHOMA,
Geological Survey, Oklahoma City. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-11448

THE AQUEOUS UNDERGROUND,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-11466

FEASIBILITY OF UTILITY TUNNELS,
Chicago City Dept. of Water and Sewers, Ill.
For primary bibliographic entry see Field 03D.
W72-11474

REGIONAL SEWERAGE PLAN FOR AN 11,000--SQUARE-MILE AREA,
Camp, Dresser and McKee, Inc., Boston, Mass.
C. A. Parthum.
Public Works, Vol 103, No 2, p 44-45, February 1972. 2 fig.

Descriptors: *Regional development, *Sewerage, *Long-term planning, *City planning, Consolidation, Economics, Administration, Water quality control, Water supply, Water reuse, Reclaimed water, *Texas.
Identifiers: *Upper Trinity River Basin, *Regional planning, Centralization.

A comprehensive sewerage plan for the Upper Trinity River Basin in North Central Texas, comprised of the metropolitan area of Dallas-Fort Worth and several surrounding counties, has won widespread support by agencies at all governmental levels. The major recommendation of a two-year study is consolidation of 53 existing waste water treatment plants in the Dallas-Fort Worth metropolitan center into a regional system of six jointly operated plants. A $50 million program of treatment facility improvements is recommended for other communities in the study area, outside the metropolitan area of the two large cities. For reasons of sound economics, centralization of responsibility, and administration of construction, operation and maintenance, the engineering team recommended limited consolidation of the large number of sewage treatment plants scattered throughout the metropolitan area into six joint systems, requiring modification and enlargement of six existing treatment plants. To obtain adequate control of pollution in the Upper Trinity River Basin, the consultants recommend that adequate collection and treatment of domestic and industrial waste water be augmented by centralization of efforts aimed at controlling all types of water pollution, including runoff from agricultural lands and leachate from solid waste disposal sites. As population and water consumption in the area increase, the surplus supply of water in the basin will decrease to the point where waste water reuse will be imperative. The study predicts that after 1990, water for domestic uses may have to be supplemented by reclaimed waste water. (Strachan-Chicago)
W72-11476

ACTION NOW - A VIEW FROM CHICAGO,
Chicago Dept. of Water and Sewers, Ill.
For primary bibliographic entry see Field 05F.
W72-11477

THE PUGET SOUND SULPHITE PULP MILLS AND THE TRAGEDY OF THE COMMONS,
Western Washington State Coll., Bellingham. Dept. of Biology.
R. W. Fonda.
Biological Conservation, Vol 4, No 1, p 31-38, October 1971. 4 tab, 3 fig, 4 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Pollution abatement, *Water quality control, Research and development, Feasibility.
Identifiers: *Puget Sound, *Mutual coercion, Discharge permit.

Garrett Hardin's thesis of mutual coercion, mutually agreed upon by the majority of the people affected, is well-founded, and represents a feasible approach to pollution control. Eight pulp-mills discharging waste into Puget Sound were the objects of four years of research into the biological impact of pulping wastes. A Federal-State Conference proposed recommendations that have been incorporated into discharge permits to stop biologically harmful waste discharge into Puget Sound. All mills were treated equally in the process, and all must meet the same effective level of biologically adequate waste discharge. Mutual coercion of this type was the only solution to the problem. Left to themselves, it is doubtful whether the mills would have made an effort to intercept wastes. (Strachan-Chicago)
W72-11478

A NATIONAL SEASHORE PROVES A MIXED BLESSING FOR ITS SURROUNDING COUNTY,
Marshall Kaplan, Gans and Kahn, Sausalito, Calif.
For primary bibliographic entry see Field 06G.
W72-11481

APPLICATIONS OF ECOSYSTEM THEORY, SUCCESSION, DIVERSITY, STABILITY, STRESS AND CONSERVATION,
Toronto Univ., (Ontario); and British Petroleum Co., Ltd., London (England).
For primary bibliographic entry see Field 06G.
W72-11486

SOLVING THE COMBINED SEWER OVERFLOW PROBLEM OF A MAJOR CITY,
Weston (Roy F.), Inc., Westchester, Pa.
R. F. Weston, J. E. Germain, and M. E. Fiore.
Public Works, Vol 103, No 5, p 106-108, May 1972. 1 tab, 2 fig, 2 ref.

Descriptors: *Sewers, *Overflow, *City planning, *Water pollution control, *Combined sewers, Alternative planning, Costs, Benefits.
Identifiers: *Metropolitan water resources management, *Washington, D.C., Combined storage and treatment.

Most major cities in the United States are facing serious pollution control problems associated with overflows from combined sewerage systems. In Washington, D. C., Roy F. Weston, Inc. under the auspices of the Office of Research and Monitoring of the Federal Environmental Protection Agency undertook a study to discover a more timely and lower cost solution to the problem of overflows. The primary objectives of the study were: to define the magnitude of combined sewer overflows in the District, to investigate the feasibility of high rate filtration for treatment of combined sewer overflows, and to develop alternative solutions to the problem. Sewer separation, storage in reservoirs, storage and treatment at each overflow point, and storage in tunnels and mined storage facilities were all methods of overflow control which warranted detailed investigation. The study showed that combined sewer overflows will provide better stream protection at lower cost and with more incidental benefits than sewer separation or any other currently available alternative. (Strachan-Chicago)
W72-11488

WATER QUALITY: A QUESTION OF STANDARDS,
Washington Univ., Seattle. Dept. of Geography.
For primary bibliographic entry see Field 06E.
W72-11496

ECONOMIC GROWTH AND THE NATURAL ENVIRONMENT,
California Univ., Riverside.
R. C. d'Arge.
In: Environmental Quality Analysis, Papers from a Resources for the Future Conference, The Johns Hopkins Press, 1972. p 11-34. 1 fig, 21 ref.

Descriptors: *Economics, *Environment, *Resources development, *Wastes, Planning, Regulation, Population.
Identifiers: *Paradigms, *Conjunctive utilization, Policy making, Consumption.

A series of highly simplified paradigms are developed which relate the economy to the natural environment in terms of resource extraction and waste emissions. Conjunctive utilization of the environment is briefly analyzed. It is argued that the hypothetical economy could achieve an optimum path of consumption and period of survival only by imposing regulations on both extraction of natural resources and waste disposal that reflected the natural environment's presumed finite waste-holding capacity and the availability of extractive resources. A rational environmental policy cannot be piecemeal or independent. A truly optimal extraction and waste accumulation program must be considered concurrently with a population program. Macroeconomic policy instruments have a definite and often unrecognized impact on the natural environment through their effects on rates of resource extraction and growth in consumption per capita. The processes of pollution and extraction are common characteristics of any economy. They are not separable entities to be studies in isolation without regard to their physical and biological interdependencies. Rational utilization of the natural environment requires careful planning of rates of resource extraction and pollutant emissions. In a growing economy, recycling, savings rates, and rates of technical or physical obsolescence are intimately connected to resource use and waste flows, and thus, cumulative short-term government policies may have a long-term impact on the environment. (Strachan-Chicago)
W72-11500

A QUANTITATIVE FRAMEWORK FOR RESIDUALS MANAGEMENT DECISIONS,
Resources for the Future, Inc. Washington, D.C.
C. S. Russell, and W. O. Spofford, Jr.
In: Environmental Quality Analysis, Papers from a Resources for the Future Conference, The Johns Hopkins Press, 1972. p 115-180. 8 fig, 5 tab, 100 ref.

Descriptors: *Planning, *Decision making, *Management, *Model studies, *Decision making, Regional analysis.
Identifiers: *Quantitative framework, *Residuals management, *Policy making, Regional planning.

A quantitative framework designed to assist regional authorities in making decisions about residuals management policies is described. The framework deals explicitly with air-borne, water-borne, and solid residuals and includes, in a linear programming model of regional production, information about internal production process changes, recirculation alternatives, and end-of-pipe treatment processes, and their implications for the form and amount of residual discharges. This model is useful both in identifying the kinds of information necessary for effective regional decision making and in structuring the problem of residuals management to suggest the areas in which several relevant disciplines may make important contributions. In application of the model, the following research tasks would be faced: (1) identification of at least the most significant residuals-generating industries of the region, and the study of their process changes, recirculation and treatment alternatives relevant to residuals discharges; (2) the building of necessary dispersion and diffusion models for the region; (3) the development of ecological models to parallel the physical transformation models; and (4) the estimation of damage functions for the region's receptor locations. The next major step in this research will be an effort to apply this framework to an actual region to see whether it will prove useful and practical under complicated real-world conditions. (Strachan-Chicago)
W72-11501

DISTRIBUTION OF ENVIRONMENTAL QUALITY,
Bowdoin Coll., Brunswick, Me.
A. M. Freeman, III.
In: Environmental Quality Analysis, Papers from a Resources for the Future Conference, The Johns Hopkins Press, 1972. p 243-278. 2 fig, 5 tab, 43 ref.

Descriptors: *Environment, *Distribution patterns, *Decision making, *Planning, *Economics, Benefits, Costs, Equity, Management, Political aspects, *Pollution abatement.
Identifiers: *Policy making.

Topics are: (1) what can be said now about the patterns of distribution of benefits and costs associated with environmental pollution and pollution abatement programs, (2) what can be said about the appropriate role of distribution considerations in environmental quality planning, and (3) in light of (1) and (2) research needs and priorities. It is granted that distribution does matter in public decision making regarding the environment, and that some means has been found to represent this equity concern. Equity concern can have three kinds of effects on the set of public decisions. (1) It could result in some projects being undertaken, even though their benefit-cost ratios were less than one, because the benefits were directed more toward a target group of 'deserving' beneficiaries. (2) Any project could be altered to further distributional objectives. (3) Efficiency and equity objectives may be competitive in that to achieve greater equity in the distribution of benefits (or costs) it may be necessary to incur lower total benefits (or higher costs). The most effective way to improve the general distribution of the environment is to improve the basic distribution of wealth. There is one respect in which the distribution question is ultimately unavoidable in environmental quality planning and decision making. Effective management of the environmental common property resources requires a clear delineation of property rights in the environment and the establishment of means to enforce these rights. The problem is to get the political system to come to grips with the equity implications of possible policy alternatives. (Strachan-Chicago)
W72-11502

ENVIRONMENTAL QUALITY AS A PROBLEM OF SOCIAL CHOICE,
Resources for the Future, Inc., Washington, D.C.
E. T. Haefele.
In: Environmental Quality Analysis, Papers from a Resources for the Future Conference, The Johns Hopkins Press, 1972. p 281-332. 3 fig, 49 ref, 11 tab, 2 append.

Descriptors: *Environment, *Social aspects, *Institutions, Governments, Planning, Decision making, Funding.
Identifiers: *Policy making, Implementation.

Environmental quality is viewed as a social choice problem and representative government as the

utility mechanism that has unique capabilities for aggregating individual preferences into social choices. General conclusions about the present state of institutions in the environmental field include: (1) There is a need to redress the balance between the legislative and the executive role in environmental choices at all levels of government. (2) There is a need to force environmental issues into partisan politics at every level of government. (3) There is a need to focus directly on institutional design. (4) There is a need for representative governmental structures at the regional level. (5) There is a need to remove water projects and other regional project investment concerns from Congress. If these shifts of emphasis occurred, the following situation would develop. The federal role would emphasize, on the legislative side, the questions of how much money should be appropriated for environmental purposes and what regional distribution should be made. On the executive side, it would emphasize the availability of technical expertise. The states, regions, and localities would be making environmental choices, and deciding how to allocate federally disbursed monies, what additional monies were needed, and how best to implement these decisions. (Strachan-Chicago)
W72-11503

LEGAL STRATEGIES APPLICABLE TO ENVIRONMENTAL QUALITY MANAGEMENT DECISIONS,
Michigan Univ., Ann Arbor.
J. L. Sax.
In: Environmental Quality Analysis, Papers from a Resources for the Future Conference, The Johns Hopkins Press, 1972. p 333-344. 6 ref.

Descriptors: *Legal aspects, *Decision making, *Environment, *Management, Administration, Planning, Decision making.
Identifiers: *Environmental Law, Theory, Implementation.

Lawyers should struggle with the same problems which engage economists and other professionals working with problems of environmental quality. The issue which most interests this profession is the effective translation of theory into practice. Effective implementation has begun to dominate the attention of lawyers concerned with environmental quality. Another issue of interest to lawyers is the representation of the public interest. This issue reveals: (1) the importance of participatory democracy in coping with environmental problems, and (2) the demerits of a system of government which is tightly structured along jurisdictional lines so that only certain people or agencies have authority to make certain kinds of decisions. Lawyers must fashion tools which will make the public interest into public rights. The need is for a 'market' in which there is a seller with power to restrainthe sale unless his interest is adequately compensated. Environmental lawyers are concentrating upon the development of such 'markets'. A willingness to abandon the faith traditionally placed in administrative processes is required. (Strachan-Chicago)
W72-11504

POWER STRUCTURE STUDIES AND ENVIRONMENTAL MANAGEMENT: THE STUDY OF POWERFUL URBAN PROBLEM-ORIENTED LEADERS IN NORTHEASTERN MEGALOPOLIS,
Indiana Univ., Bloomington.
D. C. Miller.
In: Environmental Quality Analysis, Papers from a Resources for the Future Conference, The Johns Hopkins Press, 1972. p 345-395. 6 fig, 1 append, 24 ref, 7 tab.

Descriptors: *Environment, *Management, *Urbanization, *Leadership, Regional development, City planning, Decision making.
Identifiers: *Power structure studies, *Northeastern Megalopolis, Metropolitan resources management.

A search was made for the most powerful urban problem-oriented leaders of Megalopolis (Boston to Washington). Responses from questionnaires sent to leaders provided data on urban problem interest and activity patterns, acquaintance and working relations of the key leaders, and some decision making mechanisms. Megalopolis is best conceptualized as a distinctive highly urbanized locale containing a network of leaders and organizations that are usually concerned with local, state, or national, but not regional, policy. The trend toward closer regional integration is clearly affirmed by a multitude of metropolitan and subregional planning agencies and a growing number of regional administrative agencies. Regional power structures within Megalopolis can be delineated by community power techniques. An embryonic power structure does exist, and there is rather high consensus about the key leaders who would have the most influence in regional planning and policy making for urban problems in Megalopolis. Immediate future research will include: (1) determination of group cohesion and cleavage of key and top business, labor, political, religion, and civic leaders, (2) analyses of urban problem activity, (3) determination of power rating of individual leader and occupational group networks, (4) establishment of profiles of ten highest key leaders by total acquaintance and contact to determine their network of communication in each city with each occupational group, and (5) establishment of profiles of ten highest key leaders by total acquaintance and contact to determine their acquaintance and contact with 26 regional nominees. (Strachan-Chicago)
W72-11505

ARKANSAS-RED RIVER BASINS WATER QUALITY CONTROL STUDY--PART I, AREAS VII, VIII AND X, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.

Available from the National Technical Information Service as PB-203 603D, $3.00 in paper copy, $0.95 in microfiche. September 8, 1971. 28 p, 2 map, 4 tab.

Descriptors: *Texas, *Brine disposal, *Water quality control, *Environmental effects, Brines, Salinity, Waste disposal, Saline water, Barriers, Irrigation water, Water quality, Reservoir storage, Water storage, Desalination plants, Subsurface drainage, Pipelines, Diversion, Dam construction.
Identifiers: *Environmental Impact Statements, *Arkansas-Red River basins.

The project would involve construction of four low-flow dams, three brine storage dams and several miles of pipeline in Cottle, Foard, King and Knox Counties, Texas. The project would control brines entering municipal water supplies and the Red River to a level acceptable for irrigation use without subsequent treatment. Construction would include four low-flow dams for collection of brine-laden waters, three brine storage dams for holding the concentrated salt solutions during evaporation, and the necessary pumps and pipelines to transport the solutions from the low-flow reservoirs to the brine storage reservoirs. Approximately 19,000 acres would be converted to public ownership. The project will provide facilities for water quality control and will significantly improve the quality of the water below the low-flow dams and downstream. The project will gradually reduce wildlife habitat as brine pools fill, while attracting moderate water fowl populations. The project will inundate grazing land causing a loss of livestock grazing area. Alternatives included diversion, desalination and subsequent injection. (Nielson-Florida)
W72-11510

BUFFALO HARBOR, NEW YORK--MAINTENANCE (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-11512

PITTSBURGH COAL CO. V. SANITAR WATER BOARD (MINEOWNER'S DUTY T TREAT WATERS DISCHARGED INT WATERCOURSES).
For primary bibliographic entry see Field 06G.
W72-11516

UNITED REIS HOMES V. PLANNING BOAR OF NATICK (VALIDITY OF BOARD O HEALTH REGULATIONS CONTROLLING LO DRAINAGE).
For primary bibliographic entry see Field 06E.
W72-11517

KALUR V. RESOR (VALIDITY OF REGULA TIONS AUTHORIZING DISCHARGES INT NAVIGABLE WATERS).
For primary bibliographic entry see Field 06E.
W72-11518

FLORIDA AIR AND WATER POLLUTIO CONTROL COMMISSION V. ST. REGIS PAPE COMPANY (PROCEDURE FOR ASSESSIN POLLUTION PENALTIES PURSUANT T FLORIDA AIR AND WATER POLLUTIO CONTROL ACT).
For primary bibliographic entry see Field 06E.
W72-11520

U.S. GIVES VIEWS ON CONVENING CO FERENCE ON LAW OF THE SEA,
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11521

ENVIRONMENT IN THE COURTROOM,
Michigan Univ., Ann Arbor. School of Law.
J. L. Sax.
Saturday Review, Vol. 53, p. 55-57, October 1970. 1 photo, 2 dwg.

Descriptors: *Legal review, *Legislation, *E vironmental control, *Pollution abatement, Leg aspects, Public rights, Common law, Governme tal interrelations, Judicial decisions, Water lav Administration, Political aspects, Coordinatio Institutional constraints, Leadership, Michiga Administrative agencies.
Identifiers: *Public trust doctrine.

For most environmental problems there is recognized public right to redress due to sixteent century public nuisance law. Yet instances like t Santa Barbara oil spill and the SST controver have persuaded private citizens that they must o tain the right to take environmental disputes court rather than leaving such matters solely to t discretion of public officials. The Michigan legisl ture has passed a bill empowering any person organization to sue any private or public body a to obtain a court order restraining conduct that likely to pollute, impair, or destroy the air, wate or other natural resources or the public tru therein. At least five states have passed simil bills and almost identical legislation is now pen ing in the Congress. Parallel development beginning to emerge in the courts as part of t common law under the public trust concept. Y courts serve only to supplement and invigorate t activities of administrative agencies, the legisl ture, and other governmental activities by maki clear that there is another avenue of redress f the citizen. By requiring officials to consider alte natives, the courts help to promote bro planning. (Widman-Florida)
W72-11522

POLLUTION POLITICS.

The New Republic, p. 5-6, October 31, 1970.

Descriptors: *Environmental effects, *Politic aspects, *Administration, *Governments, Feder government, Legal aspects, Economics, Legisl

ion, Administrative agencies, Water purification, Ecology, Water pollution, Water pollution control, Water quality, Water Quality Act, Water quality standards, Pollution abatement.
Identifiers: *Refuse Act.

Political implications of government actions regarding pollution are assessed. The Internal Revenue Service's removal of tax exempt status of public interest law firms engaged in environmental litigation is intended to stop citizen suits brought against industry. This ruling is aimed mainly at environmentalists' use of the 1899 Refuse Act. Countering this, Senators Hart and McGovern have introduced a bill guaranteeing the citizen's right to protect the environment against unreasonable impairment. The inadequacy of present legislation in setting standards is reflected by the relative absence of prosecution. Other than the actions of the Internal Revenue Service, the Administration has acted in the field of environmental quality, including the consolidation of pollution control agencies. However, the programs have failed to reach their potential due to a lack of funding. (Ilkson-Florida)
W72-11523

STATES JOIN THE POLLUTION BATTLE,
E. Holsendolph.
Fortune, October 1970, p. 116.

Descriptors: *Legislation, *State governments, *Pollution abatement, *Regulation, Administrative permits, Governmental interrelations, Administration, Comprehensive planning, Legal aspects, Standards, Effluents, Oil pollution, Air pollution, Mine wastes, Nuclear reactors, Law enforcement, Michigan, California, Illinois, Maine, Arizona, Washington, Vermont.

Many cities and virtually all states have some pollution control laws. Some of the more recent state laws are described. Michigan enacted a law allowing citizens to sue polluters without showing evidence of direct personal injury. California stiffened enforcement of its vehicular-emission standards, already the toughest in the nation. In Illinois the new environmental protection agency, with a five-member board appointed by the governor, is combating air, water, and noise pollution. Vermont has enacted laws creating a permit system whereby all facilities that discharge effluents into waterways must obtain permits from a state agency. Maine has enacted a tough new environmental protection package to protect its coastal waters from oil spills. In Arizona a reapportioned legislature imposed stiff emission standards drafted by the state board of health. The Washington legislature has approved anti-pollution laws dealing with nuclear plant siting, oil spills and open-pit mines. However, the effectiveness of antipollution programs depends upon enforcement. To consolidate antipollution forces and improve enforcement several states preceded the federal government in setting up 'environment departments'. (Widman-Florida)
W72-11525

VILLAPA RIVER AND HARBOR NAVIGATION PROJECT, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 04A.
W72-11530

COPAN LAKE, LITTLE CANEY RIVER, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W72-11544

INTERNATIONAL LAW AND THE PROTECTION OF THE OCEANS FROM POLLUTION,
Fordham Univ., New York.
A. A. Teclaff.
Fordham Law Review, Vol 40, p 529-564, 1972. 175 ref.

Descriptors: *Law of the sea, *International law, *Pollution abatement, *Legal aspects, *International waters, Treaties, Federal government, Coordination, Oil pollution, Waste disposal, Radioactive waste disposal, Jurisdiction, Judicial decisions, Law enforcement, Water pollution control, Water quality.

Because marine pollution has only recently been recognized for what it is--a problem of global dimensions and extreme complexity--international law has not yet evolved specific rules for dealing with it. International conventions have dealt with varying degrees of success with such areas as oil pollution, dumping of radioactive waste and other toxic materials, direct dumping of wastes from the land, and seabed exploitation. International law generally imposes on users a duty not to pollute the oceans. Both private and state entitles are responsible when they are remiss in fulfilling this duty. Similar in type and scope is the responsibility of the state for pollution caused by private ships and enterprises under its jurisdiction on the high seas. However the procedural aspects in this area are not at all settled. The scope of jurisdiction of coastal states is discussed, breaking this into jurisdictions within twelve miles of the coast and beyond twelve miles. The prohibition of pollution must be sought in the general rules pertaining to the use of the sea and standards must be uniformly established for all ocean waters. While a real problem exists in proceeding effectively against polluters in particular instances, a single international tribunal with jurisdiction in this area might be one answer. (Widman-Florida)
W72-11552

THE NATIONAL INDUSTRIAL POLLUTION CONTROL COUNCIL: ADVISE OR COLLUDE,
Washington Univ., Seattle.
W. H. Rodgers, Jr.
Boston College Industrial and Commercial Law Review, Vol 13, p 719-747, 1972. 147 ref.

Descriptors: *Federal government, *Pollution abatement, *Administrative agencies, *Industries, *Governmental interrelations, Legislation, Administration, Adoption of practices, Coordination, Governments, Legal aspects, Political aspects, Project planning, Institutional constraints, Federal project policy.

The dominant industry advisory committee on environmental issues has been the National Industrial Pollution Control Council (NIPCC), established by Executive Order on April 9, 1970. Three aspects of NIPCC's performance are analyzed: (1) the promise and risks it has presented; (2) its procedural performance, as tested by governing law; and (3) its accomplishments as measured by expectations. NIPCC is portrayed as a dangerously anticompetitive institution occasionally doing business in violation of the law. The Council has published public relations material and some useful data, but it has served more importantly as a lobbying forum for discontented industries. Recommendations designed to make the advisory committee more responsive are made. These recommendations include public access to advisory committee proceedings and further reporting obligations for trade associations. The enduring lesson of the NIPCC should provide the touchstone for reform; when members of an industry attempt to influence their government, they should be required to do so publicly. (Widman-Florida)
W72-11553

THE TENNESSEE WATER QUALITY CONTROL ACT OF 1971: A SIGNIFICANT NEW ENVIRONMENTAL STATUTE,
Tulane Univ., New Orleans, La.
For primary bibliographic entry see Field 06E.
W72-11556

A SHOCK-WAVE TECHNIQUE TO COLLAPSE THE VACUOLES OF BLUE-GREEN ALGAE,
University of Wales Inst. of Science and Tech., Cardiff.
D. C. Menday, and A. A. Buck.
Water Research, Vol 6, No 3, p 279-284, 1972. 5 fig, 18 ref.

Descriptors: *Algal control, *Cyanophyta, Explosives, Costs, Fish, Fishkill, Reservoirs, Fisheries, Pressure.
Identifiers: *Shock-waves, *Gas-vacuole deflation, South Wales, Microcystis aeruginosa, Anabaena.

A field system designed to control blue-green algae by producing pressure waves to burst their gas-vacuoles, causing them to sink, is described. The pressures required to burst gas-vacuoles of Microcystis aeruginosa, the design of an explosive system, together with methods to record pressure distribution, and the adverse effects of such pressures on fish are considered. The primary concern is the possible application in an industrial water-supply reservoir in South Walwes where the principal algae is Microcystis aeruginosa and where brown trout (Salmo trutta) have been introduced for angling. It was found that a pressure of about 4.5 kg/sq cm was required to burst vacuoles in all cells of M. aeruginosa. The technique developed provided a quick and cheap control method when a blue-green algal bloom is seriously affecting a water supply. It is not suggested that explosives should be used as a regular means of algal control. It situations where algae accumulate near abstraction points, this technique has practical advantages with low operational costs and avoidance of capital charges, particularly applicable where blooms are infrequent or of short duration. (Jones-Wisconsin)
W72-11564

FISH THAT WEED THE WATER.
For primary bibliographic entry see Field 04A.
W72-11568

POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES.
National Economic Research Associates, Inc., New York.

Available from the National Technical Information Service as PB-207 167, $3.00 in paper copy, $0.95 in microfiche. Prepared for: Council on Environmental Quality, Wash., D.C., January 5, 1972. 105 p, 26 tab, append.

Descriptors: *Electric power industry, *Pollution abatement, *Electric power costs, Costs, Prices, Economic impact, Regulation, Electricity.
Identifiers: *Power intensive industries, Employment effects.

The impact of pollution control equipment on the electric power industry will depend on supply and demand characteristics, use and availability of fuels, the industry's employment characteristics, and future trends in electricity generation. Analysis of these factors and a set of assumptions about future pollution regulations suggest that the price of electricity may rise by about 7 per cent by 1976 due to the costs of installing and maintaining pollution control devices. No significant dislocation within either the electric utility industry or industry at large is expected. Data from the 1967 Census of Manufacturers indicates that there were only six industrial classifications for which electric power costs amounted to 5 per cent or more of the total value of shipments. These classifications include the Atomic Energy Commission plants, the primary aluminum industry, electrometallurgical products, the chloralkali industries, industrial gases, and hydraulic cement. Even in these six industries few dislocations are expected because of higher electricity prices. Moreover, any employ-

ment effect would be minor relative to total employment since these industries have a labor force which represents only 0.2 per cent of the total U.S. labor force. (Settle-Wisconsin)
W72-11589

PUZZLED ABOUT SURCHARGES. HERE'S HOW DURHAM OPERATES,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 05D.
W72-11593

PHOTOSYNTHESIS--POLICIES AND PROGRAMS FOR GREAT POTENTIALS, BEGINNING STAGES FOR EFFECTIVE WATER MANAGEMENT,
Utah Univ., Salt Lake City, Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-11594

AEROBIC LAKE MUDS FOR THE REMOVAL OF PHOSPHORUS FROM LAKE WATERS,
Wisconsin Univ., Madison. Water Chemistry Lab.
G. P. Fitzgerald.
Limnology and Oceanography, Vol 15, No 4, 1970, p 550-555. 5 tab, 14 ref.

Descriptors: *Phosphorus, *Lake beds, *Algae, Algal control, Nutrient requirements, Sorption, Eutrophication, Deficient elements, Essential nutrients, *Aerobic conditions, Water pollution control.
Identifiers: Lake mud, Phosphorus sorption, Phosphorus removal, Rate of sorption.

Bioassays of algae indicated that they became phosphorus or nitrogen-limited despite the fact that the algae were close to muds containing both phosphorus and nitrogen compounds. Laboratory tests were conducted to determine if the phosphorus of lake muds is readily available to algae under aerobic conditions. Phosphorus-limited Selenastrum and Cladophora will respond by growth or changes in extractable PO4-P to as little as 0.02 mg PO4-P in solution; these species did not respond when exposed for a period of 1 or 2 weeks to as much as 2 mg of phosphorus as lake muds under aerobic conditions. Studies of the rate of sorption of phosphorus by lake muds under aerobic conditions from two lakes, and from three depths in one lake, indicated that as little as 0.4 g (dry weight) of mud could sorb about 0.05 mg PO4-P in less than 30 min. These findings suggest that the sorption of phosphorus by lake muds under aerobic conditions can be used to remove phosphorus from lake water. (Morgan-Texas)
W72-11617

INFLUENCE OF TEMPERATURE AND TURBULENCE ON THE OXYGEN TRANSFER IN WATER,
K. R. Imhoff, and D. Albrecht.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 11, Hall A, Paper No 22, June 22, 1972. 11 p, 8 fig, 1 tab, 25 ref.

Descriptors: *Oxygenation, *Turbulence, *Temperature, Mathematical models, Reaeration, Saturation, Dissolved oxygen, Aeration, Mixing, Mass transfer, Evaporation, Bubbles, Activated sludge, *Waste water treatment, Water pollution control.

The results of oxygen transfer tests have been converted directly to reference temperatures according to well established procedures. However, a review of the literature on oxygen transfer and temperature and turbulence effects has demonstrated that the temperature influence on oxygen transfer in water depends on the individual system, and therefore there is no single overall relationship which applies. Since the engineer is required to design systems without having the opportunity to conduct tests, a classification of the existing systems was established to improve the prediction of temperature influence. For naturally aerated waters, the calculation method suggested by Churchill was adopted, while pneumatic aeration systems and mechanical aerators with low turbulence were clearly described by the equation of Pasveer. Mechanical aerators with energy supplies of 20 watts/m cu on-wards follow the principle of saturation values. Based on these calculations, it was determined that for the high energy activated sludge process, the observed dependency for mechanical aerators (impellers, turbines, cylinders, etc.) should be used as a general basis to insure sufficient aeration regardless of temperature. (Lowry-Texas)
W72-11618

SELF-PURIFYING ACTIVITY OF SEA WATER: PROPOSAL FOR LOW COST TREATMENT OF A WELL DEFINED AREA,
Naples Univ. (Italy). Istituto di Igiene.
A. Paoletti.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 9, Hall C, Paper No 19, June 21, 1972. 5 p, 4 fig, 7 ref.

Descriptors: *Domestic wastes, *Oceans, *Self-purification, *Waste assimilative capacity, Waste dilution, Bacteria, Disinfection, Coagulation, Flocculation, Dispersion, Sedimentation, Activated sludge, Aesthetics, Waste water treatment, Water pollution control.
Identifiers: *Italy, *Naples (Italy).

The biological factors of sea water self-purification: (1) bactericidal; (2) antibiotic; (3) lytic factors; and (4) predatory phenomena, are all being utilized in the area of Cuma to provide treatment for 2-4 cubic meters/sec of domestic sewage from the western area of Naples. The wastes are restricted in a well defined area owing to the strong action of waves, winds and currents, and to the presence of rock walls built for the purpose of preventing dilution and dispersion of coarse material over a long distance. Recent field data indicate that bacteria are subject to the action of not only the biological factors mentioned, but also to flocculation and sedimentation. The biota in the presently utilized area are also similar in number and function to those present in activated sludge. Further improvements suggested include: (1) coarse material removal (rags, paper, plastics, etc.) for aesthetic purposes; (2) basin delimitation with 2 rock-full dams 100 to 150 meters long to arrest irregular sewage dispersion; and (3) further treatment improvements (sedimentation, chemical addition, supplemental basin aeration, etc.). (Lowry-Texas)
W72-11626

COMPARISON OF THIN-FILM EVAPORATION AND FREEZE DRYING METHODS OF CONCENTRATION OF ORGANICS IN WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
I. J. Kumar.
Master's Thesis, April 1971. 104 p, 19 fig, 10 tab, 39 ref.

Descriptors: *Organic compounds, *Analytical techniques, *Chromatography, Sewage, Natural streams, Evaporation, Freeze drying, Hydrolysis, Temperature, Biodegradation, Laboratory tests, Taste, Odor, Color, Water quality control, *Waste water treatment, *New York.
Identifiers: *Polymerization, *Lake George (NY), *Saratoga Lake (NY).

Trace organics in water samples from Lake George and Saratoga Lake, as well as raw sewage and sewage effluent from the Clifton Knolls Sewage Treatment Plant, were concentrated using both thin-film evaporation and Freeze-Drying methods. Organic carbon recovery by thin-film evaporation was superior to that of freeze-drying for all samples. Chromatograms obtained for both methods showed an identical number of peaks at about the same elution volume, and the cumulative percentage versus molecular weight curves were also similar, with a maximum difference of 2 to 3% ascribed to experimental error. These results demonstrate: (1) no significant polymerization or degradation was observed in either technique; (2) although recovery from freeze-drying is less than that of thin-film evaporation, no evidence of selective removal of a compound or compounds during freeze-drying is apparent. Results further indicate thin-film evaporation as superior for natural waters, and freeze-drying better for concentrating sewage samples because of the lessened chances of degradation at lower temperatures. (Lowry-Texas)
W72-11632

BUILDING BANS ABOUND AS POLLUTION PEOPLE CONTINUE TO CRACK DOWN.

Engineering News Record, Vol 185, April 1970. p 9-10.

Descriptors: Treatment facilities, *Sewers, *Pollution abatement, Construction, Costs, New York, New Jersey, Pennsylvania, Virginia, Maryland, Indiana, California, Georgia, Ohio, Water pollution control, *Cities.
Identifiers: *Construction bans, Court order, Cleveland, San Francisco.

Cities in New York, New Jersey, Pennsylvania, Virginia, Maryland, Indiana, California, Georgia and Ohio have recently been under new building construction bans. Essentially, the bans have been legal orders to stop new building construction until treatment plants or sewers are built or upgraded to handle the increased load the new construction would place on them. It was estimated that about $20 to $30 million worth of new construction in the Cleveland area would be delayed during 1970. In San Francisco over $80 million in new construction permits were issued in one week after a building ban had been lifted by a court order. The building ban has been an effective means of getting action in many situations. Several examples were illustrated. (Galwardi-Texas)
W72-11641

TRANSACTIONS OF THE 36TH NORTH AMERICAN WILDLIFE AND NATURAL RESOURCES CONFERENCE.
For primary bibliographic entry see Field 06G.
W72-11681

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

CONJUNCTIVE USE OF WATER IN WEST TEXAS-BENEFITS TO NONCOOPERATORS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 04B.
W72-11116

THE RIVER BASIN MODEL: DIRECTOR'S GUIDE.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EPA.10:16110 FRU 12/71-2 $1.75; microfiche from NTIS as PB 210 855, $0.95. Environmental Protection Agency Water Pollution Control Research Series December, 1971. 229 p, 19 fig, 11 append. EPA Program 16110 FRU 12/71-2.

Descriptors: *Regional analysis, *Simulation analysis, *Computer programs, *Training, *Decision making, *Population, *Water demand, *Water users, *Water pollution control, *Treatment.
Identifiers: *Gaming-simulation, Holistic models.

he RIVER BASIN MODEL is a man-machine mulation model used to delineate the interactions king place, within a real or hypothetical area, etween the local water system and the economic, cial, and governmental activities of that area; it a model of an entire regional system, with water subsystem realistically interacting with all the her major subsystems, such as transportation. he Director is responsible for the operation of the odel in a gaming mode; he acts as a communica- on link among all participants and frequently etween participants (players) and the computer. e may make inputs and distribute output in vari- is ways. Presented is a manual describing what e Director needs to know in order to operate the odel, influence play, answer questions and use e Model to meet established objectives. The uide focuses on three major areas: (1) Pregame-- esponsibilities before the start of a program, such s choice of structure and formation of teams; (2) ptional formats--provision for complementary ctivities, such as town meetings and mass media resentations; and (3) Model operations--details r operating the Model itself. (Bell-Cornell) 72-11171

ORDAN AQUEDUCT, BONNEVILLE UNIT, ENTRAL UTAH PROJECT (DRAFT EN- IRONMENTAL IMPACT STATEMENT).
ureau of Reclamation, Washington, D.C.
or primary bibliographic entry see Field 08A. 72-11181

ENEFIT-ACCURACY RELATIONSHIP FOR MALL STRUCTURE DESIGN FLOODS,
Queen's Univ., Kingston (Ontario). Dept. of Civil ngineering.
. C. Wilson.
Vater Resources Research, Vol. 8, No. 2, p 508-12, April, 1972. 1 fig, 2 ref.

Descriptors: *Flooding, *Flood control, Hydrometry, *Planning, Cost-benefit analysis, Mathematical models, Optimization, Water esources development, Construction costs.
Identifiers: *Hydrometric networks.

A model for applying cost-benefit economic analy- is to hydrometric planning is developed. The op- mal expenditure on a flood control project is seen o lie between the two extremes of (1) minimizing he actual installation costs, and (2) maximizing he flood protection. Within the framework of this odel, optimality is achieved by minimizing the um of construction costs and the present value of ne probable future damage from flooding. At the ptimum, the cost of an incremental increase in ne design flow should just equal the value of the enefits arising from this incremental increase. By xpressing cost and discharge as ratios of the alues at the optimum point, a dimensionless quation is derived which links the error in flood ow estimates to the resulting increase in the cost f flood control. This expression includes only two arameters, and when the error in flood estimation not excessively large this cost-accuracy relation- hip reduces to a simple square law. These arameters are estimated for a representative ase, and the application of the method to network lanning is indicated. (Settle-Wisconsin) 72-11215

YSTEMS ANALYSIS OF THE PANAMA ANAL WATER SUPPLY,
orps of Engineers, Davis, Calif. Hydrologic En- neering Center.
or primary bibliographic entry see Field 04A. 72-11223

YSTEM RELATIONSHIPS FOR A PANAMA ANAL WATER SUPPLY STUDY,
tomic Energy Commission, Washington, D.C.
or primary bibliographic entry see Field 04A. 72-11224

MODELING PROBLEMS AND PROBLEM AVOIDANCE IN WATER RESOURCE MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Graduate School of Business and Public Administration.
J. E. Hass.
Water Resources Research, Vol. 8, No. 3, p 785-789, June, 1972. 13 ref.

Descriptors: Water resources, *Management, *Mathematical models, *Systems analysis, Government finance, Economics, *Model studies.
Identifiers: Receiving waters, Trade, *Discharge rights.

Three basic categories of modeling are discussed. The first is labeled basic component modeling which, for example, may be utilized for building DO models; the most simple of the three, the problem at the basic component level is a lack of knowledge, primarily of the more elusive water quality characteristics. The second type of modeling is systems analysis modeling. It provides a framework in which the various basic components are integrated; it is the link between the decision variables and the physical--biological variables of a system. The third class of modeling is systems design modeling, in which the modeler must designate the optimal treatment scheme for a given watershed, for example. Classes of problems facing the modeler are discussed. Ways of avoiding problems by creating artificial marketplaces to allocate the assimilative capacities of receiving water more efficiently are presented. Finally, examination is made of the extent to which other problems could be avoided if the government were to create and sell discharge rights that would then be freely traded in a 'rights market.' (Bell-Cornell) W72-11225

DECOMPOSITION AND MULTILEVEL TECHNIQUES FOR WATER QUALITY CONTROL,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
For primary bibliographic entry see Field 05G. W72-11226

IMPACT OF SYSTEMS TECHNIQUES ON THE PLANNING PROCESS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. C. Major.
Water Resources Research, Vol. 8, No. 3, p 766-768, June, 1972. 4 ref.

Descriptors: Water resources, *Planning, *Systems analysis, Mathematical models, Water supply, Water demand, *Evaluation, Coordination.
Identifiers: *Multiple objectives.

Systems analysis has been used successfully in the North Atlantic regional (NAR) water resources study. Described are the major impacts of systems techniques on the planning process in the NAR study. The techniques discussed are an input-output-based demand projection model and a mathematical programming supply model. The impacts discussed relate to the coordination and control of the planning process, the assessment of uncertainty, the consideration of multiple objectives, the efficiency of planning, the scope for the exercise of judgment, and the opportunity for a planning process continued beyond the final report. The impact of systems techniques has been positive; no major water resource planning should be undertaken without a commitment to the use of systems techniques. (Bell-Cornell) W72-11227

THE RIVER BASIN MODEL: MUNICIPAL SERVICES DEPARTMENT.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO EP2.10:16110FRU 12/71-8 Sup Doc, $1.00; Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 93 p, 26 fig, 4 tab, 2 append. EPA Program 16110 FRU 12/71-8.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Computer programs, *Mathematical models, *Public health, *Municipal water, *Water users, *Water demand, *Water pollution control, *Treatment.
Identifiers: *Governmental processes, *Public policy, *Public services, *Gaming-simulation.

The RIVER BASIN MODEL is not primarily a water management model. Through human interaction and computer simulation, it and its users represent the major economic, social, and governmental decision-making which causes a regional system to function nd change on a year-to-year basis. As part of the functioning of this system, water is demanded by industries and municipal water suppliers and pollution is generated by manufacturing and commercial activities, by people, and by farm activities. A gaming format is employed; model users provide inputs to the computer programs on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. The Governmental Sector and the model required by its Municipal Services Department are described. A principal function of the Governmental Sector is to provide public services, and its participants are elected and appointed public officials. The Municipal Services Department provides services (police, fire, health) to population units and economic activities; it makes decisions affecting quality of life in the neighborhoods it serves as well as affecting business costs. (Bell-Cornell) W72-11271

THE RIVER BASIN MODEL: SCHOOL DEPARTMENT.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-7, $1.00; Microfiche from NTIS as PB-210 859, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 94 p, 25 fig, 3 tab, 2 append. EPA Program 16110 FRU 12/71-7.

Descriptors: *Regional analysis, *Education, *Simulation analysis, *Computer programs, *Decision making, *Mathematical models, *Water demand, *Water users, *Water pollution control, *Treatment.
Identifiers: *Public policy, *Governmental processes, *Gaming-simulation.

The RIVER BASIN MODEL and its users represent an entire regional system's economic, social, and governmental activities; water decisions are placed within their realistic context of having different importance to different individuals as a function of their occupation, location, resources, and personal inclinations. The model is a human interaction, computer-simulation decision-making tool. Its users provide inputs to the computer programs on behalf of business activities in an Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. A gaming format is employed. Presented is a description of the functions of the Government Sector and the model required by its School Department. The Government Sector represents the management apparatus for the public sector of the area represented by the Model. Its participants are the elected and appointed public officials. This Sector can make public policy, implement plans and programs, provide public services and raise and disperse funds. The School Department provides child and adult education for citizens in the local jurisdictions. The demand for school services within a district is dependent upon the number and class of population units located within the boundaries of the school district. (Bell-Cornell) W72-11272

Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-4, $1.25; microfiche from NTIS as PB-210 860, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 117 p, 27 fig, 2 tab, 1 append. EPA Program 16110 FRU 12/71-4.

Descriptors: *Social needs, *Social values, *Population, *Water users, *Water demand, *Water pollution control, *Treatment, *Regional analysis, *Simulation analysis, *Decision making, *Computer programs, *Mathematical models.
Identifiers: *Social assets, *Gaming-simulation.

The RIVER BASIN MODEL is not primarily a water management model. Through human interaction and computer simulation, it represents the entire complex economic, social, and governmental activities taking place within a specified local system. Its users represent the major economic, social, and governmental decision-makers who cause a regional system to function and change on a year-to-year basis. As part of the functioning of this regional system, water is demanded by industries and municipal water suppliers and pollution is generated by manufacturing and commercial activities, by people, and by farm activities. The model is a computer-assisted decision-making tool in which computer programs simulate the major processes. Its users provide inputs to these programs on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. A gaming format is employed. Decision-makers in the Social Sector represent the citizens living and working in the simulated area, voters who concern themselves with employment, housing, schools, parks, the quality of life and the character of the region in which they live. Water decisions are placed within their realistic context of having different importance to different individuals as a function of their occupation, location, resources, and personal inclinations. (Bell-Cornell)
W72-11273

THE RIVER BASIN MODEL: ECONOMIC SECTOR.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-3, $1.25; microfiche from NTIS as PB-210 861, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 151 p, 43 fig, 6 tab, 1 append. EPA Program 16110 FRU 12/71-3.

Descriptors: *Regional analysis, *Economics, *Water demand, *Water users, *Water pollution control, *Treatment, *Simulation analysis, *Computer programs, *Decision making, *Mathematical models, *Industries, *Farms.
Identifiers: *Economic assets, *Gaming-simulation.

The RIVER BASIN MODEL is not primarily a water management model. It is a human interaction, computer-simulation decision-making tool, representing the entire complex economic, social, and governmnetal activities occurring within a specified local system. Its users represent the major economic, social, and governmental decision-makers who cause the regional system to function on a year-to-year basis. As part of the functioning of this system, water is demanded by industries and municipal water suppliers and pollution is generated by manufacturing and commercial activities, by people, and by farm activities. The model provides computer programs which simulate the major processes. Model users provide imputs to these programs on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. A gaming format is employed; Economic Sector teams control regional economic assets: cash, land, manufacturing plants, outside investments, commercial activities, and/or residences. Economic decision-makers are those businessmen who operate commercial, industrial, residential and farm establishments. Water decisions are made within their realistic context of interaction with the regional processes. Industrial activities use surface water and all other economic businesses have some need for municipally supplied water. (Bell-Cornell)
W72-11274

MATHEMATICAL MODELLING IN HYDROLOGY,
Geological Survey, Fort Collins, Colo. Water Resources Div.
For primary bibliographic entry see Field 02A.
W72-11292

CALCULATION OF EXPECTED VALUES OF OBSERVABLES IN SOME PROBLEMS OF STATISTICAL GEOMORPHOLOGY,
Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
For primary bibliographic entry see Field 02A.
W72-11294

MATHEMATICAL MODELS AND THEIR USE IN WATER RESOURCES DECISION-MAKING,
Department of Fisheries and Forestry, Ottawa (Ontario).
A. K. Biswas.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 5, Paris, France, p. 241-248, Aug-Sept 1971. 23 ref.

Descriptors: *Mathematical models, *Optimum development plans, *Water resources development, Project planning, River basin development, Model studies, Models, Decision making, Water resources, Social aspects, Water utilization, Computer applications, Bibliographies, Simulation, Mathematical analysis, Computer models, Planning.

Use of mathematical models in the field of water resources planning is not new, but our current capability to analyze more complex systems is new. Basically, models can be divided into 2 categories: programing and descriptive. Programing models derive the optimal policy for a given objective function; descriptive models predict the values of endogenous variables for a given set of exogenous variables. Models can significantly aid the decisionmaker in arriving at better decisions by broadening his information base, by predicting the consequences of several alternative courses of action, or by selecting a suitable course of action to accomplish a prescribed result. Models augment rather than replace experience. The fundamental aspect of any decisionmaking process is the participation of those who may be affected by the decision itself. The model builder can play an important part in the decisionmaking process by informing the public of the feasible alternatives and the possible consequences of each. The public, using this knowledge, can then make more meaningful decisions. The policy implications of the mathematical programing model and the simulation model developed for the Saint John River System of Canada are discussed. (USBR)
W72-11362

SYSTEMS APPROACH TO REGIONAL WATER USE AND DEMAND,
Department of Fisheries and Forestry, Ottawa (Ontario).
For primary bibliographic entry see Field 06D.
W72-11363

A QUANTITATIVE FRAMEWORK FOR RESIDUALS MANAGEMENT DECISIONS,
Resources for the Future, Inc. Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-11501

WATER QUALITY PREDICTION WITHIN AN INTERBASIN TRANSFER SYSTEM,
Texas Water Devleopment Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 05B.
W72-11652

6B. Evaluation Process

THE RIVER BASIN MODEL: DIRECTOR'S GUIDE.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11171

THE ENERGY-ENVIRONMENT CONFLICT: SITING ELECTRIC POWER FACILITIES,
Virginia Univ., Charlottesville. School of Law.
For primary bibliographic entry see Field 06G.
W72-11172

OCONTO HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 08A.
W72-11179

JORDAN AQUEDUCT, BONNEVILLE UNIT, CENTRAL UTAH PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11181

EFFECT OF WATER AVAILABILITY ON MANUFACTURING EMPLOYMENT IN THE TENNESSEE VALLEY REGION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
C. B. Garrison, and A. S. Paulson.
Water Resources Research, Vol. 8, No. 2, p 301-316, April, 1972. 10 tab, 11 ref, append.

Descriptors: *Water supply, *Employment, *Water users, *Industries, Regression analysis, Tennessee.
Identifiers: *Manufacturing, *Tennessee Valley.

A significant relationship was found between water-oriented manufacturing employment and water availability, where water avilability is measured in terms of 7-day, 10-year minimum streamflow, in the 194-county Tennessee Valley region. Using employment change and competitive effect in number of employees as dependent variables, chi square tests of independence indicate that concentrations of at least 500 employees in water-oriented manufacturing are significantly related to water availability. Total manufacturing employment in the region in 1968 was 682,788. Of this number. 106,274 was accounted for by concentrations in water intensive employment of at least 500 in countries with a flow of at least 400 cfs. To explain the variation in employment per river mile among small regions, a regression equation with population density as the independent variable was constructed. The model was specified to be log-linear. The regression indicates that, for a difference of 10% in population density between small regions, employment per river mile varies by 8.15%. These findings suggest that public investment projects which augment minimum stream flow to values greater than 400 cfs may favorably alter a small region's location characteristics for water intensive manufacturing industries. (Settle Wisconsin)
W72-11208

AN ANALYSIS OF LATENT DEMAND FOR WATER-BASED OUTDOOR RECREATION FACILITIES,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 06D.
W72-11209

RECREATIONAL OPPORTUNITIES AND COMMUNITY PATTERNS OF NONPARTICIPATION IN WATER-BASED RECREATION IN OKLAHOMA,
Oklahoma State Univ., Stillwater. Dept. of Geography.
R. D. Hecock.
Rocky Mountain Social Science Journal, Vol. 9, No. 2, p 11-17, April, 1972. 2 fig, 3 tab.

Descriptors: *Recreation, *Recreation facilities, *Recreation demand, *Social aspects, Water utilization, Statistical methods, Oklahoma, *Water demand.
Identifiers: *Recreation supply, Nonparticipation.

The following hypothesis is posed: water recreation facilities or opportunities are relevant variables in explaining patterns of nonparticipation in water recreation activities. To test this hypothesis, data obtained from a 1969 survey of approximately 4,100 Oklahoma households were analyzed. Nearly one-half of the Oklahomans surveyed did not participate in water-based recreation activities. Generally, the geographical patterns of nonparticipation appear to correspond with an east to west decline in water-recreational resource opportunities in Oklahoma. This relation was particularly apparent for swimming and boating. Nonparticipation in these activities rapidly increases if opportunities are more than a few miles away. For fishing and water skiing, however, there was no significant statistical relationship between water resource opportunities and the nonparticipation rates, suggesting that the availability of nearby opportunities is not very important for these activities. Overall, the study suggests that opportunity availability is a factor in explaining nonparticipation in some instances of water-based recreation activities. While these are not the only relevant variables, they are at least equal to socioeconomic factors in explaining boating and swimming activities. In the case of water skiing and fishing, it seems likely that different measures of opportunity are required. (Settle-Wisconsin)
W72-11210

RURAL WATER SUPPLIES IN DEVELOPING COUNTRIES,
World Health Organization, Washington, D.C. Pan American Sanitary Bureau.
D. Donaldson.
Water Resources Bulletin, Vol. 8, No. 2, p 391-398, April, 1972. 10 ref.

Descriptors: *Water supply development, *Rural areas, *Water resources development, Planning, Financing, Water demand.
Identifiers: *Less developed countries, *Latin America.

The best available figures indicate that on a global basis only about 10 per cent of the rural populations have a safe source of water, with the Americas having the highest coverage at 19 per cent. The scope of the problem of further developing rural water supplies is enormous. A recent U.N. proposal called for the installation of 20,000 rural water systems each year for the next ten years. For an estimated cost of 1.6 billion dollars, this project would provide coverage to an additional 200 million rural inhabitants. Yet, such an effort would still leave 80 per cent of the world's rural inhabitants without safe water supplies. The development of a rural water supply can be viewed as having the following three parts: (1) community wells for the dispersed population; (2) a rudimentary aqueduct for the semiconcentrated population; and (3) a rural aqueduct for the concentrated population. Successful rural water development programs exemplify certain common elements. They are part of a national or master plan; the staff have been trained in rural techniques; community participation is strong; simple economical designs are employed; and water rates cover operation and maintenance costs. The use of revolving funds may help finance the projects. (Settle-Wisconsin)
W72-11211

AN ECONOMIC ANALYSIS OF WATER RESOURCE USE AND USE CONFLICTS OF SELECTED INDUSTRY GROUPS IN ALABAMA WITH RESPECT TO AREA DEVELOPMENT,
Auburn Univ., Ala. Dept. of Economics.
R. L. Burks.
M Sc Thesis, December 12, 1968. 111 p, 7 fig, 24 tab, 72 ref, 9 append.

Descriptors: *Water utilization, *Water users, *Industrial water, *Competing uses, Industrial plants, Water resources development, Economic efficiency, *Alabama.
Identifiers: *Manufacturing.

The utilization of Alabama's water resources are analyzed in order to determine the water supply-demand situation for industrial firms and to isolate significant industrial water problems. The primary source of data for the study was a questionnaire survey of over 235 industrial firms. The study suggested that principal water-using industries exert a significant impact on Alabama's economy. Water-using industries employed over 50 per cent of Alabama's manufacturing workers and paid almost 56 per cent of the total annual payroll for all manufacturing. They also accounted for 74 per cent of the new capital expenditure by Alabama industry in recent years. The study also uncovered some significant water-conflict situations. Fifty firms were either currently experiencing water conflicts of some type or expected to encounter them in the near future. The most frequently reported conflict concerned quantitative uses of water interfering with a plant's waste-disposal practices. Some plants also experienced qualitative conflicts. Several firms expected a conflict to develop between future uses of water for recreational purposes and industrial use for transportation of waste materials. These conflicts need to be minimized if economic efficiency is to be assured. (Settle-Wisconsin)
W72-11218

CLEAN WATER: AFFLUENCE, INFLUENCE, EFFLUENTS, A DESIGN FOR WATER QUALITY MANAGEMENT.
For primary bibliographic entry see Field 05B.
W72-11219

AN ECONOMIC AND BIOSTATISTICAL ANALYSIS OF THE BAIT FISH INDUSTRY IN THE LOWER COLORADO RIVER,
Nevada Univ., Las Vegas.
F. A. Espinosa, J. E. Deacon, and A. Simmons.
Available from the National Technical Information Service as COM-72-10082, $3.00 in paper copy, $0.95 in microfiche. September, 1970. 87 p, 10 fig, 18 tab, 19 ref.

Descriptors: *Baits, *Bait fishing, *Fishing, Minnows, Salamanders, Supply, Demand, Fisheries, Colorado River, Recreational facilities.
Identifiers: *Recreational fishing.

The supply of and demand for bait fishes in the Lower Colorado River Complex is studied. The total number of retail bait outlets in this basin is 53. Seventeen of these outlets are in the Las Vegas-Lake Mead area; fourteen are in the Lake Havasu-Mohave County area; and ten are in the Parker Dam area. In 1968, bait sales in the study area were approximately $457,000, or roughly 4.3 million units of live salamander larvae and minnows. The supply of minnows produced in the basin meets only about 50 per cent of the retail demand. The remaining demand is met with minnows imported from two Central California hatcheries. A survey of 29,501 fishermen in the Lake Mead area indicated that about 62 per cent fished exclusively with live bait such as salamander larvae, golden shiners, and goldfish. Projections for increases in population, leisure time, mobility, income and tourism suggest that the demand for bait in the Lake Mead area is likely to increase at an annual rate of about 9 per cent in the next decade. Increases in minnow supply should meet these demand increases; however, the supply of salamanders should become quite erratic in the future. (Settle-Wisconsin)
W72-11220

FOREIGN DEEP WATER PORT DEVELOPMENTS, A SELECTIVE OVERVIEW OF ECONOMICS, ENGINEERING, AND ENVIRONMENTAL FACTORS,
Little (Arthur D.), Inc., Cambridge, Mass.
J. L. Goodier, M. C. Huston, B. M. Putnam, and B. L. De Frondeville.
Three vols available from NTIS, Springfield, Va. as AD-736 340, AD-736 341, and AD-736 342, for $9.00 paper copy or $2.85 microfiche. Army Engineer Institute for Water Resources Report IWR 71-11, Volumes I-III, December, 1971. 655 p, 6 fig, 27 tab, 8 append. DACW 31-71-c-0044.

Descriptors: *Harbors, *Deep water, *Economic feasibility, Engineering, Planning, Evaluation, Water resources development, Environmental effects, Cost sharing.
Identifiers: *Ports, *Port development, Foreign ports.

The economic advantages of large-scale ocean carriers of oil and ores have generated considerable pressure for the development of several deep ports in the United States providing drafts in excess of 60 feet. Several foreign deep-water port developments were studied. The port experiences analyzed were those of Dunkirk, Le Havre, Antwerp, Rotterdam, Amsterdam, Canada's Port Carter, Ireland's Bantry Bay, the Persian Gulf, the United Kingdom, Australia and Japan. The major categories of analysis were economics, engineering considerations, and environmental issues. The study suggests that a major bulk port needs (1) a deep access for 250,000 dwt ships, (2) efficient ship- and cargo-handling capability, (3) good transportation links with the interior, and (4) industrial land acreage ranging from 20,000 to 50,000 acres. Furthermore, major port development plans should be based on (1) good, long-range forecasts, (2) clear national strategies, (3) consideration of all possible location alternatives, (4) a flexible regional master plan, (5) plans for an integrated transportation system, (6) plans for the reorientation of existing ports, and (7) an implementation of mechanisms ensuring participation of and communication between all parties concerned. (Settle-Wisconsin)
W72-11222

SYSTEMS ANALYSIS OF THE PANAMA CANAL WATER SUPPLY,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 04A.
W72-11223

SYSTEM RELATIONSHIPS FOR A PANAMA CANAL WATER SUPPLY STUDY,
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-11224

IMPACT OF SYSTEMS TECHNIQUES ON THE PLANNING PROCESS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-11227

THE RIVER BASIN MODEL: MUNICIPAL SERVICES DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11271

THE RIVER BASIN MODEL: SCHOOL DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11272

Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11273

THE RIVER BASIN MODEL: ECONOMIC SECTOR.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11274

HISTORY OF FEDERAL WATER RESOURCES PROGRAMS, 1800-1960.
Economic Research Service, Washington, D.C.
B. H. Holmes.
Dept. of Agriculture Miscellaneous Publication No. 1233, June 1972, 51p.

Descriptors: *Water resources development, *Legislation, *Planning, *Institutional constraints, *Political aspects, Regional development, River basin development, History.
Identifiers: *Study commissions, *Congressional control.

This history of federal water resources planning and development programs begins with a summary description of the first legislation and planning reports for navigation, flood control, irrigation, and power projects which were initiated during the 19th Century; and notes the activities of the Army Corps of Engineers as the first federal construction agency. The next four chapters cover the 'Progressive era, 1901-1920', beginning with the planning commissions of Theodore Roosevelt, the 'Era of normalcy', 1921-1933' which includes the basic Rivers and Harbors Act of 1930, the 'New Deal in planning, 1933-1943' with the establishment of the National Resources Planning Board, and the 'Era of congressional control, 1943-1960' which includes a review of the influence of the study commissions, inter-agency coordinating committees, the two Hoover reorganization commissions, and the development of new planning procedures. Also discussed are national political issues related to water resources, such as the relationships between Congress and the Executive, between federal planning agencies, and the origins and continuation of federal policies which favored natural resources development to strengthen the economic condition of smaller cities, agriculture, and the West. (Cowgill-OWRR)
W72-11276

HYDROELECTRIC POWER DEVELOPMENT IN CENTRAL SIBERIA,
Waterloo Univ. (Ontario).
J. R. Bater.
Water Power, Vol. 24, No. 1, p 5-12, Jan 1972. 3 fig, 3 photo, 1 tab, 28 ref.

Descriptors: Water resources, *Management, *Water resources development, Project planning, Bibliographies, Hydroelectric power, Electric power production, Decision making, River basin development, Foreign projects, Economic justification, Cost analysis, Multiple purpose projects, Benefit-cost analysis, Priorities.
Identifiers: *Hydroelectric resources, USSR, Siberia, Angara River (USSR), Krasnoiarsk Powerplant (USSR), Bratsk Powerplant (USSR).

The purpose is to: (1) examine the hydroelectric development in a region well endowed with water resources (but escaping few of the current water management problems); and, (2) discuss aspects of the controversy over water management relevant to hydropower development. Central Siberia, with 2 important river systems of developed hydro potential--the Angara and the upper Yenisei--is discussed. Criticisms of low cost electricity, the principal economic benefit of hydropower in Central Siberia, are examined. Development priorities, cost considerations, cost-benefit assessment, and the environmental impact are reviewed. In Soviet river basin development programs, decisions frequently maximized benefits to the hydropower sector at considerable cost to other water users. Based on original terms of reference, these programs were deemed economical by Soviet decision makers; now, the terms of reference and evaluation procedures are being questioned. (USBR)
W72-11377

WATER RESOURCE PROJECTS AND ENVIRONMENTAL IMPACTS: TOWARDS A CONCEPTUAL MODEL,
Wisconsin Univ., Madison. Water Resources Center.
D. W. Bromley, N. L. Meyer, J. Stoltzenberg, and M. Warner.
Available from the National Technical Information Service as PB-210 918, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center Madison, Completion Report, February 1972. 56 p, 7 fig, 2 tab, 15 ref, 2 append. OWRR B-057-WIS (1).

Descriptors: Land resources, Economics, *Environmental effects, *Model studies, *Evaluation, *Land use, *Idaho, Simulation analysis.

As multiobjective evaluation of water resource investments becomes more common, it is important to develop conceptual bases for including monetary as well as nonmonetary impacts in the evaluation process. This is currently hampered by the lack of a comprehensive and systematic model which permits the identification and display of the many project impacts. And, more importantly, there is little information on the linkage between economic activity and many environmental impacts. A start is made by depicting natural resource use by sector of economic activity, with concentration on land use. A simulation model is developed which will determine acres in certain land-use categories in Southern Idaho over time without any water development. By being able to predict land use changes with and without a project, the first step in linking economic activity to certain environmental impacts has been taken.
W72-11385

WATERSHED PLANNING.
Minnesota Univ., Minneapolis. Water Resources Research Center.

Available from the National Technical Information Service as PB-210 914, $3.00 in paper copy, $0.95 in microfiche. Papers presented at Seminar on Watershed Planning sponsored By the Metropolitan Council and the Minnesota Association of Watershed Districts, February 15, 1972, Bloomington, Minnesota. Minnesota Water Resources Research Center, Bulletin 50, April 1972. 63 p. OWRR A-999-MINN (24).

Descriptors: *Planning, *Watersheds (Basins), *Minnesota, Water resources, Land use, Legislation, *Inter-agency cooperation.
Identifiers: *Metropolitan Council, Advocacy positions, Joint Power Agreements, Development guide.

The objective of the Seminar on Watershed Planning was to gather area leaders representing watershed districts, municipal, county and State government, and private groups in an effort to stimulate further coordinated water resources planning in Minnesota. The following topics were discussed: Metropolitan Council, watershed district, and municipal water resources planning relationships; importance of open space to watershed district planning; watershed planning in Minnesota; Department of Natural Resources relationship to watershed districts; soil and water conservation relationships to watershed districts; and regional planning and watershed resources. In particular, the Seminar was concerned with the Metropolitan Development Guide and the overall plans of watershed districts. (Walton-Minnesota)
W72-11439

7 PRINCIPLES FOR AN URBAN LAND POLICY,
For primary bibliographic entry see Field 03D.
W72-11475

LEGAL AND POLITICAL CONDITIONS OF WATER RESOURCE DEVELOPMENT,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 06E.
W72-11484

CREATIVE WATERFRONT DEVELOPMENT,
Metropolitan Toronto and Region Conservation Authority, Woodbridge (Ontario). Waterfront Task Force.
For primary bibliographic entry see Field 03D.
W72-11485

REMOTE LAND - DEVELOPMENT OR EXPLOITATION,
W. H. Martin.
Urban Land, Vol 30, No 2, p 3-10, February 1971 4 photo, 1 fig.

Descriptors: *Land development, *Exploitation *Recreation demand, Planning, Zoning, Ecology Environment, Regulation, Ethics, *California.
Identifiers: *Remote land, Western Developers Council.

As the pressures of increasing population and time for recreational pursuits continue, the desirability of remote lands for leisure activities and retirement will also increase. Some basic aspects of the development of remote land are discussed, including: purchase motivation, land acquisition, land development, and sales organization. Two examples of remote land development are discussed Antelope Valley located in the San Gabriel Mountains, and Canyon Lake located in Riverside County about 70 miles southeast of Los Angeles Although the concept of using zoning as a planning tool has worked well in most communities providing for compatible land uses, urban zoning classifications of industrial and multiple residential use for remote land parcels appear to be inconsistent with good planning practices. An organization committed to setting and maintaining professional standards in the land development industry has been formed, the Western Developers Council The Council's Code of Ethics is designed to serve as a guideline for members and the industry at large. It requires the use of professional master planners for recreation-residential development in cooperation with ecological and environmental consultants; full and accurate disclosure of all conditions; and factual data in promotion and advertising efforts. It prohibits statements to potential buyers regarding a specific rate of future value appreciation over a particular time period. Development and observance of such a code is beneficial to the developer, purchaser, and land development industry. (Strachan-Chicago)
W72-11487

KALAMAZOO RIVER FLOOD CONTROL PROPOSAL: A CASE STUDY,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 04A.
W72-11490

CHICAGO'S LAKEFRONT PARKLAND: GREAT LEGACY UP FOR GRABS,
L. Wille.

Inland Architect, Vol. 16, No. 2, p 8-15, February 1972. 8 photo, 1 fig.

Descriptors: *Conservation, *Lake Michigan, *Land use, Airports, Land development, Costs, Planning, *Illinois.
Identifiers: *Chicago.

The proposed overhaul of Chicago's Soldier Field is critized. Although this proposal appears at first to be a victory for the conservationists, the City would do better to destroy the stadium and use the land to expand Chicago's shoreline. There are three major threats to the future of Chicago's lakefront: (1) a proposed airport in the lake, (2) development of the Illinois Central air rights, and (3) the automobile. The proposed airport would be an extremely expensive undertaking, while compounding already existing problems of water, air, and noise pollution. Development of the Illinois Central air rights would further cut the city off from its lakefront by the construction of a wall of high rise buildings. City planners must reach some sort of rapprochement with motor traffic, and prohibit further erosion of the lakefront parks by road-widening, highway interchanges, and parking lots. The lakefront should not be appropriated by a few individuals to the exclusion of others. Background information is presented about environmental problems and their solutions in Chicago. (Strachan-Chicago)
W72-11491

THE FUTURE OF WASTEWATER TREATMENT - AN OPINION SURVEY.
For primary bibliographic entry see Field 05D.
W72-11493

WATER PROJECTS AND RECREATION BENEFITS,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 06E.
W72-11495

WILD AND SCENIC RIVERS: PRIVATE RIGHTS AND PUBLIC GOODS,
Washington Univ., Seattle. Dept. of Geography.
For primary bibliographic entry see Field 06E.
W72-11497

LEGISLATIVE NEEDS IN WATER--RESOURCES MANAGEMENT IN ALABAMA,
For primary bibliographic entry see Field 06E.
W72-11536

POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES.
National Economic Research Associates, Inc., New York.
For primary bibliographic entry see Field 05G.
W72-11589

COOPERATIVE COMMUNITY-UNIVERSITY WATER RESOURCE PLANNING: AN INTERDISCIPLINARY APPROACH,
Wisconsin Univ., Green Bay.
For primary bibliographic entry see Field 04A.
W72-11590

WATER DEMAND FORECASTS AND PLANNING MARGINS IN SOUTH-EAST ENGLAND,
London School of Economics and Political Science (England); and Queen Mary Coll., London (England).
For primary bibliographic entry see Field 06D.
W72-11592

PHOTOSYNTHESIS--POLICIES AND PROGRAMS FOR GREAT POTENTIALS, BEGINNING STAGES FOR EFFECTIVE WATER MANAGEMENT,
Utah Univ., Salt Lake City, Dept. of Economics.
J. R. Mahoney.
The Physical and Economic Foundation of Natural Resources, No. VI, University Research Committee, University of Utah, 1971. 81 p, 8 fig, 5 tab.

Descriptors: *Photosynthesis, *Water supply, *Plant physiology, Water utilization, Management, Water resources development, Water policy.

Advances in the knowledge of the process of photosynthesis have provided the beginnings of a scientific base for the economics of water use. This most vital process, in which green plants use water, carbon dioxide from the atmosphere, and various mineral elements from the soil, is driven forward by the radiant energy of the sun to manufacture all of the products used by plants and, directly or indirectly, those used by animals. For the most part, the economic implications of photosynthesis have been ignored. This neglect is particularly surprising in the face of numerous and costly projects for the management of water resources. To partially offset this previous neglect, several features of the earth's water resources are examined in fifteen short papers. Seven papers discuss the basic elements of the photosynthetic process as it was understood in 1952. The physical basis of water supply and its principal uses are examined by six writers. The supply sources analyzed include evaporation from the sea, rainfall, evapotranspiration, and reclamation from sewage and industrial wastes. The two remaining papers discuss (1) the status of groundwater studies, and (2) the nation-wide water situation. (Settle-Wisconsin)
W72-11594

PUBLIC DOMAIN ADMINISTRATION--A SCIENTIFIC BASIS FOR WATERSHED MANAGEMENT,
Utah Univ., Salt Lake City, Dept. of Economics.
J. R. Mahoney.
The Physical and Economic Foundation of Natural Resources, No. V, University Research Committee, University of Utah, 1971. 63 p, 10 charts, 3 fig, 16 tab.

Descriptors: *Watershed management, *Watersheds (Basins), *Water resources development, Legal aspects, Surveys, Maps, Meteorology.
Identifiers: *Public domain, Data requirements, Catchments.

Several aspects of public land and watershed management are discussed, including (1) the background of public land acquisition, (2) the need for and essential features of an accelerated federal surveying and mapping program, (3) the basic elements of a national water resources basic-data program, (4) the principles of catchment area management, and (5) the meteorological and physical factors affecting water supply. As early as 1950, the U.S. Congress was considering bills which would have provided for an accelerated surveying and mapping program and for a national water resources basic-data program. Unfortunately the outbreak of the Korean War prevented these bills from reaching the floor of Congress and since then similar basic legislation has not been presented for action by the Congress. These bills are reprinted as a guide to future legislation. Also, a set of tables, which are presented for the first time, show quantitative measurements of some physical and economic results of water consumption under present federal public domain management programs. Although these management programs received strong support in a recent report of the Public Land Law Review Commission, the new data suggest that few net benefits are generated under present programs. (Settle-Wisconsin)
W72-11595

DESIGN AND ECONOMICS OF JOINT WASTEWATER TREATMENT,
Vanderbilt Univ., Nashville, Tenn; and Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 05D.
W72-11597

SOCIO-ECONOMIC CONSIDERATIONS IN WATER RESOURCES PLANNING,
Department of the Environment, Ottawa (Ontario). Policy Research and Coordination Branch.
A. K. Biswas.
Preprint paper presented at American Society of Civil Engineers National Meeting on Water Resources Engineering, Atlanta, Georgia, January 24-28, 1972. 17 p, 1 fig, 17 ref.

Descriptors: *Water resources development, *Planning, *Social aspects, *Environmental control, *Economic efficiency, Reviews, Project planning, Projections, Costs, Governments, Ecology, Management, Public health, Decision making, Regulation, Water pollution control.

Increasing public awareness of environmental problems and our overall social responsibility has added new dimensions to water resources planning. Increasing public participation in decisionmaking will probably be beneficial because often in the past the planners were not aware of the needs and desires of the society, and, consequently, planning decisions have included a rather limited response to new opportunities and lack of sensitivity to public values. However, techniques currently available for effectively integrating public participation in planning are rudimentary and leave much to be desired. Intensive research efforts shoud be directed to this area and also to development of methodologies to build social science models to improve the planning process. Finally, there is a need for better understanding of the dynamic relationship between man and his environment so that balanced long-term development and conservation policies can be pursued. (Woodard-USGS)
W72-11660

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

BENEFIT-ACCURACY RELATIONSHIP FOR SMALL STRUCTURE DESIGN FLOODS,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-11215

AN ECONOMIC AND BIOSTATISTICAL ANALYSIS OF THE BAIT FISH INDUSTRY IN THE LOWER COLORADO RIVER,
Nevada Univ., Las Vegas.
For primary bibliographic entry see Field 06B.
W72-11220

WHY METERING MAKES SENSE.
For primary bibliographic entry see Field 03D.
W72-11221

DECOMPOSITION AND MULTILEVEL TECHNIQUES FOR WATER QUALITY CONTROL,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
For primary bibliographic entry see Field 05G.
W72-11226

FEDERAL COST-SHARING POLICIES FOR WATER RESOURCES,
National Bureau of Standards, Washington, D.C.
H. E. Marshall, and V. L. Broussalian.
Available from the National Technical Information Service as PB-208 304, $6.75 paper copy,

$0.95 in microfiche. National Water Commission Report SBSi72-039, April 1972, 269 p.

Descriptors: *Cost sharing, Cost repayment, Cost allocation, Cost-benefit analysis, Water policy, Federal project policy, Flood control, Irrigation, Water pollution control, *Water resources development, *Multiple-purpose projects, Economics.
Identifiers: *Federal water resources policy, Public finance.

Federal cost-sharing policies for water resources development are examined with respect to their influence on decisions of local beneficiary groups. These influences are analyzed using criteria of efficiency, equity, administrative feasibility and sound financial arrangements. Current cost-sharing policies are found to be deficient. Alternative cost-sharing rules, namely the association rule, benefit sharing rule and single-percentage rule, are compared with existing Federal cost-sharing policies. The association rule, requiring local beneficiaries to share all costs of a project purpose in the proportion that local benefits bear to national benefits at the margin, is generally superior to the other cost-sharing rules examined. (NWC)
W72-11380

PRICING AND EFFICIENCY IN WATER RESOURCE MANAGEMENT,
George Washington Univ., Washington, D.C. Natural Resource Policy Center.
R. K. Davis, and S. H. Hanke.
Available from the National Technical Information Service as PB-209 083, $6.75 in paper copy, $0.95 in microfiche. National Water Commission Report SBS-72-044, December 1971, 283 p. Contract NWC 71-022.

Descriptors: *Prices, *Pricing, Efficiencies, *Public utilities, *Use rates, *Water rates, Water supply, Irrigation, Flood control, Water pollution control, Recreation, Hydroelectric power.
Identifiers: Federal water resources policy.

Pricing policies have been long recognized as potential mechanisms to improve efficiencies in resource use but pricing of water resources for this purpose has not been widely employed in the United States. The study examines the potential for pricing various water resource services including municipal, industrial and irrigation water supplies; sewage collection and treatment; control of losses from flooding; outdoor recreation; use of inland waterways; and hydroelectric power. The study concludes that efficiency in the use of water resource services can be improved through adopting policies of cost-based pricing although the potential varies among services. An econometric pricing policy model is applied to the Washington metropolitan area to demonstrate the relationship between pricing and the need for investment in new water supply facilities. (NWC)
W72-11382

DETERMINATION OF OPTIMUM STORAGE IN DISTRIBUTION SYSTEM DESIGN,
Dallas, City Water Utilities, Tex.
For primary bibliographic entry see Field 04A.
W72-11395

POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES.
National Economic Research Associates, Inc., New York.
For primary bibliographic entry see Field 05G.
W72-11589

PUZZLED ABOUT SURCHARGES. HERE'S HOW DURHAM OPERATES,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 05D.
W72-11593

DESIGN AND ECONOMICS OF JOINT WASTE-WATER TREATMENT,
Vanderbilt Univ., Nashville, Tenn; and Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 05D.
W72-11597

6D. Water Demand

THE RIVER BASIN MODEL: DIRECTOR'S GUIDE.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11171

EFFECT OF WATER AVAILABILITY ON MANUFACTURING EMPLOYMENT IN THE TENNESSEE VALLEY REGION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
For primary bibliographic entry see Field 06B.
W72-11208

AN ANALYSIS OF LATENT DEMAND FOR WATER-BASED OUTDOOR RECREATION FACILITIES,
Oklahoma State Univ., Stillwater. Dept. of Geography.
R. D. Hecock, and J. R. Rooney.
Available from the National Technical Information Service as PB-210 809, $3.00 in paper copy, $0.95 in microfiche. Completion Report (1971), 118 p, 39 tab, 12 ref, 5 append. OWRR B-020-OKLA (1).

Descriptors: *Recreation demand, *Recreation facilities, *Water resources development, Management, Income, Life cycles, Oklahoma, Social aspects.
Identifiers: *Latent demand, Leisure.

The extent and character of latent or unfulfilled demand for water-based recreation in Oklahoma are studied. To estimate recreation participation, facility use, and future demand, a household questionnaire was designed and administered to 4,000 Oklahoma households during the summer of 1969. The data gathered concerned trip expenditures, type and amount of participation in several outdoor activities, important decision-making parameters in the selection of facilities, and personal characteristics of the respondent. The survey indicated that about 30 per cent of Oklahoma's families do not participate in any water-based recreation whatsoever. Forty-five per cent did no swimming, and nearly 80 per cent failed to boat. The forces that seemed to be important to this repressed demand included satisfaction levels, life-cycle stage, leisure time availability, money, proximity to resources, and perception of water resource characteristics. Among these variables, income, time, and life-cycle were the most important. These findings have immediate applications for resource managers. Future increases in income and leisure time are likely to substantially increase demand. It is, therefore, important to predict the location and extent of income and leisure time growth so that those resources most affected can be properly altered to meet the demand. (Settle-Wisconsin)
W72-11209

RECREATIONAL OPPORTUNITIES AND COMMUNITY PATTERNS OF NONPARTICIPATION IN WATER-BASED RECREATION IN OKLAHOMA,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 06B.
W72-11210

RURAL WATER SUPPLIES IN DEVELOPING COUNTRIES,
World Health Organization, Washington, D.C. Pan American Sanitary Bureau.
For primary bibliographic entry see Field 06B.
W72-11211

AN ECONOMIC ANALYSIS OF WATER RESOURCE USE AND USE CONFLICTS OF SELECTED INDUSTRY GROUPS IN ALABAMA WITH RESPECT TO AREA DEVELOPMENT,
Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-11218

WHY METERING MAKES SENSE.
For primary bibliographic entry see Field 03D.
W72-11221

THE RIVER BASIN MODEL: MUNICIPAL SERVICES DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11271

THE RIVER BASIN MODEL: SCHOOL DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11272
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11273

THE RIVER BASIN MODEL: ECONOMIC SECTOR.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-11274

SYSTEMS APPROACH TO REGIONAL WATER USE AND DEMAND,
Department of Fisheries and Forestry, Ottawa (Ontario).
P. J. Reynolds.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 5 Paris, France, p 293-300, Aug-Sept 1971. 1 tab, 2 ref.

Descriptors: *Planning, *Systems analysis *Water resources development, Water demand Water resources, Costs, Benefits, Investment Forecasting, Decision making, Management, Industrial water, Domestic water, Hydroelectric power, Waste dilution, Wildlife, Recreation demand, Demand, Navigation, Bibliographies.
Identifiers: *Regional planning, *Regional water use, Canada, Microanalysis.

Competing demands for water supply, flood control, irrigation, hydropower, recreation, and quality control have increased with the Nation' growth. A critical examination of the availabilit and the costs and benefits associated wit development of each region's water resources i needed. Costs and manpower commitment required to collect and assess water use and demand data can be prohibitive; however, th methods and techniques of the systems approac provide effective ways of improving investmer decisions and forecasting alternative futures. Th essential steps in water demand forecasting are (1) regional economic base study; (2) identificatio of variables relating to each water demand an trend analysis over time; (3) analysis of alterna tives for meeting demands (supply functions); an (4) comparison of demand and supply functior and iteration to revise (1), (2), and (3) as necessar Water demand forecasting serves 2 purposes: (provides answers for broad, preliminary polic decisions or for preliminary screening of project and (2) aids investment decisions within specif regions. (USBR)
W72-11363

A MODEL ON MUNICIPAL WATER DEMAND: A CASE STUDY OF NORTHEASTERN ILLINOIS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geography.
S. T. Wong.
Land Economics, Vol 48, No 1, p 34-44, February 1972. 2 tab, 28 ref.

Descriptors: *Municipal water, *Water demand, *Economics, Income, Prices, Temperature, Elasticity of demand, Water supply, Analysis.
Identifiers: *Metropolitan water resources management, *Northeastern Illinois, Municipal water demand function.

Questions related to the economic demand for municipal water are examined including (1) How do price, income and average summer temperature affect the water demand function of Chicago and outside communities over time. (2) What impact do price and income have on the municipal water demand function among the various community groups in time. (3) Is municipal water demand relatively unresponsive to price change. (4) Is the income elasticity of municipal water demand near zero. (5) How do price and income elasticities compare with some previous studies. Data deficiency is a problem for this study. Over time, both income and average summer temperature have a significant impact on Chicago's water demand. While price is found to be insignificantly different from zero, the negative sign of its elasticity coefficient is consistent with consumer behavior theory. The statistical significance of income and average summer temperature on Chicago's water demand function suggests that any attempt to forecast the future demand for water in Chicago ought to take into consideration the household income level and the average summer temperature conditions. While price has no significant impact in Chicago, it was significant for Chicago's outside communities. At a point in time, price and income were found to have a significant impact for the two community size groups: 25,000-over and 10,000-24,999. In general, the results of these analyses lend support to the results of several earlier studies that have estimated price and income elasticities for municipal water demand. (Strachan-Chicago)
W72-11489

COUNTY-WIDE STUDY FORECASTS WATER USE,
North Carolina State Dept. of Water and Air Resources, Raleigh.
J. D. Wray.
Public Works, Vol. 103, No. 2, p 58-62, February 1972. 4 tab, 4 fig.

Descriptors: *Forecasting, *Water users, *Water supply, Population, Agriculture, Industrial water, Water quality, *North Carolina, Domestic waste.
Identifiers: *County water planning, *Wake County (NC).

The rate of water use for all purposes was determined for Wake County, North Carolina in a pilot study conducted by the State Department of Water and Air Resources. Undertaken in 1967, the study was an attempt to establish a rational basis for each quantifiable use and to obtain data that could be projected for forecasting future rates of use not only in Wake County but throughout the state. In Wake County, it is expected that most categories of water use will vary as a function of the population. Water use for irrigation has a large potential. If farm acreage is not significantly absorbed by urban growth and the market improves, it is estimated that over 14 billion gallons might be used during dry years by 2020. Livestock watering should decline slightly over the next fifty years. Industrial use forecast was 17 billion gallons for Wake County and 9 billion gallons for Raleigh in 2020. Institutional and commercial water use will generally vary with population growth. Per capita residential use should increase slowly as lawn watering becomes more popular and more water using appliances are installed. Although the total water loss in municipal systems will increase, the overall percentage loss will be reduced. A decline of one percent of the overall municipal use per decade was predicted. In combining the projections, hydrological conditions were considered because of their significant effect on overall county use. Predictions were made for both dry and wet conditions. Raleigh's water supply is expected to be adequate from a quantitative standpoint, although some questions of quality remain unresolved. (Strachan-Chicago)
W72-11492

WATER AND URBAN DECENTRALIZATION IN NEW SOUTH WALES,
University of New England, Armidale (Australia). Dept. of Geography.
J. Hobbs, and E. Woolmington.
Annals of the Association of American Geographers, Vol. 62, No. 1, p 37-41, March, 1972. 1 fig, 2 tab, 2 ref.

Descriptors: *Water supply, *Water demand, *Urbanization, Water requirements, Water resources development, *Australia.
Identifiers: *New South Wales, *Urban decentralization.

The estimated water needs of a hypothetical decentralized city of 100,000 people in New South Wales, Australia, are related to the water supply characteristics of ten different locations. These locations are Bathurst, Bourke, Casino, Cowra, Dubbo, Grafton, Gunnedah, Tamworth, Wagga Wagga, and Fernbrook. Examination of Newcastle's water supply situation suggests a ratio of 3.7 to 1 for mean annual water discharge to gross annual water demand for an adequate water supply to be available to a new city of 100,000 people. This ratio criterion means that a city of 100,000 people, consuming 4,818 million gallons per annum, requires a mean annual discharge of 17,727 million gallons. This ratio criterion can be relaxed somewhat when the nature of the catchment area is considered. A modified criterion might be based on mean annual discharge per square mile of catchment. Catchment size and the volume and variability of mean annual stream discharge suggest that coastal streams will provide the best water availability potential for decentralized urban development. However, locations such as Wagga Wagga and Albury, which benefit from water control enterprises already undertaken, also have some merit. (Settle-Wisconsin)
W72-11591

WATER DEMAND FORECASTS AND PLANNING MARGINS IN SOUTH-EAST ENGLAND,
London School of Economics and Political Science (England); and Queen Mary Coll., London (England).
J. A. Rees, and R. Rees.
Regional Studies, Vol. 6, No. 1, p 37-48, March, 1972. 6 tab, 7 ref.

Descriptors: *Water demand, *Water supply, *Forecasting, Expenditures, Regression analysis.
Identifiers: *Excess capacity, *Overestimates, *England.

On the basis of its demand forecasts, the Water Resources Board has derived a set of projections of required expenditures on new water supply capacity. Linear regression analysis suggests, however, that the Board's forecasts are well above the demand levels which would be expected from the best estimate and extrapolation of past trends. The Board's estimates overstate future demand for at least four reasons. First, their log-linear estimating equation gave a relatively poor fit to the data. Second, since the Board's aggregate estimates were based on estimates provided by individual water authorities, some double counting of both population increases and industrial developments certainly occurred. A third source of overestimation lies in the assumption made by some water authorities that as a consequence of the licensing and pricing of private abstractions, there would be a significant switch in industrial demands from private to public water supply. Finally, each estimating agency may have built a 'safety margin' into its estimates; however, the aggregate 'safety margin' would be much less than this aggregation of individual estimates. These faulty estimates imply the installation of considerable excess capacity by 1985 which may cost as much as 30 percent of the total project expenditure. (Settle-Wisconsin)
W72-11592

6E. Water Law and Institutions

CRAWFORD V. WEST INDIA CARRIERS, INC. (RIGHT OF UPLAND OWNER TO RECOVER FOR INJURY TO BEACH GROIN).

337 F. Supp. 262-278 (S.D. Fla. 1971).

Descriptors: *Florida, *Judicial decisions, *Barges, *Groins (Structures), Beaches, Hydraulic structures, Structures, Oceans, Atlantic Ocean, Adjudication procedure, Erosion control, Coastal structures, Coastal engineering, Damages, Accidents, Navigation, Navigable waters.

Three actions were filed and consolidated for trial. Suit resulted when a barge being pulled by a tug broke loose and drifted into beach groins owned by a coastal hotel. Plaintiff, salvor, was not allowed a salvage award. Plaintiff, barge owner, did collect for negligence of tug owner. Plaintiff upland owner sued for damage to his beach groins caused by negligence of defendant tug owner and crew of tug. The federal district court, in holding for plaintiffs barge owner and upland owner, ruled that an upland owner has the right to construct groins into the ocean, provided a permit is first obtained from the Corps of Engineers. Furthermore, plaintiff had a property interest in and to the groins which permitted him to claim and recover for damages to the groins resulting from the negligence of the defendant. Proper method of determining damages was cost of repairing the groins less depreciation up to time of collision. (Nielsen-Florida)
W72-11178

A LEGISLATOR'S VIEW OF IMPENDING AMENDMENTS TO THE WATER POLLUTION CONTROL ACT,
Congress, Washington, D.C.; and Senate, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-11185

PHOSPHATES AND PHOSPHATE SUBSTITUTES IN DETERGENTS (PART 2).
Committee on Government Operations (U.S. House).
For primary bibliographic entry see Field 05C.
W72-11186

ENVIRONMENTAL ACTIVISM: THERMAL POLLUTION--AEC AND STATE JURISDICTIONAL CONSIDERATIONS.
State Univ., of New York, Buffalo.
For primary bibliographic entry see Field 05G.
W72-11193

SFI DIRECTORS RESOLUTIONS--WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, TEMPORARY EXEMPTION OF EPA FROM ISSUANCE OF ENVIRONMENTAL IMPACT STATEMENTS AND NATIONAL ENVIRONMENTAL RESEARCH CENTER.
For primary bibliographic entry see Field 05G.
W72-11196

ENVIRONMENTAL LAW--NATIONAL ENVIRONMENTAL POLICY ACT OF 1969--PROCEDURAL REQUIREMENTS OF THE ACT MUST BE FOLLOWED IN GOOD FAITH--CALVERT CLIFFS' COORDINATING COMMITTEE, INC. V. ATOMIC ENERGY COMMISSION,
A. P. Salloway.
Boston College Industrial and Commercial Law Review, Vol. 13, p. 802-812 (1972). 62 ref.

Descriptors: *Judicial decisions, *Legal aspects, *Legal review, *Nuclear powerplants, Water pollution sources, Environmental effects, Administrative decisions, Decision making, Regulation, Water law, Constraints, Construction, Permits, Competing uses, Nuclear wastes, Powerplants, Federal project policy, Legislation.
Identifiers: *National Environmental Policy Act.

Defendant Atomic Energy Commission granted a construction permit to the Baltimore Gas and Electric Company for construction of the Calvert Cliffs Nuclear Power Plant. Plaintiff Calvert Cliffs' Coordinating Committee sought review of four AEC procedural rules and their application. The Court of Appeals for the District of Columbia, in holding that the Commission's rules and their application did not conform to the provisions of the National Environmental Policy Act, remanded the case to the Commission for rule changes, including further consideration of the environmental impact of the proposed plant. This case note first examines the court's application of NEPA's provisions to the AEC. The required degree of agency compliance under the Act is discussed. The mechanics of compliance in regard to all federal agencies is then analyzed as to when the provisions of NEPA are to be considered and, once considered, how the various data are to be collected and evaluated. The instant decision's implications for judicial review and future federal agency action are discussed. The expanded opportunity for reviewing courts to compel agency compliance with the NEPA is discussed. The 'discretionary' substantive provisions of the Act may be overcome when the good faith of the agency is suspect. (Widman-Florida)
W72-11197

LOCAL WARS ON POLLUTION.
For primary bibliographic entry see Field 05G.
W72-11198

ENVIRONMENT REPORT/EPA AND JUSTICE DEPARTMENT CLASH OVER ANTI-POLLUTION ENFORCEMENT,
For primary bibliographic entry see Field 05G.
W72-11199

RESCUING THE ENVIRONMENT--THE PRESIDENT'S PROGRAM.
For primary bibliographic entry see Field 05G.
W72-11200

GENEVA DISARMANMENT CONFERENCE AGREES ON TEXT OF TREATY BANNING EMPLACEMENT OF NUCLEAR WEAPONS ON THE SEABED,
Congress, Washington, D.C.; and House, Washington, D.C.; and House, Washington, D.C.
J. F. Leonard.
Department of State Bulletin, Vol. 63, p. 362-366 (1970). 5 p, append.

Descriptors: *Nuclear explosions, *International waters, *Treaties, *United Nations, International law, Legal aspects, Nuclear energy, Governments, Governmental interrelations, Administration, Oceans, Foreign countries, Law of the sea, Foreign waters, Water law.

The draft treaty affirms the common interest of mankind in the use of the seabed for peaceful purposes and pursuant to such interest seeks to exclude the seabed from the arms race. The Treaty bans the planting of nuclear weapons or any other weapons of mass destruction from the seabed beyond 12 miles from shore. Structures, launching installations or other facilities for storing, testing or using such weapons would also be banned. Article III establishes procedure for verification and resolution of questions concerning the fulfilment of the obligations assumed under the Treaty. The Treaty further deals with the effect of this Treaty on the Convention on the Territorial Sea; future efforts to develop, amend and discuss the treaty; and ratification and withdrawal procedures. The changes and amendments made from the original draft are examined and their causes and effects explained. Full text of the Treaty is included.
W72-11202

NATO EXPERTS RECOMMEND INTERNATIONAL ACTION ON OCEAN OIL SPILLS,
Department of Transportation, Washington, D.C.
J. A. Volpe.
Department of State Bulletin, Vol. 63, p. 665-669 (1970). 5 p, 1 append.

Descriptors: *Oil spills, *Oceans, *Governmental interrelations, *Environmental effects, *United States, Oil pollution, Oily water, Governments, International commissions, Ships, Navigation, Environmental control, Water quality control, Water pollution effects, Water pollution sources, Water pollution control, Marine biology, Technology.

The NATO Committee on the Challenges of Modern Society held an oil spills conference which was the first major international meeting to deal with the entire range of problems relating to oil spills, including detection, prevention and cleanup. Included is the statement of the U.S. delegate to the Conference. Oil currently dumped into the seas is an immediate danger to health, recreation and welfare of mankind and ocean life. Present knowledge of the exact effect of oil pollution is rudimentary. The United States has taken steps to prevent pollution by the passage of the National Environmental Policy Act and the Water Quality Improvement Act. The U.S. proposes that NATO nations resolve to achieve by mid-decade a complete halt to all intentional discharge of oil into the oceans by tankers and other vessels. Further the government recommends the following steps toward abatement of discharges: acceleraion of research into effects of oil spills, development of technology to prevent spills and of methods to remove oil once it is in the ocean, more effective international ship construction standards, and international plans for coping with spill contingencies. The text of the resolution adopted at the meeting is included. (Ilkson-Florida)
W72-11203

DRAFT U.N. CONVENTION ON THE INTERNATIONAL SEABED AREA: U.S. WORKING PAPER SUBMITTED TO U.N. SEABEDS COMMITTEE,
Department of State, Washington, D.C.
J. R. Stevenson, and C. H. Phillips.
Department of State Bulletin, Vol. 63, p. 209-218 (1970). 10 p.

Descriptors: *Law of the Sea, *Treaties, *Oceans, *United Nations, International waters, Ecology, International law, Legal aspects, Exploitation, Exploration, Mineral industry, Administration, Navigation, Beds, Beds under water, Environmental control, Economics, International commissions, United States, Regulation.

President Nixon proposed that nations should by international agreement renounce their sovereign rights in the seabed under the high seas beyond a water depth of 200 meters. The draft convention is designed to achieve the President's goals that will save over two-thirds of the earth's surface from national conflict and rivalry, protect it from pollution, and put it to use for the benefit of all. This will require a system of law generally respected by the international community to deal equitably with a wide variety of national and international interests. The radical departure from the traditional law of the sea was intended. Some of the highlights of the draft convention are: a declaration that the area beyond the 200 meter isobath is the common heritage of mankind; no state has any right to such area beyond that provided by the convention; such areas will be open to use by all states, exclusively for peaceful purposes; revenues developed from the area will be used to aid developing nations; the development of the area will be regulated and the environment protected; and the establishment of the International Seabed Resource Authority to implement the provisions of the convention. Basic provisions of the convention are summarized. (Ilkson-Florida)
W72-11204

U. S. DRAFT ARCTICLES ON TERRITORIAL SEA, STRAITS, AND FISHERIES SUBMITTED TO U.N. SEABEDS COMMITTEE,
Department of State, Washington D.C.
J. R. Stevenson.
Department of State Bulletin, Vol. 65, p. 261-268 (1971). 8 p, 1 append.

Descriptors: *Law of the sea, *Straits, *Fishing, *Treaties, *International waters, International Law, Oceans, Fisheries, Regulation, Navigation, Communication, Legal aspects, United Nations, Exploitation, Environmental effects, Water pollution, Economics, Migration, Administration, Fish, Fish management.
Identifiers: *Coastal waters.

Freedom of the seas is an essential prerequisite for communications and defense. Technological changes and more intensive use of the oceans require new agreements revising the regime of the high seas as it applies to some uses of the oceans. The first acticle presented would establish a maximum breadth of 12 miles for the terrtorial sea. However, such extension would place many important straits totally within the territorial sea of riparian states, thereby impairing freedom of navigation and overflight on the high seas. Hence, the second article provides for the right of free transit for vessels and aircraft through all international straits overlapped by territorial seas. Territorial waters in straits would retain national character, subject only to the right of free transit. Many states bordering straits are concerned with pollution from shipping. Since this problem is not unique to straits it requires specific international agreements. The third article is concerned with fishing and specifies fishing in the high seas shall be regulated by international (including regional) fisheries organizations. Other provisions concern prohibition of overfishing certain stocks; protection of coastal states' economic interest while allowing others to fish on the high seas; problems of migratory stocks; and enforcement, research and development, and dispute settlement. (Ilkson-Florida)
W72-11205

LEGAL REGULATION OF MINERAL EXPLOITATION IN THE DEEP SEABED,
Department of State, Washington, D.C.
J. R. Stevenson.
Department of State Bulletin, Vol. 65, p. 48-5[illegible]
(1971). 8 p.

Descriptors: *International commissions, *Treaties, *International law, *International waters, Exploration, Exploitation, Mineral industry, Mining engineering, Technology, Oceans, Governmental interrelations, Legal aspects, Law of the sea, Economics, United States, Political aspects, Political constraints, Resources development, United Nations.

A gap has emerged between the capability to exploit mineral resources in the deep seabed and the establishment of an effective and stable legal regime. Accompanying this technological capabili

ty, a political trend of economic nationalism regarding control over ocean resources has been growing among developing nations. The fundamental objective of the United States is to accomodate the interests of all states to promote development of the minerals of the deep seabed while maintaining the freedom of the seas. To promote this policy President Nixon has proposed that the breadth of the territorial sea be established at 12 nautical miles coupled with guaranteed free transit through international straits, and indicated the need for carefully defined fishing rights for coastal states on the high seas beyond 12 miles. In addressing himself to control over mineral resources, the President divided the ocean floor into two areas. First, coastal states would maintain their sovereign rights to the natural resources to a depth of 200 meters. Second, coastal states, under the regulation of an international regime, would licence exploration and exploitation of the resources in a zone beyond 200 meters as trustees for the international community. The proposed organization to administer this plan would consist of the Assembly, a plenary organ; the Council, a small executive order; the Tribunal, a judicial organ; and three commissions to carry on the day-today work. (Ilkson-Florida)
W72-11206

SEABEDS ARMS CONTROL TREATY TRANSMITTED TO THE SENATE,
Executive Office of the President, Washington, D.C.
R. Nixon, and W. P. Rogers.
Department of State Bulletin, Vol. 65, p. 185-187 (1971). 3 p.

Descriptors: *Oceans, *Treaties, *Nuclear explosions, *International law, *International waters, Legal aspects, United Nations, Governmental interrelations, Federal government, Law of the sea, Nuclear energy, Governments, United States, Legislation, Nuclear wastes, Foreign countries.

President Nixon and Secretary of State Rogers transmitted to the Senate the Seabed Arms Control Treaty. The Treaty would prohibit the emplacement of nuclear weapons and other weapons of mass destruction on the seabed beyond the outer limits of a 12-mile coastal 'seabed zone' defined by the Treaty. The prohibition would also extend to structures, launching installations, mines or other facilities designed to use nuclear weapons. The Treaty would not affect failities for research or commercial exploitation not designed specifically for using weapons of mass destruction. Peaceful nuclear explosions, scientific research or other obligations for nuclear explosions, scientific research or other obligations for nuclear energy would not be within the prohibitions of the Treaty. The Treaty also defines 'seabed zone' as an area whose outer limit shall be coterminous with the 12-mile outer limit of the zone described in Part II of the Convention on the Territorial Sea and the Contiguous Zone Sizned in Geneva on 29 April 1958. (Ilkson-Florida)
W72-11207

CLEAN WATER: AFFLUENCE, INFLUENCE, EFFLUENTS, A DESIGN FOR WATER QUALITY MANAGEMENT.
For primary bibliographic entry see Field 05B.
W72-11219

MODELING PROBLEMS AND PROBLEM AVOIDANCE IN WATER RESOURCE MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Graduate School of Business and Public Administration.
For primary bibliographic entry see Field 06A.
W72-11225

ILLINOIS V. CITY OF MILWAUKEE, WISCONSIN (POLLUTION OF INTERSTATE WATERS INVOLVES FEDERAL QUESTION UNDER FEDERAL COMMON LAW).

92 S. Ct. 1385-1395 (1972).

Descriptors: *United States, *Federal jurisdiction, *Navigable waters, *Common law, Jurisdiction, Pollution abatement, Federal government, Legal aspects, Judicial decisions, Local governments, State governments, Water law, Water pollution, Municipal wastes, Legislation, Lake Michigan, Water resources.

Plaintiff state of Illinois filed suit against four Wisconsin cities and two local sewerage commissions to abate alleged pollution of Lake Michigan. Plaintiff alleged defendants discharged inadequately treated sewage and other waste materials into the Lake. Plaintiff sought to invoke the original jurisdiction of the United States Supreme Court. After noting that rights in interstate streams and navigable waters have been recognized as presenting federal questions, the Court held that since federal courts fashion federal law where federal rights are concerned, there is a federal common law dealing with air or water in their ambient or interstate aspects. Thus in a public nuisance action for water pollution of interstate waters federal law governs, although state standards may be relevant. A state with high water quality standards may ask that its standards be honored and that it not be compelled to lower its standards. Therefore the Supreme Court remanded the case to the appropriate district court for resolution of a federal question. (Brackins-Florida)
W72-11259

HISTORY OF FEDERAL WATER RESOURCES PROGRAMS, 1800-1960.
Economic Research Service, Washington, D.C.
For primary bibliographic entry see Field 06B.
W72-11276

WASTEWATER MANAGEMENT PROJECT MUSKEGON COUNTY, MICHIGAN,
Illinois Univ., Chicago. Center for Urban Studies.
For primary bibliographic entry see Field 03F.
W72-11381

WATERSHED PLANNING.
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W72-11439

ACTION NOW - A VIEW FROM CHICAGO,
Chicago Dept. of Water and Sewers, Ill.
For primary bibliographic entry see Field 05F.
W72-11477

THE PUGET SOUND SULPHITE PULP MILLS AND THE TRAGEDY OF THE COMMONS,
Western Washington State Coll., Bellingham. Dept. of Biology.
For primary bibliographic entry see Field 05G.
W72-11478

ISAIAHS AT THE BAR: ENVIRONMENTALISTS AND THE JUDICIAL PROCESSES,
Davies, Biggs, Strayer, Stoel, and Boley, Portland, Oreg.
J. P. Rogers.
Land and Water Law Review, Vol 7, No 1, p 63-72, 1972. 23 ref.

Descriptors: *Environmental effects, *Judicial decisions, *Legal aspects, Regulation, Jurisdiction, Administration, Planning.
Identifiers: *Environmentalists, *Litigation, 'Crank litigation', Injunction, Administrative appeal, Policy making.

The judicial processes, particularly of the federal courts, have been used and abused in the name of 'ecology' or 'environmental degradation' to the extent that those processes themselves, the national health and welfare, and the division of the government into legislative, executive, and judicial confines, are all in danger. The practical effect of the scores of environmental cases which have been thrust upon the national community in the past six years is that there simply are no available protections of consequence against inordinate delay or 'crank' litigation. Assurances that the processes of the law can weed out the harmful effects of these reports to the court are not borne out by practical experience. Faced with the prospect of such inordinate delay in litigation, the business whose project is attacked may decide to abandon it, whether or not the defendants prevail in the end. If the courts are not to overextend themselves in the environmental litigation field, a limitation of the federal judiciary's jurisdiction must be Congressionally imposed. All jurisdiction to hear and determine the right of injunction should not be removed. One qualification should be that where administrative review is provided for, the federal courts may not take jurisdiction until the right of administrative appeal has been exhausted. Review of such action should be made before the administrative agency, and then only to the appropriate United States Court of Appeal. In this way, judicial, legislative, and administrative chaos will be avoided. (Strachan-Chicago)
W72-11482

LEGAL AND POLITICAL CONDITIONS OF WATER RESOURCE DEVELOPMENT,
Indiana Univ., Bloomington.
V. Ostrom, and E. Ostrom.
Land Economics, Vol 48, No 1, p 1-14, February 1972. 2 fig, 18 ref.

Descriptors: *Legal aspects, *Political aspects, *Water resources development, Engineering, Feasibility, Decision making, Planning, California.
Identifiers: *West Basin (Calif), Externalities, Market mechanisms, Interdependency.

In recognizing the union of relationships involved in the engineering of works and the engineering of institutions for water resource development, five sets of criteria become relevant to decision making. They are: technical feasibility, economic feasibility, financial feasibility, legal feasibility, and political feasibility. The groundwater basin management program in West Basin, California is illustrative of the legal and political strategies involved in reallocating decision making capabilities among a community of water users under changing conditions of supply and demand. Technical solutions are dependent upon the formulation of political solutions. The theory of market mechanics in economics permits the anticipation of where market arrangements can be used to advantage and where market weaknesses and market failure will occur. The high degree of interdependency among joint and alternative uses characteristic of water resource development poses special problems associated with externalities, the theory of public goods, common properties, and the organization of collective decision rules. A central task for water resource developers will be one of conceptualizing appropriate institutional solutions which will take account of the heterogeneous sets of interest involved among diverse communities of water users. The collaboration of engineers, lawyers, economists, and political scientists is called for. (Strachan-Chicago)
W72-11484

PROLOGUE: ENVIRONMENT AND THE QUALITY OF POLITICAL LIFE,
California Univ., Santa Cruz. Dept. of Political Science.
G. McConnell.
In: Congress and the Environment, University of Washington Press, 1970. p 3-15. 5 ref.

Descriptors: *Environment, *Conservation, *Political aspects, Social aspects, Economics, Values, Planning.
Identifiers: *Conservation movement.

Some historical background of conservation is presented. The term 'conservation movement' dates from 1908. By 1954, what had been a strong political force in the country had disintegrated. The present conservation movement rests on a strong popular base. The popular base results from a change in values. Issues which were previously considered to be a matter for localities have become increasingly the concern of outsiders. Most importantly, a deep and general change has occurred in our national political life. Fear of tomorrow has been removed. As the nation has become richer, economic values have lost their old urgency, and other important matters, e.g., beauty and wilderness, have emerged and taken the foreground. The striking evidence of growth in the conservation movement since 1954 is directly related to the clarity with which the conservation leaders of today have perceived the strategic nature of conservation issues. The fact that today's movement is principled has contributed to the growth of the movement. The leaders of the modern conservation movement must expect to be told that they are unreasonable. The conservation movement will have to succeed as a movement, enduring all the committee meetings, the endless work of organization, and hammering out the principles and the applications of these principles. (Strachan-Chicago)
W72-11494

WATER PROJECTS AND RECREATION BENEFITS,
Oregon State Univ., Corvallis. Dept. of Geography.
K. W. Muckleston.
In: Congress and the Environment, University of Washington Press, 1970. p 112-129. 13 ref.

Descriptors: *Water, *Recreation, *Project planning, *Benefits, *Institutional constraints, Federal government, Management, Environment, Legislation.
Identifiers: *Policy making, Implementation.

The Federal organization of and responsibility for water resource management has responded poorly to the changes in the public's environmental outlook. The traditional ad hoc and fractionalized approach continues, often at the expense of broader environmental considerations. The present system of water management embodies three interrelated characteristics which render a balanced approach to water management exceedingly difficult, i.e., the committee system, the constituency-orientation of Congress, and the pork barrel. The U.S. Corps of Engineers and the Bureau of Reclamation are discussed. The Federal Water Project Recreation Act exhibits many of the weaknesses inherent in the existing system of policy formation, although it is not without merit. Legislative recognition is given to the idea that recreation, fish, and wildlife values must share equal consideration with the tradition and utilitarian benefits from water development. The impact of the act depends upon its implementation. The specific nature of the act's impact on the environment is debatable. In some cases, implementation will have a marked favorable influence on traditionally nonutilitarian values. On the other hand, the construction agencies may be using provisions of the act to manipulate benefit-cost analysis at the expense of some valuable wilderness recreation areas and other aesthetic values. The major weakness of the act is that the construction agencies may interpret it as a mandate to continue recommending projects as long as they can sell them to a nonfederal unit of government. (Strachan-Chicago)
W72-11495

WATER QUALITY: A QUESTION OF STANDARDS,
Washington Univ., Seattle. Dept. of Geography.
P. P. Micklin.
In: Congress and the Environment, University of Washington Press, 1970. p 130-147. 21 ref.

Descriptors: *Water quality control, *Standards, *Water quality act, Conservation, Legislation, Pollution abatement, Legal aspects, Planning.
Identifiers: *Policy making, Enforcement, Federation.

Adequacy of the Water Quality Act of 1965 to resolve the water pollution problem in the U.S. and the whole approach to waste management it symbolizes are discussed. The Act is a milestone in Federal conservation legislation. It continued and expanded earlier congressional policy, while breaking new ground. For the first time, an organization charged solely with water pollution control was established at the Federal level, and the Federal government was empowered to take an active role in formulation and enforcement of water quality standards. The provision of the Act which requires states to develop water standards for interstate waters is an effective tool. Enforcement of water quality standards may be more difficult. (1) Initial enforcement responsibility remains with the states. (2) There are ambiguities in the enforcement procedures. The law is not a final solution to the water pollution problem in the U.S. Congress should be considering the interrelations and ramifications of water, air, and land pollution to avoid piecemeal legislation. Legislative responsibility regarding water, water pollution, and waste disposal problems is fragmented among numerous committees, and this militates against rational systematic action in these matters. The concept of federalism may be an even great barrier to the institution of a viable water pollution control program. Congress has been forced to write legislation to satisfy constitutional strictures rather than to create the most effective program. Some innovative legislative approaches are in order. (Strachan-Chicago)
W72-11496

WILD AND SCENIC RIVERS: PRIVATE RIGHTS AND PUBLIC GOODS,
Washington Univ., Seattle. Dept. of Geography.
D. G. Asmussen, and T. P. Bouchard.
In: Congress and the Environment, University of Washington Press, 1970. p 163-174. 12 ref.

Descriptors: *Wild rivers, *Public benefits, Legislation, Planning, Decision making, Pollution abatement, Funding, Recreation.
Identifiers: *Wild and Scenic River Act (1968), *Private rights, Implementation.

The Wild and Scenic Rivers Act (1968) suggests that the public good, by virtue of an expanding population and a scarcity of recreation opportunities, must someday transcend the private property rights of the few. A more familiar issue in the controversy over wild rivers legislation is that of development versus nondevelopment. A history of wild rivers legislation is presented. This legislation now faces the challenges of implementation. One problem is the procedure for the addition of a river to the system. The partnership of private development interests and the Federal water agencies interested in serving them (Corps of Engineers, Bureau of Reclamation, and Federal Power Commission) could well eliminate the possibility of including rivers in regions having potential for irrigation, dam construction, or electric power generation. An additional problem in implementation of the act may result from the weak safeguards against pollution. Funding for land acquisition presents yet another problem. However, the wild rivers legislation has some new and encouraging implications for public recreation. Recreational use of water resources has traditionally been a secondary consideration. Private property rights have been legislatively challenged. Private property stands in the face of all but the most utilitarian social welfare needs. (Strachan-Chicago)
W72-11497

NATIONAL POLICY FOR THE ENVIRONMENT: POLICIES AND THE CONCEPT OF STEWARDSHIP,
Washington Univ., Seattle. Dept. of Political Science.
G. Wandesforde-Smith.
In: Congress and the Environment, University of Washington Press, 1970. p 205-226. 17 ref.

Descriptors: *Environment, *Political aspects, Federal government, Planning, Decision making, Ecology, Ethics, Economics, Management, Legislation, Institutions.
Identifiers: *Policy making, *Stewardship, *National policy for the environment, Responsibility.

The main objective of a national policy for the environment is to create within the Federal government a point at which responsibility for the total environment can be fixed. Despite an array of informal coordinating mechanisms, the Federal government is presently committed to a problem-by-problem approach to environmental policy. The case for establishing a national policy for the environment rests upon two basic premises. (1) The relationship between man and the environment cannot be adequately understood or effectively managed except as a highly complex, seamless web of ecological relationships. (2) There is a definite ethical basis to a national environmental policy, centered around the Federal government's role as the protective custodian of the environment for posterity. A national policy for the environment amounts to more than the preservation of natural environments or the management and use of natural resources according to an economical or ecologically optimal model. A brief history on environmental legislation is given. The history of efforts to establish a national environmental policy indicated than when the President is unable or unwilling to act, Congress must take the lead in determining whether the ends served by environmental policy will improve human well-being. This task requires institutional arrangements that reach out to larger and more inclusive ends. (Strachan-Chicago)
W72-11498

CONCLUSIONS: CONGRESS AND THE ENVIRONMENT OF THE FUTURE,
Washington Univ., Seattle.
R. A. Cooley, and G. Wandesforde-Smith.
In: Congress and the Environment, University of Washington Press, 1970. p 227-243. 12 ref.

Descriptors: *Environment, *Planning, *Decision making, *Legislation, Evaluation, Federal government, Institutions, Political aspects.
Identifiers: *Congress, *Policy making, Committee system.

The central problem is whether or not the American political system, and especially Congress, can deal effectively with both a wide range of specific environmental issues and with the larger challenge of providing the nation with a meaningful public policy for the environment. The major conclusion is that Congress has failed to do more than make halting progress through a series of incremental adjustments. The congressional committee system hinders the careful evaluation of environmental legislation. The present, highly fragmented committee system favors special, frequently economic, interests at the expense of giving adequate recognition to the full range of values and interests to be served by environmental policy. Senior congressmen have failed to press for reorganization of committees with jurisdiction over environmental legislation. The committee structure tends to place tremendous power in the hands of a few congressmen. A FURTHER CONSEQUENCE OF THE POOR ORGANIZATION OF Congress is that Congress is placed at a disadvantage when dealing with the executive branch. Congress has refused to face up to the need for governmental reorganization in the executive

branch to reduce the highly diffuse and fragmental system of decision making. Little is known about the policy consequences of alternative institutional arrangements for achieving environmental policy goals in the executive and legislative branches. (Strachan-Chicago)
W72-11499

ENVIRONMENTAL QUALITY AS A PROBLEM OF SOCIAL CHOICE,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-11503

LEGAL STRATEGIES APPLICABLE TO ENVIRONMENTAL QUALITY MANAGEMENT DECISIONS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05G.
W72-11504

POWER STRUCTURE STUDIES AND ENVIRONMENTAL MANAGEMENT: THE STUDY OF POWERFUL URBAN PROBLEM-ORIENTED LEADERS IN NORTHEASTERN MEGALOPOLIS,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 05G.
W72-11505

SIMPSON V. IOWA STATE HIGHWAY COMMISSION (RIPARIAN LANDOWNER'S RIGHT TO DAMAGES FOR CONDEMNATION OF MINERAL CONTENT).

195 N.W.2d 528-541 (Iowa 1972).

Descriptors: *Iowa, *Condemnation value, *Gravel, *Easements, Mineralogy, Quarries, Riparian rights, Flood plains, Floodways, Legal aspects, Judicial decisions, Land tenure, State jurisdiction, Eminent domain, Non-navigable waters, Condemnation, Public rights, Bridges, Jetties.
Identifiers: *Lateral support.

Appellant State Highway Commission appeals an award of damages to appellee landowning partnership for condemnation losses. Appellant had constructed a bridge across the Maple River, a nonmeandered, nonnavigable stream and required 2.8 acres of appelle's land for a jetty. The land was part of a 27 acre quarry which appellee owned. Appellee also owned part of the streambed. Appellant contended that it was improper for the court to award damages based on the mineral content of the 2.8 acres because said land was part of the flood plain and removal of gravel would be prohibited. The Supreme Court of Iowa held that in a condemnation action damages properly include mineral content, but that the State Highway Commission should have been permitted to introduce evidence showing that the state Natural Resources Council would not permit gravel removal in a flood plain and to show whether or not the condemned land was within such a flood plain. The court also ruled that appellee's duty to provide lateral support for an adjacent landowner did not extend to a newly constructed bridge. Therefore the duty to furnish lateral support did not prevent compensation for mineral content. (Grant-Florida)
W72-11515

UNITED REIS HOMES V. PLANNING BOARD OF NATICK (VALIDITY OF BOARD OF HEALTH REGULATIONS CONTROLLING LOT DRAINAGE).

270 N.E.2d 402-405 (Mass. 1971).

Descriptors: *Massachusetts, *Judicial decisions, *Drainage water, *Drainage effects, *Public health, Drainage systems, Pipes, Habitats, Mosquitoes, Environmental engineering, Legal aspects, Pest control, Safety, Streams, Drainage, Water law.

Plaintiffs, owners of subdivision property, appealed from decision of defendant, planning board, claiming that requirements placed on land were unreasonable. The plaintiffs owned tract of land and filed with the planning board a proposed subdivision plan. The board approved the plan subject to board of health requirements that a brook running through the site be piped underground and that certain lots be filled in with gravel to a required distance. Plaintiff contended that such requirements were unreasonable and ultra vires. The defendant maintained that an open brook in an inhabitated area becomes a public health problem, a breeding place for vermin and mosquitoes, and that the safety and health of the inhabitants required these items as conditions of approval. The Supreme Judicial Court of Massachusetts, in affirming the planning board requirements, stated that the board of health has statutory authority to control and direct lot drainage and that the requirements in the instant case were not unreasonable. (Nielson-Florida)
W72-11517

KALUR V. RESOR (VALIDITY OF REGULATIONS AUTHORIZING DISCHARGES INTO NAVIGABLE WATERS).
335 F. Supp. 1-15 (D.C. 1971).

Descriptors: *United States, *Judicial decisions, *Waste disposal, *Rivers and Harbors Act, *Permits, *Navigable waters, Navigable rivers, Nonnavigable waters, Regulation, Administrative agencies, Wastes, Legislation, Legal aspects, Supervisory control (Power), Federal jurisdiction, Industrial wastes.
Identifiers: *National Environmental Policy Act, *Refuse Act.

Plaintiff private citizens and conservation groups sought injunctive relief with respect to regulations promulgated by defendant Army Corps of Engineers, the Secretary of the Army, and the Administrator of the Environmental Protection Agency, under the Rivers and Harbors Act (Refuse Act) and National Environmental Policy Act. The contested regulations prescribed policy and procedure to be followed in issuing permits authorizing discharges in navigable waters or tributaries emptying into navigable water. Plaintiff contended that the defendants exceeded their statutory authority by issuing permits under such regulations authorizing discharges in non-navigable waters. They also alleged that defendants' regulations did not comply with NEPA's requirement of a detailed environmental impact statement. The court, in granting plaintiffs' motion for summary judgement, held the regulations were ultra vires and of no effect insofar as they purported to allow the issuance of permits to discharge refuse matter into non-navigable waterways. Following the reasoning in Calvert Cliffs V. A.E.C. the court further ruled that permits issued under the Refuse Act are not exempt from NEPA's environmental impact statement requirement. (Nielson-Florida)
W72-11518

PITMAN V. UNITED STATES (RIGHT OF THE UNITED STATES TO ALTER LITTORAL FLOW).

457 F.2d 975-978 (Ct. Cl. 1972).

Descriptors: *Florida, *Navigable waters, *Riparian rights, Littoral drift, Legal aspects, Water law, Constitutional law, Easements, Accretion (Legal aspects), Land tenure, Public rights, Littoral, Sediment transport, Jetties, Harbors, Ocean currents, Accelerated erosion, Beach erosion, Atlantic Ocean.
Identifiers: *Tucker Act.

Plaintiff, littoral landowner sued the United States for damages resulting from an alleged taking of 4 acres of beachfront property without compensation. Plaintiff contended that defendant's construction of two seaward extending jetties at Cape Canaveral, Florida, interrupted the normal littoral drift of the Atlantic Ocean, thereby causing erosion of his littoral land to the south of the jetties. Since 1954 the beach had been receding. Plaintiff acquired the property in 1957. The United States Court of Claims held that the United States has a dominant servitude in the flow of a navigable waterbody and that a riparian or littoral landowner's right to have navigable waters come to him unchanged applied only against other riparian or littoral landowners and not against the United States. The court also held that plaintiff could not recover on the theory that his land had been permanently inundated because there was no showing that defendant had raised the level of the ocean. The court ruled that damages were not recoverable for the erosion since it was purely consequential and therefore not actionable. The court further ruled that plaintiff had no right to the prevention of erosion value of the littoral flow since it inhered in the flow of water, which defendant was entitled to interrupt. (Grant-Florida)
W72-11519

FLORIDA AIR AND WATER POLLUTION CONTROL COMMISSION V. ST. REGIS PAPER COMPANY (PROCEDURE FOR ASSESSING POLLUTION PENALTIES PURSUANT TO FLORIDA AIR AND WATER POLLUTION CONTROL ACT).

257 So.2d 253-256 (Fla. 1971).

Descriptors: *Adjudication procedure, *Florida, *Administrative agencies, *Administrative decisions, *Penalties (Legal), Legal review, Legal aspects, Administration, Legislation, Oil pollution, Water pollution control, Judicial decisions, Water pollution, State governments, Industrial wastes.
Identifiers: *Florida Air and Water Pollution Control Act.

Plaintiff state agency brought action to collect penalties incurred by defendant paper company's alleged oil discharge into a river. Defendant sought to dismiss on the ground that the Commission had failed to properly exhaust its administrative remedies. The District Court dismissed the complaint, rejecting the Commission's contention that it could treat violations either as an administrative matter or move directly against a violator in court. The Supreme Court of Florida affirmed and held that the penalty stage under the Florida Air and Water Pollution Control Act can not be reached until the alleged violator is given notice and the opportunity to be heard before the Commission. Once the due process safeguards are met and liability assessed, the Commission is then free to initiate judicial action to impose penalties. This litigation did not foreclose further Commission action in accordance with proper procedures. (Ilkson-Florida)
W72-11520

U.S. GIVES VIEWS ON CONVENING CONFERENCE ON LAW OF THE SEA,
Department of State, Washington, D.C.
W. P. Rogers.
Department of State Bulletin, Vol. 63, p. 38-39, (1970).

Descriptors: *Environmental effects, *Law of the sea, *United Nations, *International commissions, United States, International waters, International law, Governments, Exploration, Exploitation, Boundaries (Property), Straits, Fisheries, Legal aspects, Treaties, Foreign waters, International Joint Commission.

The United States strongly supports codification of international law especially as reflected by the

developments on the law of the sea. The United States is pleased with the continuing work of the United Nations in the establishment of the Committee on the Peaceful Uses of the Seabed and the Ocean Floor Beyond the Limits of National Jurisdiction. Future conferences on the law of the sea should consider the questions of the breadth of the territorial sea and the regime for the exploration and exploitation of the seabeds outside the national jurisdiction. The protection of the environment, and particularly the prevention of pollution, must occupy a major role in the future development of the international law of the sea. The United States believes that the procedures for the resolution of these issues should be structured so as to assure that each issue receives appropriate attention which will facilitate its examination and enhance the opportunity for agreement. The Secretary General is urged to bring before the General Assembly those issues previously discussed and to have the Committee on Peaceful Uses of the Seabed accelerate the development of a regime for exploitation. (Ilkson-Florida)
W72-11521

ENVIRONMENT IN THE COURTROOM,
Michigan Univ., Ann Arbor. School of Law.
For primary bibliographic entry see Field 05G.
W72-11522

POLLUTION POLITICS.
For primary bibliographic entry see Field 05G.
W72-11523

STATES JOIN THE POLLUTION BATTLE,
For primary bibliographic entry see Field 05G.
W72-11525

THE NATIONAL WATER COMMISSION ANNUAL REPORT FOR 1971.
National Water Commission, Washington, D.C.

For Sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $0.35. Interim Report No. 3, December 31, 1971, 25 p, 4 append.

Descriptors: *Water management (Applied), *Administrative decisions, *National Water Commission, *Federal government, Comprehensive planning, Administration, Planning, Water allocation (Policy), Water rights, Coordination, Legal aspects, Administrative agencies, Water law, Social aspects, Institutions, Watersheds (Basins), Interstate compacts.

The National Water Commission was established to study national water resource problems, to consider consequences of water resource development, to provide advice on water resource matters, and to prepare reports and recommendations for the President and the Congress. Minutes of meetings held during 1971 and descriptions of completed reports dealing with such topics as future water demands, metropolitan water management, precipitation modification, wastewater reuse, ground-water management, federal-state relations in water law, and metropolitan water institutions are included. Also included are brief reports on appropriation law, improvement of state water right records, law of interbasin transfers, market transfers of water rights, the Federal-State Regional Corporation, interstate water compacts, hydroelectric power policy, potential technical advances and their impact on anticipated water requirements, and institutions for water planning. Also discussed are public participation in water resources planning, systems anlaysis, the New England River Basin Commission, legal protection of instream water values, riparian water law, water salvage, public access rights in waters and shorelands, population growth in communities in relation to water resources policy, and administrative allocation of water. (Widman-Florida)
W72-11527

MAGNUSON COASTAL ZONE MANAGEMENT ACT OF 1972.
S. 3507, 92nd Cong, 2nd Sess. (1972). 29 p.

Descriptors: *Legislation, *Estuarine environment, *Coastal plains, *Management, Estuaries, Oceans, Rivers, Wetlands, Coasts, Tidal marshes, Coordination, Land management, Marsh management, Land resources, State governments, Local governments, Federal government.

The bill would establish a national policy and develop a national program for the management, beneficial use, protection and development of the land and water resources of the nation's coastal zones. The bill would encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the preparation and implementation of management programs. The bill provides for annual grants to coastal states to assist in developing a management program which would identify state boundaries of the coastal zone, establish permissible land and water uses, and establish guidelines on priority of uses. The bill also provides for public hearings, rules and regulations, review of management programs, and for the keeping of records on disposition of funds. The bill would create the National Coastal Resources Board and the Coastal Zone Management Advisory Committee. These groups would serve to coordinate programs, mediate in case of disagreement, and advise and consult with officials. The Secretary of Commerce would be authorized to provide grants for acquisition of estuarine sanctuaries. The Secretary would also be required to prepare an annual report on the administration of this Act. (Nielson-Florida)
W72-11528

LEGISLATIVE NEEDS IN WATER-RESOURCES MANAGEMENT IN ALABAMA,
D. M. Grubbs, and H. Cohen.
Alabama University Natural Resources Center, Report 711, 1971. 86 p, 82 ref.

Descriptors: *Legislation, *Alabama, *Water resources development, *Administration, *Adoption of practices, Administrative decisions, Legal aspects, Constitutional law, Common law, Legal review, Riparian rights, Governments, Water resources, Judicial decisions, Water law.

The objective is the identification of legislative action required to place responsibility and authority in the hands of Alabama agencies charged with development and conservation of water resources. Hypotheticals are used to demonstrate existing problems involving riparian rights, ground water use, control of diffused surface water and watercourses, preferences, and eminent domain. National trends in water legislation are reviewed. Interim needs--where the legislature has existing authority to act--include amendments to legislation creating the Alabama Water Well Standards Board, improved flood plain management, coordination of state planning activities, deep well disposal of liquid wastes, preservation of scenic rivers, coordination of water resources research, water-use inventory, coordination of planning activities by removal of inactive state agencies, review of proposed water resources legislation, eminent domain priorities in water management, agency reporting, a water resources information center, pollution control in coastal waters, size limitations on water management districts, and coastal preservation and management. Legislation requiring constitutional amendment includes a declaration that all non-appropriated waters in the natural environment are natural resources, creation of a Water Resources Commission, and a definition of reasonable use in ground water withdrawal. (Widman-Florida)
W72-11536

INTERNATIONAL LAW AND THE PROTECTION OF THE OCEANS FROM POLLUTION,
Fordham Univ., New York.
For primary bibliographic entry see Field 05G.
W72-11552

THE NATIONAL INDUSTRIAL POLLUTION CONTROL COUNCIL: ADVISE OR COLLUDE,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05G.
W72-11553

THE TENNESSEE WATER QUALITY CONTROL ACT OF 1971: A SIGNIFICANT NEW ENVIRONMENTAL STATUTE,
Tulane Univ., New Orleans, La.
J. C. Juergensmeyer.
Vanderbilt Law Review, Vol 25, p 323-330, 1972. 30 ref.

Descriptors: *Water quality control, *Tennessee, *Water permits, *Legislation, Water pollution control, Administrative agencies, State governments, Permits, State jurisdiction, Water resources planning, Long-term planning, Legal aspects, Law enforcement, Water resources development, Water law, Legal review.
Identifiers: *Public trust doctrine.

Tennessee's new Water Quality Control Act is one of the most significant pieces of environmental legislation to be produced in recent years. The salient features of the Act and its efficacy both as basic law for Tennessee and as a model for other jurisdictions are discussed. By adopting the public trust doctrine, the Act provides citizens direct access to relevant administrative agencies. The Act creates the Tennessee Water Quality Control Board as the prime administrative machinery for planning and performance of the state's duties to protect water quality. The Board serves as a reviewing agency for enforcement orders and permits issued by the Commissioner of Public Health. The Act also creates a staff of attorneys to be assigned to the Division of Water Quality Control. The Act also establishes a dual permit system which makes it unlawful for any person to alter the water quality of Tennessee waters without a permit from the commissioner. (Waldron-Florida)
W72-11556

COOPERATIVE COMMUNITY-UNIVERSITY WATER RESOURCE PLANNING: AN INTERDISCIPLINARY APPROACH,
Wisconsin Univ., Green Bay.
For primary bibliographic entry see Field 04A.
W72-11590

SOCIO-ECONOMIC CONSIDERATIONS IN WATER RESOURCES PLANNING,
Department of the Environment, Ottawa (Ontario). Policy Research and Coordination Branch.
For primary bibliographic entry see Field 06B.
W72-11660

6F. Nonstructural Alternatives

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, CATRON COUNTY,
New Mexico State Univ., University Park, Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W72-11311

6G. Ecologic Impact of Water Development

JAMES BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-11131

THE ENERGY-ENVIRONMENT CONFLICT: SITING ELECTRIC POWER FACILITIES,
Virginia Univ., Charlottesville. School of Law.
M. Willrich.

Virginia Law Review, Vol. 58, p. 257-336 (1972). 193 ref.

Descriptors: *Electric powerplants, *Sites, *Environmental effects, *Decision making, Electric power industry, Federal government, State governments, Administrative agencies, Project planning, Planning, Coordination, Legal aspects, Electric power demand, Electric power production, Environmental control, Powerplants, Legislation.

The conflict between demands for electric power and environmental protection is evident whenever decisions are made concerning the location of electric power facilities. The demand for electricity, the supply alternatives, and the environmental effects of electric power production are examined. This information depicts the magnitude and complexity of the forces that shape, and are shaped by, particular siting choices. The legal framework that presently governs electric facilities siting decisions is outlined and evaluated. A state level decision-making process for siting major electric facilities is developed. Such a process must include policy goals for state siting decisions, electric power supply policy, environmental protection policy, and land use perspective. Participants in electric facilities siting decisions should include the electric utilities, state agencies, and private citizens. The decision-making process concerning the siting of electric power facilities may be divided into two main phases, planning and certification. Planning and certification criteria are discussed. If the initial responsibility of the siting body must be limited to the siting of electric facilities, policies and procedures should be designed for future expansion into other areas of land use regulation. (Widman-Florida)
W72-11172

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08A.
W72-11173

FPC PROJECT NO. 1121--BATTLE CREEK HYDROELECTRIC PROJECT, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 08C.
W72-11174

GREAT LAKES CONNECTING CHANNELS, WIDENING AND DEEPENING BENDS IN ST. MARY'S RIVER, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 04A.
W72-11175

PROPOSED CHANGE IN THE OPERATION OF THE EXISTING KORTES UNIT OF THE PICK-SLOAN MISSOURI BASIN PROGRAM, WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11176

SMITHVILLE LAKE, LITTLE PLATTE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-11177

FORT SCOTT LAKE, MARMATON RIVER, KANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-11180

DETAILED PROJECT STUDY OF FLOOD CONTROL IMPROVEMENTS FOR WAIMANO STREAM, OAHU, HAWAII (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 08F.
W72-11182

CEDAR BAYOU, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-11183

HURRICANE CREEK WATERSHED STRUCTURAL PROJECT MEASURE, HOPKINS COUNTY IN KENTUCKY, TRADEWATER RIVER RC AND D PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-11184

PUGET SOUND OCEANOGRAPHIC RESOURCES.
Committee on Commerce (U.S. Senate). Subcommittee on Oceans and Atmosphere.

Descriptors: *Washington, *Administrative organizations, *Environmental effects, *Oceanography, Estuaries, Pacific Northwest, Pacific Ocean, Marine geology, Political aspects, Social aspects, Grants, Experimental farms, Resource development, Technology, Marine fisheries, Estuarine fisheries, Marine plants, Marine animals, Economic impact, Economic feasibility, Commercial fisheries, Adoption of practices.

Testimony taken before the Senate Subcommittee on Oceans and Atmosphere concerning Puget Sound oceanographic resources is presented. Ocean fishery research by the National Oceanic and Atmospheric Administration (NOAA) is discussed. Also discussed is NOAA's program of oceanographic mapping, pollution study, sea farming, and cost figures relative to future programs. The programs and functions of the Washington Department of Natural Resources in aquatic land management is discussed, including the overlap and conflict of functions with federal agencies. The environmental conflict between industrial use and commercial fishing in Puget Sound is explained. Recommendations include strengthened regional entities of federal agencies, larger federal investments in state projects, long-range growth of the Sea-Grant program, increased impetus to the data buoy program, and support of the national marine fisheries service program. The need for exploration of the ocean shelf off Puget Sound is examined. The unique biological chacteristics of the Puget Sound estuary, the need for a moratorium on oil well drilling, and the need for coordinated development planning are explained. Impacts from the construction of the Alaskan oil pipeline are examined. (Grant-Florida)
W72-11187

LAND AND WATER POLLUTION FROM RECREATIONAL USE.
National Industrial Pollution Control Council, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-11188

EDEN WATERSHED, MISSISSIPPI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-11189

PROPOSED SANTA MARGARITA PROJECT, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11190
For primary bibliographic entry see Field 08A.
W72-11191

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-11192

ENVIRONMENTAL ACTIVISM: THERMAL POLLUTION--AEC AND STATE JURISDICTIONAL CONSIDERATIONS.
State Univ., of New York, Buffalo.
For primary bibliographic entry see Field 05G.
W72-11193

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA-PERMIT APPLICATION FOR SNAG REMOVAL BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-11194

WASTE TREATMENT PROJECT IN SPENCER, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W72-11195

ENVIRONMENTAL LAW--NATIONAL ENVIRONMENTAL POLICY ACT OF 1969--PROCEDURAL REQUIREMENTS OF THE ACT MUST BE FOLLOWED IN GOOD FAITH--CALVERT CLIFFS' COORDINATING COMMITTEE, INC. V. ATOMIC ENERGY COMMISSION,
For primary bibliographic entry see Field 06E.
W72-11197

PALATLAKAHA RIVER WATERSHED, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11201

GENEVA DISARMANMENT CONFERENCE AGREES ON TEXT OF TREATY BANNING EMPLACEMENT OF NUCLEAR WEAPONS ON THE SEABED,
Congress, Washington, D.C.; and House, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11202

DRAFT U.N. CONVENTION ON THE INTERNATIONAL SEABED AREA: U.S. WORKING PAPER SUBMITTED TO U.N. SEABEDS COMMITTEE,
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11204

U. S. DRAFT ARCTICLES ON TERRITORIAL SEA, STRAITS, AND FISHERIES SUBMITTED TO U.N. SEABEDS COMMITTEE,
Department of State, Washington D.C.
For primary bibliographic entry see Field 06E.
W72-11205

SEABEDS ARMS CONTROL TREATY TRANSMITTED TO THE SENATE,
Executive Office of the President, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11207

INLAND WATERWAY FROM DELAWARE RIVER TO CHESAPEAKE BAY, DELAWARE AND MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W72-11260

SECOND POWERHOUSE, BONNEVILLE LOCK AND DAM, COLUMBIA RIVER, OREGON AND WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08C.
W72-11261

COW CREEK WATERSHED, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.
W72-11262

VANDALIA DRAINAGE AND LEVEE DISTRICT (DISTRICT 21), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 08D.
W72-11263

LAKE FOREST BEACH EROSION, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 08A.
W72-11264

SUPERVISOR OF THE HARBOR PERMIT PROGRAM FOR WASTE DISPOSAL IN THE ATLANTIC OCEAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 05G.
W72-11265

OCEAN OUTFALL EXTENSION PROJECT, CARMEL SANITARY DISTRICT, CARMEL, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, San Francisco, Calif., and California State Water Control Board, San Francisco.
For primary bibliographic entry see Field 05E.
W72-11266

NAHUNTA SWAMP BASIN, WAYNE AND GREENE COUNTIES, NORTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 08A.
W72-11267

SCAPPOOSE DRAINAGE DISTRICT, OREGON, PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IMPAC STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08A.
W72-11268

CLARKS FORK--BULLOCKS CREEK WATERSHED, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-11269

WATER RESOURCE PROJECTS AND ENVIRONMENTAL IMPACTS: TOWARDS A CONCEPTUAL MODEL,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 06B.
W72-11385

A NATIONAL SEASHORE PROVES A MIXED BLESSING FOR ITS SURROUNDING COUNTY,
Marshall Kaplan, Gans and Kahn, Sausalito, Calif.
S. Fraser.
City, Vol 6, No 1, p 36-44, January-February 1972. 12 photo.

Descriptors: *Conservation, *Environmental effects, *Seashores, Benefits, Degradation, Wildlife conservation, Taxes, Tourism, *California.
Identifiers: *Point Reyes National Seashore, Despoliation, Traffic.

While the Point Reyes National Seashore in Marin County, California was originally considered a victory for the conservationists, there is at present some question as to whether the designation of the Seashore will yield as many problems as benefits to the partly urbanized, partly wild, and partly pastoral suburban county. The unanticipated fallout from the Seashore includes: despoliation of pristine wilderness areas, interference with wildlife habitats, automobile congestion, increased police and other public safety needs, a declining county property-tax base, and tourism run rampant. The proposed Golden Gate National Recreation Area only promises to exacerbate the area's problems. The most visible and highly criticized problem is that of traffic congestion. (Strachan-Chicago)
W72-11481

ISAIAHS AT THE BAR: ENVIRONMENTALISTS AND THE JUDICIAL PROCESSES,
Davies, Biggs, Strayer, Stoel, and Boley, Portland, Oreg.
For primary bibliographic entry see Field 06E.
W72-11482

APPLICATIONS OF ECOSYSTEM THEORY, SUCCESSION, DIVERSITY, STABILITY, STRESS AND CONSERVATION,
Toronto Univ., (Ontario); and British Petroleum Co., Ltd., London (England).
H. A. Regier, and E. B. Cowell.
Biological Conservation, Vol 4, No 2, p 83-88, January 1972. 4 fig, 11 ref.

Descriptors: *Ecosystems, *Succession, *Stability, *Stress, *Conservation, Economics, Exploitation, Pollutants, Ecology, Pollution abatement.
Identifiers: *Ecosystem theory, *Diversity.

Processes at the ecosystem level of organization are examined as they are affected by conventional regimes of fishery exploitation and pollution, the latter including both nutrient and toxic materials. Exploitation and pollution are treated as stresses that deform and transform community structure and reverse the usual sequence of ecological succession with respect to dominance of various tax diversity, stability, and production. Broad economic implications of such processes are outlined. (Strachan-Chicago)
W72-11486

PROLOGUE: ENVIRONMENT AND THE QUALITY OF POLITICAL LIFE,
California Univ., Santa Cruz. Dept. of Political Science.
For primary bibliographic entry see Field 06E.
W72-11494

NATIONAL POLICY FOR THE ENVIRONMENT: POLICIES AND THE CONCEPT OF STEWARDSHIP,
Washington Univ., Seattle. Dept. of Political Science.
For primary bibliographic entry see Field 06E.
W72-11498

CONCLUSIONS: CONGRESS AND THE ENVIRONMENT OF THE FUTURE,
Washington Univ., Seattle.
For primary bibliographic entry see Field 06E.
W72-11499

ECONOMIC GROWTH AND THE NATURAL ENVIRONMENT,
California Univ., Riverside.
For primary bibliographic entry see Field 05G.
W72-11500

A QUANTITATIVE FRAMEWORK FOR RESIDUALS MANAGEMENT DECISIONS,
Resources for the Future, Inc. Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-11501

DISTRIBUTION OF ENVIRONMENTAL QUALITY,
Bowdoin Coll., Brunswick, Me.
For primary bibliographic entry see Field 05G.
W72-11502

VENTURA MARINA, VENTURA COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 08A.
W72-11507

BETHEL SMALL-BOAT HARBOR, BETHEL, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-11508

FALMOUTH LAKE, LICKING RIVER, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-11509

ARKANSAS-RED RIVER BASINS WATER QUALITY CONTROL STUDY--PART I, AREAS VII, VIII AND X, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 05G.
W72-11510

KANAWHA RIVER COMPREHENSIVE BASIN STUDY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Kanawha River Basin Coordinating Committee, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-11511

BUFFALO HARBOR, NEW YORK--MAINTENANCE (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-11512

PEARL RIVER, MISSISSIPPI AND LOUISIANA--NAVIGATION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 08A.
W72-11513

GRAHAM BURKE PUMPING PLANT, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 08C.
W72-11514

PITTSBURGH COAL CO. V. SANITARY WATER BOARD (MINEOWNER'S DUTY TO TREAT WATERS DISCHARGED INTO WATERCOURSES).

286 A.2d 459-470 (Commw. Ct. Pa. 1972).

Descriptors: *Pennsylvania, *Subsurface drainage, *Mine water, *Permits, *Mine drainage, Water pollution, Rivers, Groundwater, Subsurface waters, Legislation, Mine acids, Mine wastes, Mining, Administration, Regulation, Legal aspects, Judicial decisions, Administrative agencies, Diversion, Water pollution sources, Water quality, Waste treatment, Water pollution treatment, Waste water treatment.

Appellant corporation sought reversal of an order of the Sanitary Water Board denying appellant a mine drainage permit for its coal mine. Abandoned mines adjacent to appellant's mine contained an underground lake of 100 to 350 billion gallons of polluted water. In order to mine coal from its own site appellant was forced to pump out water originating in the abandoned mines. Appellant contended that it was not required to treat discharge originating in the adjacent mine. The Clean Streams Act prohibits mine discharges until issuance of a permit. The court held that waters already formed in the abandoned mine constituted 'waters of the Commonwealth' and that the Board could not require the mine operator to treat such waters. The accumulated ground water in the abandoned mine when diverted into another water course naturally flowing into appellant's mine was not discharge from the mine within the meaning of the Clean Streams Act. In ordering the Board to issue a permit the court stated that to require appellant to treat waters originating in abandoned mines would be oppressive. (Ilkson-Florida)
W72-11516

U.S. GIVES VIEWS ON CONVENING CONFERENCE ON LAW OF THE SEA,
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11521

ADVANCES IN ECOLOGICAL RESEARCH, VOL. 7.

Academic Press: London, England; New York, N.Y., 1971. 254p. Pr. $11.50.
Identifiers: *Ecology, *Fish, Microorganisms, *Aquatic plants, *Reviews, *Toxicity, Water pollution effects, *Environmental effects, Heavy metals.

The 4 reviews in this volume cover very diverse aspects of environmental biology as it relates to developments in ecology. The first review of the tolerance to heavy metals of certain plants presents information on the ability of plants and microorganisms to combat such toxic effects in both natural and man-made plant communities. In the second contribution, concerning the rate of net photosynthesis in plants, differences are cited in photosynthetic production capacity in different groups of plants and the ecological implications of such differences are discussed. The third contribution, involving the ecological aspects of fishery research, includes the application of fishery research, models of the dynamics of fish populations, factors affecting total abundance, and interaction between species. The fourth contribution concerns the effects of climatic trends on vegetational distribution, tree growth, and crop success over the last 2000 yr including physical, geophysical, glaciological and botanical data for both hemispheres. Extensive tables, graphs and bibliographic references are found throughout the four contributions. An author index is provided along with a subject index.--Copyright 1972, Biological Abstracts, Inc.
W72-11524

PENN'S LANDING, DELAWARE RIVER, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08D.
W72-11526

THE NATIONAL WATER COMMISSION ANNUAL REPORT FOR 1971.
National Water Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11527

BUFFALO CREEK AT MEADOW GROVE, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 04A.
W72-11529

WILLAPA RIVER AND HARBOR NAVIGATION PROJECT, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 04A.
W72-11530

WILLOW ISLAND LOCKS AND DAM, OHIO RIVER, OHIO AND WEST VIRGINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-11531

SMALL NAVIGATION PROJECT, ANDREWS RIVER, HARWICH, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Waltham, Mass., New England Division.
For primary bibliographic entry see Field 08A.
W72-11532

LONG LAKE AREA, HELENA, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 08A.
W72-11533

DAVIDS CREEK LAKE, EXIRA, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 08A.
W72-11534

AN APPLICATION FOR MAJOR LICENSE FILED BY APPALACHIAN POWER COMPANY FOR CONSTRUCTED BYLLESBY AND BUCK HYDROELECTRIC PROJECT NO. 2514-VIRGINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Federal Power Commission, Washington, D.C. Bureau of Power.
For primary bibliographic entry see Field 08A.
W72-11535

LITTLE CEDAR CREEK, COOSA RIVER BASIN, GEORGIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-11537

POINT LOOKOUT STATE PARK, ST. MARY'S COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 08A.
W72-11538

LONGBOAT PASS, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-11539

BOXELDER CREEK WATERSHED, COLORADO AND WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.
W72-11540

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK, AT AND IN THE VICINITY OF BREWSTER, OHIO (DRAFT ENVIROMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-11541

ST. FRANCIS BASIN, MISSOURI AND ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 08A.
W72-11542

TRANTERS CREEK, BEAUFORT, MARTIN AND PITT COUNTIES, NORTH CAROLINA FLOOD CONTROL (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 04A.
W72-11543

COPAN LAKE, LITTLE CANEY RIVER, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W72-11544

MILLS RIVER DAM AND RESERVOIR (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Office of Health and Environmental Science, Chattanooga.
For primary bibliographic entry see Field 08A.
W72-11545

JACKSONVILLE HARBOR, FLORIDA (SECTION 2) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-11546

SMALL BOAT HARBOR, PORTSMOUTH STATE PARK, OHIO, OHIO RIVER (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-11547

KAUNAKAKAI HARBOR MAINTENANCE DREDGING, MOLOKAI, HAWAII (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 04A.
W72-11548

LEWIS AND CLARK CONNECTING CHANNEL, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08A.
W72-11549

THE DUCK RIVER PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Office of Health and Environmental Science, Chattanooga.
For primary bibliographic entry see Field 08A.
W72-11550

CHANNEL SNAGGING AND CLEARING PAINT CREEK, SOUTH OF CHILLICOTHE, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-11554

PALM BEACH COUNTY SEWAGE IMPROVEMENT PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 05D.
W72-11555

CHESAPEAKE BAY HYDRAULIC MODEL, MATAPEAKE, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 08B.
W72-11557

GREELEY, COLORADO--EPA PROJECT NO. COLO-261 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W72-11558

DEEP GEOTHERMAL TEST WELL, GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Region 3 Office.
For primary bibliographic entry see Field 04B.
W72-11559

PROPOSED CONCRETE LINING OF MAIN OUTLET DRAIN, SOUTH GILA VALLEY, COLORADO RIVER FRONT AND LEVEE SYSTEM, ARIZONA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nevada. Region 3 Office.
For primary bibliographic entry see Field 08A.
W72-11560

TRANSACTIONS OF THE 36TH NORTH AMERICAN WILDLIFE AND NATURAL RESOURCES CONFERENCE.

Wildlife Management Institute: Washington, D. C., 1971. 534 p. Pr. $6.50.
Identifiers: Conference, *Fish, Forests, *Natural resources, Symposium, Transactions, *Wildlife.

This book presents the Transactions of the 36th North American Wildlife and Natural Resources Conference, the theme of which was resource use and quality living. The conference, held in Portland, Oregon, March 7-10, 1971, was divided into 3 major parts: society's failure to solve environmental problems; technical sessions on controlling land use: chemical contamination, oil, fish and wildlife, oil developments in Alaska-a panel, field and forest, and conservation communications; and a closing general session entitled national well-being demands solutions. A total of 45 contributions were presented, including a summarization and critique of the conference. The book is concluded with closing remarks and a list of the registered attendance.--Copyright 1972, Biological Abstracts, Inc.
W72-11681

07. RESOURCES DATA

7A. Network Design

CATALOG OF INTERNATIONAL HYDROLOGICAL DECADE STATIONS AND NETWORKS IN THE UNITED STATES.
National Committee for the International Hydrological Decade, Washington, D. C.

National Academy of Sciences--National Research Council Publication, Washington, DC, 1972. 66 p, 3 fig, 11 tab, 20 ref.

Descriptors: *International Hydrological Decade, *Basic data collections, *Hydrologic data, *Networks, *United States, Sites, Hydrology, Hydrologic cycle, Water resources development, Surface waters, Groundwater, Water yield, Water quality, Water supply, Documentation.
Identifiers: Station listing, Station types.

The International Hydrological Decade is a cooperative international program involving the efforts of over 100 nations. Its purposes are to strengthen the scientific basis for water use and conservation, to stimulate education and training in hydrology, and to improve the ability of developing and developed countries alike to cope with their water problems. In this catalog, the Decade Stations in the United States are discussed briefly by type and are described in tables and located on maps. Locations are also given in the tables wherever possible. The number of stations for various types of data collections includes 40 pan evaporation, 12 lysimeter, 82 river, 23 lake, 34 groundwater, 94 water quality, 60 representative and experimental (basins), 48 hydrological bench mark, 5 glacier, and 58 vigil. (Woodard-USGS)
W72-11280

SUMMARY OF PLANS FOR ACQUISITION OF SURFACE-WATER DATA BY FEDERAL AGENCIES, FISCAL YEAR 1973: STAGE, STREAMFLOW AND QUALITY.
Geological Survey, Washington, D.C. Office of Water Data Coordination.

Geological Survey Office of Water Data Coordination Report, 1972. 81 p, 2 fig, 7 tab, 3 append.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Water quality, *United States, Federal government, Documentation, Reviews, Projections, Hydrologic data, Gaging stations, Sampling, Networks, Network design, Flow measurement, Chemical analysis, Rivers, Lakes, Reservoirs.

Long-term stations (three years of longer) operated by Federal agencies at which surface-water stage or streamflow were being measured as of January 1, 1971, are tabulated by Water Resources Regions. Agency plans for activation or discontinuance of stations during the period January 1, 1971, to June 30, 1973, are shown by agency. The plans call for the discontinuance of 501 stations and the activation of 289 stations; thus, the number of stations in operation as of June 1973 would decrease from 21,419 to 21,207. The same information is tabulated for long-term, surface-water quality stations operated by Federal agencies. Agency plans call for the activation of 327 stations and the discontinuance of 117 between January 1971 and June 1973. The number of surface-water quality stations anticipated as of June 1973 would increase from 5,928 to 6,138. Plans for activation or discontinuance of stations reported by the agencies are proposals for action and are subject to change. They represent the best estimates the agencies could make at the time of the field-coordination activity (Spring 1971). (Woodard-USGS)
W72-11287

7B. Data Acquisition

INFRARED TEMPERATURE SENSING OF SNOW-COVERED TERRAIN,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 02C.
W72-11129

FLUID CONTAMINATION MEASURING SYSTEM,
Alpha Advanced Systems, Inc., Inglewood, Calif. (assignee).
For primary bibliographic entry see Field 05A.
W72-11139

UNDERWAY WATER SAMPLER,
Department of the Navy, Washington, D.C.
R. L. Stewart, K. M. Olson, Jr., and L. Walsh.
U. S. Patent No 3,537,316, 3 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office Vol 880, No 1, p 62, November 3, 1970.

Descriptors: *Patents, *Sampling, *Water sampling, Instrumentation.

The water sampler has a chamber with a valve closure system which can be selectively triggered to capture a sample of liquid while the sampler is being towed from a ship. Electronic pressure and temperature sensors supply information to an X - Y plot. (Sinha-OEIS)
W72-11149

AUTOMATIC DETECTION OF WATER-BORNE FLUORESCENT TRACERS,
Colorado State Univ., Fort Collins.
H. Steppuhn, J. R. Meiman, and B. C. Goodell.
International Association of Scientific Hydrology Bulletin, Vol 16, No 4, p 83-89, December 1971. 4 fig, 18 ref.

Descriptors: *Tracers, *Fluorescent dye, *Monitoring, *Instrumentation, Tracking techniques, Sampling, Automation, Data collections, Measurement.
Identifiers: *Fluorescent tracers.

Water-borne fluorescent tracers are conventionally detected fluorometrically in liquid samples taken from the water body under test. A continuous, automatic, film system was developed to detect tracer concentrations of one part per billion, provide a time distribution of concentration changes, and combine low cost with ready portability. Field installations are self-operative for up to 10 days. A single laboratory-based fluorometer can easily analyze the concurrent data input from 15 or more field installations. Data can also be stored prior to fluorometry. Fluorescent tracers have been detected successfully by the film system under experimental conditions to gage streamflow, to produce flow hydrographs, and to determine the travel time of streamflow. Further refinements can be made by potential users to optimize the system for specific needs. (Knapp-USGS)
W72-11297

A FURTHER CONTRIBUTION TO USING ULTRASONIC SENSORS FOR FISH ACTIVITY STUDIES,
California Univ; La Jolla. School of Medicine.
J. E. Byrne.
Trans Am Fish Soc. Vol 100 No 4 p 792-794. 1971. Illus.
Identifiers: *Fish behavior, Oncorhynchus nerka, Salmon, *Sensors, Ultrasonics, Equipment.

The application of a technique (Muir et al, 1965) using ultrasonic sensors to a study of spontaneous locomotor activity cycles in juvenile sockeye salmon (Oncoryhynchus nerka) is given.--Copyright 1972, Biological Abstracts, Inc.
W72-11324

USE OF ULTRASONIC TESTING IN WATER FACILITY CONSTRUCTION, OPERATION, AND MAINTENANCE,
Bureau of Reclamation, Denver, Colo.
T. E. Backstrom.
Paper, American Society of Civil Engineers National Water Resources Engineering Meeting, Atlanta, Ga., Jan 1972. 16 p, 5 fig, 6 ref.

Descriptors: *Ultrasonics, *Nondestructive tests, *Materials tests, Sound waves, Detection, Sensors, Foundation investigations, Reservoir leakage, Vibrations, Operation and maintenance, Quality control.
Identifiers: *Ultrasonic tests, *High frequency monitoring, Pulse echo technique, Sonic velocity tests, Thickness measurement.

Recent advances in materials applications have given impetus to rapid development of advanced nondestructive testing techniques. Ultrasonic testing, one of the most useful forms of nondestructive testing is commonly used to determine the presence of flaws in materials and welds; to measure properties, dimensions, and conditions; to sense changes in materials resulting from corrosion or mechanical damage; and to monitor changes in structures and operating machinery indicative of approaching failure. New applications and instruments are being developed at a rapid rate. Sonic devices, their operating principles, and application to testing and monitoring use in construction, operation, and maintenance of water facilities are discussed. (USBR)
W72-11364

FIELD MEASUREMENTS WITH COMMON EQUIPMENT,
Sacramento State Coll., Calif.
N. C. Janke.
Photogrammetric Engineering, Vol. 38, No. 1, p 37-47, Jan 1972. 2 fig, 1 tab, 2 ref.

Descriptors: *Mapping, *Geologic mapping, *Measurement, On-site investigations, Photography, Cameras, Graphical analysis, Terrian analysis, Geologic investigations, Geology, On-site data collections.
Identifiers: *Photointerpretation, Dipping, Foliation, Photogeology, *Photographic analysis.

Mapping and measurement with an ordinary camera have been largely ignored by geologists and others who might benefit from such use. Simple operations with a few tripod accessories will yield mapping and measurement of outcrop features to precisions of about 0.1 deg or better, and 0.5% in linear measurement. The result obtainable include the fixing of map positions and elevations, determination of apparent angles (e.g., dips, lineations, foliations) and true angles, measurement of fault separations, size distributions of coarse materials, and metrics of fossil impressions. The basic field measurements are: (1) length of a level line indicated on the outcrop face by 2 stakes or other markers; (2) angle of the dip of the outcrop face; (3) one photo from a level camera; (4) the distance setting on the focal ring of the camera; (5) correctly exposed and focused photographs; and (6) vertical rods or stakes of known height. The necessary field equipment includes: (1) a camera (a 35-mm single-lens reflex), and (2) a tripod with an attachment for leveling the panning plane. (USBR)
W72-11371

DRAINAGE TILE LOCATION USING AERIAL PHOTOGRAPHY,
Army Topographic Command, Washington, D.C.; and Ohio State Univ., Columbus.
For primary bibliographic entry see Field 04A.
W72-11374

ORTHOPHOTOGRAPHY IN THE EVALUATION OF MAN'S ENVIRONMENT,
Baker (Michael J.), Inc. Rochester, Pa. Photogrammetric Engineering Div.
C. E. McNoldy.
Preprint of paper presented at American Society of Civil Engineers National Meeting on Water Resources Engineering, Atlanta, Georgia, January 24-28, 1972. 14 p, 4 fig, 5 ref.

Descriptors: *Photography, *Remote sensing, *Aerial photography, *Mapping, *Water resources development, Instrumentation, Terrain analysis, Topography, Geology, Planning, Environmental control, Evaluation.
Identifiers: *Orthophotography.

Orthophotography is a recently developed photogrammetric technique which enables the photogrammetrist to achieve a scale-rectified image of a portion of the earth's surface on a photographic emulsion. The orthophotograph is produced by an instrument which removes the effects of tilt, relief and many of the lens aberrations from the aerial photographs taken of the terrain. Consequently, each incremental area of the photograph is relocated to where it would have appeared had the photograph been taken from infinity. The detail depicted on the orthophoto depends upon the scale and resolution of the original aerial photographs as well as the fidelity of reproduction of the orthorectification technique. On large scale orthophotos in the order of 1:1000, surface detail such as water hydrants, lamp posts, utility poles and guard rail posts can be recognized. Numerous applications exist for rapidly produced and correctly rectified orthophotographs. For example, geologists apply orthophoto techniques to structural studies, investigations of water resources, engineering geology investigations, and general geologic mapping. (Woodard-USGS)
W72-11659

VOLUMETRIC COMPONENT ANALYSIS OF UNCONSOLIDATED SEDIMENTS USING SLIT SIEVES,
Bristol Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-11664

THE MEASUREMENT OF CONDUCTIVITY AND TEMPERATURE IN THE SEA FOR SALINITY DETERMINATION,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
E. L. Lewis, and R. B. Sudar.
Aidjex Bulletin No 13 (Washington University, Seattle), p 93-113, May 1972. 4 fig, 2 tab, 11 ref.

Descriptors: *Salinity, *Oceans, *Estuaries, *Cold regions, Measurements, Specific conductivity, Water temperature, Depth, Ice-water interfaces, Saline water intrusion, Forecasting, Analytical techniques, Equations.
Identifiers: Salinity calculations, Salinometer.

Problems of obtaining in situ measurements of electrical conductivity and temperature in the sea at known levels of accuracy are outlined. Practical solutions are offered with emphasis on calibration procedures. Conversion of the resulting values at temperatures below 10 deg C is discussed. The equipment and techniques for the measurements are of particular interest to studies in Arctic oceanography but should be relevant to oceanographic measurements in any part of the world. (Woodard-USGS)
W72-11669

THE MEASUREMENT OF SNOW DEPTH AND DENSITY USING A SHORT PULSE RADAR SYSTEM,
Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 02C.
W72-11671

SIMULTANEOUS DETERMINATION OF SAMPLE CONCENTRATION AND REAGENT BLANK,
Hach Chemical Co., Ames, Iowa. Water Analysis Research Lab.
For primary bibliographic entry see Field 05A.
W72-11703

DIRECT STEADY STATE CALIBRATION OF A FLAME IONIZATION DETECTOR,
Rice Univ., Houston, Tex. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W72-11706

STANDARD SOLUTION FOR REDOX POTENTIAL MEASUREMENTS,
Foxboro Co., Mass. Research Center.
For primary bibliographic entry see Field 02K.
W72-11707

INTERNATIONAL AFLATOXIN CHECK SAMPLE PROGRAM: 1971 STUDY,
WARF Inst., Inc., Madison, Wis.
For primary bibliographic entry see Field 05A.
W72-11709

USE OF CONTINUOUS RECORDING SALINITY-TEMPERATURE-PRESSURE INSTRUMENTATION AT OCEAN STATION P (50N, 145W),
Fisheries Research Board of Canada, Nanaimo (British Columbia). Pacific Oceanographic Group.
C. A. Collins, and D. A. Healey.
Journal Fisheries Research Board of Canada, Vol 29, No 3, p 323-327, March 1972. 3 fig, 2 tab, 9 ref.

Descriptors: *Monitoring, *Salinity, *Temperature, *Pressure, *Electronic equipment, Evaluation, Data collections, Data processing, Computers, Instrumentation, Oceans, Measurement, Automation, On-site investigations, Equipment.
Identifiers: Nansen bottles, Precision, Performance evaluation.

An evaluation has been made of the precision of Salinity-Temperature-Pressure (STP) instruments at ocean station P, as well as a comparison of this method to the Nansen bottle technique of water analysis. Data collected by both instruments on scientific ocean cruises were electronically processed to determine precisions and standard deviations. The operational precision of STP instruments for salinity and temperature was estimated as 0.07 ppt and 0.07 C, respectively. Correction of electronically digitized data for instrument response constants failed to improve the quality of the data. However, a response constant of 1 sec would remove the salinity inversions associated with large temperature gradients. Smoothing of STP data with a numerical taper about 2-db wide and decimation to 2-db intervals seemed appropriate for 0.2 sec sampling rates. (Mackan-Battelle)
W72-11722

THE CONTRIBUTION OF GAS CHROMATOGRAPHY TO THE IDENTIFICATION OF SUBSTANCES,
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
For primary bibliographic entry see Field 02K.
W72-11725

REPORT ON HAZARDOUS SUBSTANCES,
Food and Drug Administration, Washington, D.C. Office of Product Safety.
D. F. McCaulley.
Journal of the Association of Official Analytical Chemists, Vol 55, No 2, p 242-243, March 1972. 1 tab, 3 ref.

Descriptors: *Chemical analysis, *Quality control, Evaluation, Testing, Viscosity, *Methodology, Inspection, Performance, Standards, Physical properties, *Laboratory tests, *Pollutant identification.
Identifiers: Interlaboratory studies, Performance evaluation, Flash point, Petroleum distillates, Petroleum residues, Hazardous substances, Errors.

An interlaboratory study was conducted by the Food and Drug Administration's Field Scientific Coordinating Staff in order to ascertain the quality of testing methodology. Eighteen FDA laboratories were each given 2 quart cans of liquid 'all purpose' thinner in order to classify it under the Hazardous Substances Act. The cans were all of the same lot and all samples were identical. Three tests were performed according to prescribed methods: (1) petroleum distillates (as unsulfonated residues), (2) flash point, and (3) viscosity. No difficulties were encountered with the methodology in general; however, two laboratories were outside the allowed range of 2 standard deviations for one or more of the methods. Examination revealed improper standardization or difficulties in laboratory technique technique as the cause of these poor results. Only one of these methods is included in Offical Methods of Analysis, although all have been validated by either AOAC or ASTM. Thus, these and several other validated methods will be proposed as additions to the hazardous substances chapter in Official Methods of Analysis. (Mackan-Battelle)
W72-11728

INSTRUMENTATION FOR MEASUREMENT OF WASTEWATER FLOW,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 05B.
W72-11732

A NEW MOUNTING MEDIUM FOR DIATOMS,
Bemidji State Coll., Minn. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W72-11738

7C. Evaluation, Processing and Publication

CONJUNCTIVE USE OF WATER IN WEST TEXAS-BENEFITS TO NONCOOPERATORS,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 04B.
W72-11116

PHYSICAL INVESTIGATIONS OF THE SEASONAL MOUNTAIN SNOWPACK: BRIDGER RANGE, MONTANA,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 02C.
W72-11130

FLOODS ON THE GUYANDOTTE RIVER IN THE VICINITY OF LOGAN, LOGAN COUNTY, WEST VIRGINIA,
Geological Survey, Washington, D.C.
E. A. Friel, and G. S. Runner.
Available from USGS, Washington, DC 20242 Price $1.50. Geological Survey Hydrologic Investigations Atlas HA-347, 2 sheets, 1972. 10 fig, 2 maps, 3 ref.

Descriptors: *Floods, *Flood plains, *Flood control, *Hydrologic data, *West Virginia, Aerial photography, Photogrammetry, Maps, Appalachian Mountain Region, Flood profiles, Flood forecasting, Flood recurrence interval.
Identifiers: *Logan County (W. VA.), *Guyandotte River.

This 2-sheet atlas was prepared by the U.S. Geological Survey to further the objectives of the Appalachian Regional Commission. Hydrologic data are presented concerning the extent, depth, and frequency of flooding along the Guyandotte River in the vicinity of Logan, Logan County, West Virginia. The data will aid those individuals, organizations, and government agencies who are responsible for making decisions for the safe and economical use of these flood-plain lands. The approximate boundaries of inundation along the Guyandotte River by hypothetical floods having recurrence intervals of 5, 25, and 50 years are delineated on an aerial photomosaic map. Depths of inundation and limits of overflow of floods of various magnitudes can be estimated by using the methods and relations presented. (Woodard-USGS)
W72-11278

ANALOG SIMULATION OF WATER-LEVEL DECLINES IN THE SPARTA SAND, MISSISSIPPI EMBAYMENT,
Geological Survey, Washington, D.C.
J. E. Reed.
Available from USGS, Washington, DC 20242, Price $0.75. Geological Survey Hydrologic Investigations Atlas HA-434, 1 sheet, 1972. 5 fig, 1 tab, 3 ref.

Descriptors: *Groundwater, *Water level fluctuations, *Drawdown, *Analog models, *Mississippi River basin, Water wells, Water supply, Withdrawal, Pumping, Water levels, Forecasting, Projections, Hydrologic data, Aquifer characteristics, Maps, Groundwater resources, Transmissivity, Storage coefficient.
Identifiers: *Mississippi Embayment, Sparta Sand.

Because local groundwater withdrawals from several aquifers in the Mississippi embayment have caused water-level declines that are of regional and interstate significance, an analog model of the Sparta Sand was used to predict and evaluate the regional effects of increasing future water withdrawals. The results are presented on a one-sheet hydrologic atlas. The transmissivity of the analog model, determined from data in files of the U.S. Geological Survey, ranged from 7,000 to 70,000 sq ft per day. The storage coefficient used was assumed to be proportional to the thickness of the aquifer and ranged from 0.0001 to 0.001. Although the model was constructed with a coarse grid spacing and data in some areas were scarce, it nevertheless gives reasonable regional values for water levels that may be expected as a result of projected pumping rates and proposed future withdrawals. The model can be useful in theconstruction of more detailed models of local problem areas within the Mississippi embayment, and also in the management of water resources of the entire region. (Woodard-USGS)
W72-11279

METEOROLOGICAL DATA, 1950-1970,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
D. S. Rickard.

Descriptors: *Meteorological data, *Data collections, *Weather data, *Synoptic analysis, Foreign countries, Rainfall, Humidity, Air temperature, Winds, Soil temperature, Grasses, Instrumentation.
Identifiers: *New Zealand, Winchmore Irrigation Research Station (N.Zealand).

Twenty-one years of meteorological data from the Winchmore Irrigation Research Station in New Zealand are summarized. Data extremes for the period of record are: maximum air temperature 35.9C, Jan. 19, 1956; minimum air temperature -8.4 C, May 25, 1952; minimum grass temperature -11.0 C, Aug. 1, 1957; greatest annual rainfall 948.5 mm, 1957; least annual rainfall 491.3 mm, 1969; greatest monthly rainfall 253.0 mm, Nov. 1952; least monthly rainfall 2.5 mm, June 1966; greatest daily rainfall 95.3 mm, Feb. 9, 1951; and greatest daily miles of wind 702, Feb. 2, 1952. (Woodard-USGS)
W72-11281

WATER RESOURCES DATA FOR KANSAS, 1971: PART I. SURFACE WATER RECORDS.
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 02E.
W72-11282

TEMPERATURE OF FLORIDA STREAMS,
Geological Survey, Tallahassee, Fla.
W. Anderson.
Florida Bureau of Geology Map Series No 43, 1 sheet, 1971. Text, 5 fig, 1 map, 1 tab, 1 ref.

Descriptors: *Water temperature, *Streams, *Surface waters, *Florida, Air temperature, Data collections, Canals, Average, Variability, Fluctuations, Frequency curves, Measurement, Sites, Maps.

The highest and lowest stream temperatures observed in Florida since 1956 were 100 F for Fisheating Creek near Venus and 34 F for Ochlockonee River near Havana. The Sopchoppy River in northern Florida and Miami Canal in southern Florida show how water temperatures vary with time, location and air temperature. The range in observed temperatures of these streams, 40 F to 98 F, encompasses the range in temperature likely to occur elsewhere in the State. Illustrations in this map report indicate the effect of geographic location on the seasonal variation in stream temperatures and variations in air temperatures and stream temperatures in northern and southern Florida. The percentage of days that the diurnal range in water temperature of Sopchoppy River and Taylor Slough equals or exceeds a specific number of degrees and the percentage of days that temperatures are likely to be equalled or exceeded in northern and southern Florida are also shown. (Woodard-USGS)
W72-11284

RECORDS OF PRECIPITATION, WATER LEVELS, AND GROUND-WATER RECHARGE TO THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1971.
Geological Survey, San Antonio, Tex.

Edwards Underground Water District Bulletin 30, May 1972. 11 p, 4 tab, 12 ref.

Descriptors: *Groundwater, *Water levels, *Hydrologic data, *Basic data collections, *Texas, Precipitation (Atmospheric), Groundwater recharge, Aquifers, Streamflow, Flow rates, Hydrogeology, Limestones.
Identifiers: *San Antonio area (Tex), Edwards Limestone.

Records of precipitation, water levels, and estimates of recharge to the Edwards and associated limestones in the San Antonio, Texas, area during 1971 are summarized. Data tabulations are from 8 precipitation sites, 25 streamflow gaging stations, and 5 wells. Rainfall was above average

throughout most of the recharge area. Water levels reached a lower point during June than had been experienced for several years; however, toward the latter part of the year, water levels were near the record highs. Recharge to the Edwards and associated limestones is chiefly from streams that lose most of their base flow and part of their flood flow as they cross the Balcones Fault Zone on the outcrop of the aquifer. Total recharge in 1971 was in excess of the average annual recharge by nearly 400,000 acre-feet and was about 75% above the annual average. (Woodard-USGS)
W72-11288

CONTROL OF THE DAILY WATER LEVEL DATA--TEST BY RELATING REDUCED LEVELS (CONTROLE DES COTES HYDROMETRIQUES JOURNALIERES--TEST DU RAPPORT DES COTES REDUITES),
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
For primary bibliographic entry see Field 02A.
W72-11296

WATER RESOURCES INVESTIGATIONS IN PENNSYLVANIA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Pennsylvania, *Inter-agency cooperation, Surface waters, Groundwater, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Streamflow, Runoff, Water temperatures, Sediment transport, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Pennsylvania are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 251 primary, secondary, and water management streamflow stations; 66 groundwater observation wells; and 88 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, discharge of the principal rivers, and zones of similar surface-water chemistry. A map, scale 28 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Pennsylvania in January 1969. (Woodard-USGS)
W72-11305

WATER RESOURCES INVESTIGATIONS IN MAINE, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 4 fig, 1 tab.

Descriptors: *Water resources, *Investigations, *Maine, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Maine are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 57 primary, secondary, and water management streamflow stations; 13 groundwater observation wells; and 7 water quality observing sites. Small State maps show areas of published groundwater reports, mean annual precipitation, average annual runoff, and discharge of principal rivers. A map, scale approximately 40 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Maine in July 1968. (Woodard-USGS)
W72-11306

WATER RESOURCES INVESTIGATIONS IN TENNESSEE, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 7 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Tennessee, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, On-site investigations, Water temperature, Springs, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Tennessee are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 122 primary, secondary, and water management streamflow stations; 3 springflow stations; 65 groundwater observation wells; and 121 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, suspended sediment concentrations of streams, discharge of the principal rivers, and the dissolved solids in streams. A map, scale 24 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Tennessee in December 1968. (Woodard-USGS)
W72-11307

A COMPUTER MODEL OF THE TIDAL PHENOMENA IN COOK INLET, ALASKA,
Alaska Univ., Fairbanks, Inst. of Water Resources.
For primary bibliographic entry see Field 02L.
W72-11355

ON THE SIGNIFICANCE OF THE HOERNER WALDORF WELL FIELD WATER-TABLE FLUCTUATIONS,
Montana Univ., Missoula. Water Resources Research Center.
For primary bibliographic entry see Field 04B.
W72-11383

LAND DRAINAGE SURVEY: III. MAPS OF IRELAND SHOWING THE GENERAL DISTRIBUTION OF DRAINAGE PROBLEMS AND OF DRAINAGE SCHEMES,
Foras Taluntais, Dublin (Ireland).
For primary bibliographic entry see Field 04A.
W72-11419

GLACIER DAMMED LAKES AND OUTBURST FLOODS IN ALASKA,
Geological Survey, Washington, D.C.
A. Post, and L. R. Mayo.
Available from USGS, Washington, DC 20242, Price - $1.50. Geological Survey Hydrologic Investigations Atlas HA-455, 3 sheets, 1971. Text, 3 fig, 2 map, 1 tab, 12 photo, 71 ref.

Descriptors: *Glaciology, *Lakes, *Floods, *Melt water, *Alaska, Ice, Dams, Glaciers, Arctic, Flood damage, Data collections, Aerial photography, Aircraft, Volcanoes, Temperature, Flood forecasting, Flood plains, Streamflow.
Identifiers: *Atlas.

Glacier dammed lakes in south-central and southeastern Alaska and in adjacent Canada which drain into rivers entering Alaska are numerous; 750 glacier dammed lakes are plotted on the maps of this 3-sheet hydrologic atlas. The number and size of individual lakes vary enormously during the seasons and from year to year. An assessment is presented of the hazardous glacier outburst floods in Alaska by mapping the present extent of glaciers, the location of glacier dammed lakes and glacier-clad volcanoes, presenting the recent history of several prominent glacier dammed lakes, and delineating areas where outburst flooding may be expected. Recommendations are made for monitoring a few lakes which cause very large or potentially damaging floods. Base maps showing the glaciers were compiled from United States and Canadian topographic maps, scale 1:250,000 reduced to 1:1,000,000. These were extensively revised and brought up to date by checking more than 15,000 aerial photographs of glaciers taken between 1960 and 1970. (Woodard-USGS)
W72-11445

WATER MEASUREMENTS OF COASTAL LOUISIANA,
Louisiana Wild Life and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 02L.
W72-11446

DRILLERS' LOGS OF WELLS IN HARRIS COUNTY, TEXAS, 1905-71,
Geological Survey, Austin, Tex.
R. K. Gabrysch, G. D. McAdoo, and C. W. Bonnet.
Geological Survey Open-file Report (Texas District), 1972. 420 p, 1 fig, 5 ref.

Descriptors: *Water wells, *Drillers logs, *Geologic units, *Texas, *Lithologic logs, Depth, Well data, Maps, Sites, Data collections, Geologic formations, Profiles.
Identifiers: *Harris County (Tex).

Drillers' logs are presented for approximately 1,200 wells in Harris County, Texas, that were collected from 1905 to 1971 as part of the county's groundwater inventory. The logs include the thickness of each geologic unit along with the accumulated depth for the units from land surface to well bottom. A map of the county, scale 4 miles to the inch, shows locations of the wells. (Woodard-USGS)
W72-11449

ANALYSIS OF POTENTIAL ERRORS IN REAL--TIME STREAMFLOW DATA AND METHODS OF DATA VERIFICATION BY DIGITAL COMPUTER,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 02E.
W72-11460

GROUNDWATER IN LAKE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
D. D. Knochenmus.
Florida Bureau of Geology Map Series No 44, 1 sheet, 1971. 5 fig, 9 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water supply, *Florida, Hydrologic data, Data collections, Maps, Hydrographs, Geology, Groundwater recharge, Water yield, Water quality, Water utilization, Irrigation, Citrus fruits, Water level fluctuations.

Identifiers: *Lake County (Fla).

Maps, sections, and graphs show some of the important hydrogeologic features, the quality of water, and fluctuations of the potentiometric surface of the Floridan aquifer in Lake County, Florida. The major use of water is for irrigation. Of the 143,000 acres of citrus groves in 1970, 36,000 acres, or about 25%, was irrigated. Seventy-five percent was irrigated from the Floridan aquifer and 25% from lakes and streams. Water-level fluctuations in five wells open to the Floridan aquifer are shown by hydrographs. For the period shown, 1959-69, no overall decline of groundwater levels is indicated. Water in the Floridan aquifer is of good quality, except in the St. Johns River valley, where it contains dissolved solids that exceed the maximum of 500 mg/liter recommended for public supplies by the U.S. Public Health Service. (Woodard-USGS)
W72-11462

WATER RESOURCES INVESTIGATIONS IN NEVADA, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Nevada, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Water temperature, Sediment transport, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Nevada, are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 97 primary, secondary, and water management streamflow stations; 242 groundwater observation wells; and 10 water quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, average annual precipitation, average annual runoff, and areas where quantitative water reports have been completed. A map, scale 50 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Nevada in September 1968. (Woodard-USGS)
W72-11653

WATER RESOURCES INVESTIGATIONS IN NEW HAMPSHIRE, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 3 fig, 1 map.

Descriptors: *Water resources, *Investigations, *New Hampshire, *Inter-agency cooperation, Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Precipitation (Atmospheric), On-site investigations, Water quality, Water temperatures, Sediment transport, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in New Hampshire, are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 60 primary, secondary, and water management streamflow stations; 26 groundwater observation wells; and 10 water quality observing sites. Small State maps show discharge of the prinicpal rivers, mean annual precipitation, and average annual runoff. A map, scale 20 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in New Hampshire in December 1968. (Woodard-USGS)
W72-11654

ORTHOPHOTOGRAPHY IN THE EVALUATION OF MAN'S ENVIRONMENT,
Baker (Michael J.), Inc. Rochester, Pa. Photogrammetric Engineering Div.
For primary bibliographic entry see Field 07B.
W72-11659

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1970,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 02E.
W72-11661

STORM RAINFALL VARIABILITY OVER CONNECTICUT,
The Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 02B.
W72-11668

WATER-QUALITY RECORDS FOR SELECTED RESERVOIRS IN TEXAS, 1970-71 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02H.
W72-11670

TECHNIQUES FOR ASSESSING WATER RESOURCE POTENTIALS IN THE DEVELOPING COUNTRIES WITH EMPHASIS ON STREAMFLOW, EROSION AND SEDIMENT TRANSPORT, WATER MOVEMENT IN UNSATURATED SOILS, GROUND WATER, AND REMOTE SENSING IN HY DROLOGIC APPLICATIONS,
Geological Survey, Washington, D.C.
G. C. Taylor, Jr.
Available from NTIS, Springfield, Va 22151 as PB-207 192, Price: $3.00 paper copy; 95 cents microfiche. Geological Survey Report prepared for Agency for International Development, December 1971. 70 p, 46 ref.

Descriptors: *Data collections, *Basic data collections, *Data processing, *Instrumentation, *Water resources development, Economics, Streamflow, Erosion, Sediment transport, Groundwater, Remote sensing, *Foreign countries, *Tropical regions.
Identifiers: Developing countries.

This preliminary report describes techniques for assessing water-resource potentials in the developing countries, most of which lie in the tropics. These techniques are well established in the developing countries. Institutional and economic constraints, however, inhibit growth of sustained programs of hydrologic data collection and application of the data to problems in engineering technology. Computer-based technology, including automatic processing of hydrologic data and mathematical modeling is also well begun in many developing countries and has much wider potential application. Application of nuclear techniques to hydrologic problems is likely to be marginal for some years. Remote sensing offers great promise for synoptic evaluations of water resources and hydrologic processes, including the transient phenomena of the hydrologic cycle. There are few identifiable gaps in existing hydrologic instrumentation and methodology. What is needed is acceleration of institutional development and professional motivation toward more effective use of existing and proven methodology. Moreover, much sophisticated methodology can be applied effectively in the developing countries only when adequate levels of indigenous scientific skills have been reached and supportive institutional frameworks are evolved. (Knapp-USGS)
W72-11672

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 7 fig, 1 map.

Descriptors: *Water resources, *Investigations, *North Dakota, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, Water temperature, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in North Dakota are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 120 primary and water management streamflow stations; 124 groundwater observation wells; and 19 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, discharge of the principal rivers, and the dissolved solids in surface waters. A map, scale 50 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in North Dakota in January 1969. (Woodard-USGS)
W72-11675

RANDOM-WALK MODEL OF STREAM NETWORK DEVELOPMENT,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02J.
W72-11676

08. ENGINEERING WORKS

8A. Structures

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-200 342D, $3.00 in paper copy, $0.95 in microfiche. May 1971. 130 p, 1 map.

Descriptors: *Florida, *Environmental effects, *Water management (Applied), *Flood protection, *Water control, Flood control, Wildlife habitats, Land use, River basins, Canals, Levees, Navigation, Fish, Recreation, Water supply, Water demand, Water conveyance, Channel improvement, Aquatic plants, Water pollution, Water pollution sources, Water quality, Water quality control, Floods, Multiple purpose projects, Project benefits, Project purposes, Drainage, Water conservation, Navigable rivers, Lakes.
Identifiers: Lake Okeechobee (Fla), Kissimmee River (Fla), St. Johns River (Fla) *Environmental Inpact Statements.

The project consists of a system of canals, levees, pumping plants, control structures and channel improvements for flood control, drainage water conservation, and wildlife conservation, and to retard

or prevent salt water intrusion in coastal areas and provide water supplies for Central and South Florida. The project would convert aquatic swamplands into terrestrial environment and raise the water level of Lake Okeechobee. It would alter natural flowing streams in areas of the St. Johns and Kissimmee Rivers. Wildlife habitats and sport fishing in the Okeechobee River would be adversely affected. Conveyance of water may cause water quality problems due to excessive nutrients. An immediate short term effect of the project would be impaired water quality caused by construction. The long term effect however would be beneficial to water quality. The project would provide a more dependable source of water to the Everglades. Irreversible commitment of resources would be wildlife habitats, natural marshlands and 38 miles of natural rivers. Alternatives to each facet of the project are included. (Backins-Florida)
W72-11173

PROPOSED CHANGE IN THE OPERATION OF THE EXISTING KORTES UNIT OF THE PICK--SLOAN MISSOURI BASIN PROGRAM, WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.

Available from the National Technical Information Service as PB-202 303D, $3.00 in paper copy, $0.95 in microfiche. August 1971. 15 p, 1 map.

Descriptors: *Missouri River, *Wyoming, *Environmental effects, *Hydroelectric plants, *Flow control, Reservoir releases, Flow duration, Flow rates, River flow, Fishing, Fish establishment, Stream fisheries, Recreation, Trout, Reservoirs, Reservoir fisheries, Reservoir operation, Dams, Project planning.
Identifiers: *Environmental impact statements.

The proposed project will involve changing the method of operating the Kortes unit dam of the Pick-Sloan Missouri Basin Program, Wyoming. The project is currently a single-purpose hydroelectric facility. The project will alter operations to provide a minimum flow of 500 cubic feet per second in the 10 mile reach of the North Platte River between Kortes dam and Pathfinder Reservoir in order to restore and enhance trout fishing. The project would have a favorable environmental impact by restoring much of the rivers former aesthetic quality and restoring the fishery. The supply of freshwater shrimp will also be increased. Adverse environmental effects include an annual power loss reduction which will require increased output from other power facilities. Additionally a greater concentration of refuse can be expected in the area from increased human use. Various alternative minimum flows were considered and their effects evaluated. The proposed change would not be irreversible and would not be made at a loss of any known long-term needs. (Grant-Florida)
W72-11176

OCONTO HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.

Available from the National Technical Information Service as PB-201 329F, $3.00 in paper copy, $0.95 in microfiche. July 1971. 22 p, 1 map.

Descriptors: *Wisconsin, *Environmental effects, *Breakwaters, *Channel improvement, Dredging, Disposal, Spoil banks, Aquatic habitats, Aquatic environment, Harbors, Inland waterways, Rivers and Harbors Act, Turbidity, Recreation, Boating, Beaches, Shore protection, Maintenance.
Identifiers: *Environmental impact statements.

The project will involve rehabilitation of the badly deteriorated south breakwater at Oconto Harbor, Wisconsin. The project would replace the stone filled piling structure by a rubble-mound stone covered breakwater. The project also will involve dredging the existing channel to the authorized 15 foot level. Spoil will be placed as beach nourishment. Spoil will not be polluted and will be dumped in an undeveloped area. Destruction of plant life and turbidity from dredging will be temporary. Adverse impacts include disturbance of fish and plant life from dredging, disturbance of plant life in the disposal area, and loss of breakwater vegetation. Loss of plant material should not significantly affect the terrestrial ecology. Alternatives include dredging to a more shallow depth and steel and concrete breakwater construction. Alternate disposal sites are unsatisfactory. (Grant-Florida)
W72-11179

FORT SCOTT LAKE, MARMATON RIVER, KANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-201 520D, $3.00 in paper copy, $0.95 in microfiche. June 1971. 8 p, 2 map.

Descriptors: *Kansas, *Environmental effects, *Flood control, *Dam construction, Dams, Flood protection, Lakes, Alternative planning, Comprehensive planning, Coordination, Multiple-purpose projects, Easements, Land development, Outlet works, Impoundments, Water quality control, Water supply development.
Identifiers: *Environmental impact statements, *Marmaton River (Kan).

The project provides for the construction of a dam and multipurpose lake on the Marmaton River in Bourbon County, Kansas. A multilevel outlet will be included in the dam for water quality and water supply releases. The project will control the drainage of 279 square miles and will involve the purchase of 19,500 acres in fee simple acquisition and 600 acres in flowage easements. Environmental impact will include providing flood protection, water quality control, water supply storage, recreation and fish and wildlife enhancement, and encouraging intensified agricultural, residential and commercial development in the area. The lake will inundate 5,000 acres of land and eliminate 25 miles of the Marmaton River and tributary streams and associated fish and wildlife habitat. Alternatives considered include levees, limited channel works, and no action. Irreversible or irretrievable commitments of resources will include alteration of the free-flowing stream, permanent inundation of wildlife habitation in the lake site, and the man power and materials involved in the construction of the lake. (Widman-Florida)
W72-11180

JORDAN AQUEDUCT, BONNEVILLE UNIT, CENTRAL UTAH PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.

Available from the National Technical Information Service as PB-198 838D, $3.00 in paper copy, $0.95 in microfiche.

Descriptors: *Water supply, *Bonneville Dam, *Utah, *Environmental effects, *Aqueducts, Flumes, Pipelines, Water conveyance, Canal design, Canal embankments, Canal linings, Canal seepage, Hydraulics, Wildlife habitats, Fisheries, Aesthetics, Birds, Channels, Flow control.
Identifiers: *Environmental impact statements.

The Jordan Aqueduct project will be a part of the Bonneville Dam unit of the Central Utah Project. The aqueduct will be a buried pre-cast concrete pipeline 20.8 miles long which will run northward to the southern limits of Salt Lake City. The aqueduct is being constructed to deliver 3,000 acre feet per year with a subsequent capacity of 70,000 acre feet per year. Rehabilitation of the Provo River canal will be undertaken by raising the left bank, raising the walls of a flume, and lining 2.4 miles to prevent leakage in order to contain the aqueduct's upstream supply. No permanent adverse environmental effects are anticipated. Minor landscape disturbances will occur. Fish resources will be affected only during construction at the siphon crossing the Jordan River. Fishery resources will ultimately be enhanced in the Provo River due to increased flows. Temporary disruption of small game and bird habitats will occur during construction. Practical alternatives are limited to variations in design and location of the project. (Grant-Florida)
W72-11181

HURRICANE CREEK WATERSHED STRUCTURAL PROJECT MEASURE, HOPKINS COUNTY IN KENTUCKY, TRADEWATER RIVER RC AND D PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-11184

EDEN WATERSHED, MISSISSIPPI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-11189

PROPOSED SANTA MARGARITA PROJECT, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.

Available from the National Technical Information Service as PB-202 300-D, $3.00 in paper copy, $0.95 in microfiche. July 1971. 12 p, 1 map.

Descriptors: *California, *Environmental effects, *Dam construction, *Multiple-purpose reservoirs, Reservoirs, Reservoir construction, Reservoir fisheries, Groundwater resources, Water resources development, Water storage, Multiple-purpose projects, Water supply, Wildlife habitats, Aquatic habitats, Riparian plants, Natural flow doctrine, Municipal water, Industrial water, Irrigation, Flood protection.
Identifiers: *Environmental Impact Statements.

The proposed project would involve construction of two mulitple-purpose dams on the Santa Margarita River about 75 miles southeast of Los Angeles. The project will impound, conserve and deliver natural river flows for water supply and irrigation purposes. Environmental impacts would include increased flood protection, increased agricultural productivity from irrigation, increased water-related recreational activities, slight impairment of water quality, loss of riparian vegetation, and some undetermined impact on marshland. Adverse effects would include inundation of riparian habitats, loss of wildlife habitat, construction scars, loss of hunting days for deer and upland game, increased automobile traffic, and reduction in sand replenishment for beaches at the mouth of the river. Alternatives considered include construction of only one dam and no construction. The two reservoir sites are irretrievable commitments of resources. (Grant-Florida)
W72-11190

Available from the National Technical Information Service as PB-200 441-D, $3.00 in paper copy, $0.95 in microfiche. November 1970. 10 p, 1 map.

Descriptors: *Georgia, *Dam construction, *Environmental effects, *Multiple-purpose projects, Flood control, Hydroelectric plants, Wildlife habitats, Water supply, Recreation, Fisheries, Stream fisheries, Regulated flow, Streamflow, Thermal stratification, Dissolved oxygen, Aeration, Aesthetics, Pumped storage, Impaired water quality, Water quality control.
Identifiers: *Environmental Impact Statements.

The Trotters Shoals project would involve construction of a concrete dam on the Savannah River between Georgia and South Carolina. The project

will also include recreational sites and facilities and four generating units. Also recommended, but not authorized are two pumped storage units. Other project purposes include fishery, incidental flood control, streamflow regulation, and water supply. Environmental impacts anticipated include inundation of 26,650 acres, flood control, loss of natural stream section, lower average water temperatures in warm months and higher average temperatures in cold months, stimulated oxygen depletion, and lengthened temperature stratification due to cold water discharges. Adverse environmental effects include loss of 26,650 acres of wildlife habitat, timber, and crops from inundation; loss of river fishery value and impairment of fish migration; water quality impairment due to lessened natural aeration; and loss of 30 miles of scenic river. Alternative measures considered include several alternative dam sites and construction of two smaller dams. (Grant-Florida)
W72-11191

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 798-D, $3.00 in paper copy, $0.95 in microfiche. July 1, 1971. 17 p, 1 map.

Descriptors: *Washington, *Dam construction, *Flood control, *Environmental effects, Area development, Concrete dams, Flow control, Multiple-purpose projects, Dam design, Recreation, Fisheries, Irrigation water, Industrial water, Aquatic habitats, Trout, Administrative agencies, Storage, Water resources development.
Identifiers: *Environmental Impact Statements.

The Wynoochee Project in Grays Harbor County of southwestern Washington would involve construction of a central concrete gravity dam for water supply, irrigation, flood control, recreation and fisheries enhancement. The project will provide 35,000 acres of water storage for flood control and assure a 385 c.f.s. flow during the low flow period at the Aberdeen diversion. The project will facilitate industrial use, irrigation and fishery enhancement. There will be a loss of resident stream fish habitat and anadromous trout spawning and rearing habitats. The natural stream production area inundated by the reservoir will be lost. The only feasible alternative would be abandonment of the project. The natural stream production area inundated by the reservoir will be lost. Coordination has been maintained with appropriate state, federal, county and local agencies. (Waldron-Florida)
W72-11192

PALATLAKAHA RIVER WATERSHED, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-203 472-D, $3.00 in paper copy, $0.95 in microfiche. October 13, 1971. 26 p, 1 fig.

Descriptors: *Florida, *Channel improvement, *Flood control, *Environmental effects, *Watershed management, Recharge, Ground water recharge, Aquifers, Floods, Flood damage, Water control, Structures, Erosing, Sediment discharge, Turbidity, Kaolinite, Flood protection, Erosion control, Sediment control.
Identifiers: *Environmental Impact Statements.

The project, in Lake County, Florida, proposes the installation of 19.4 miles of channel improvement and other structures on the Palatlakaha River watershed. The channel improvement along with grade stabilization structures and water control structures would reduce flood water damages on numerous citrus groves, farms and ranches. The installation of conservation land treatment measures would reduce erosion and sediment production areas. The increased bodies of open water would contribute to frost abatement and serve to recharge the Floridian Aquifer. Adverse environmental effects include the loss of present use on 185 acres of sloughs, marshes and open water to be used for spoil storage. Additional acreage would be lost to the channel area and recreation. Temproary turbidity problems would result. The river would be changed from a shallow meandering stream choked with aquatic plants to a new ecological balance normal to deeper rivers and streams. Alternatives included no action, flood zoning, public ownership of flood damage areas, and water conservation features without flood prevention. These were considered either ineffective or detrimental because of losses to the owner, the tax base and the vast labor pool. (Nielson-Florida)
W72-11201

COW CREEK WATERSHED, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Watershed Planning Div.

Available from the National Technical Information Service as PB-202 906D, $3.00 in paper copy, $0.95 in microfiche. August 1971. 8 p, 1 fig.

Descriptors: *Oklahoma, *Environmental effects, *Flood control, *Channel improvement, Administrative decisions, Multiple-purpose projects, Flood plains, Flow augmentation, Environmental engineering, Flood protection, Water management (Applied), Project planning, Explosives, Explosions.
Identifiers: *Environmental Impact Statements.

This action is a Public Law 566 watershed to be carried out by local sponsors with federal assistance. The project is located near Comanche, Oklahoma, and will include a land treatment work supplemented by 46 floodwater retarding structures, one multipurpose structure with a recreation development, and 2.5 miles of stream channel clearing and snagging. The project will reduce floodwater damages to flood plain lands by about 70%. Public recreational opportunities will be provided by development of outdoor, water based facilities. Adverse effects will include disturbance of vegetative cover on about 192 acres during construction and some loss of agricultural production and wildlife habitat. Alternatives considered include continuing present agricultural use, letting land revert to less intensive uses, developing floodplain into publicly owned park or wildlife area, and development of picnic areas without water based activity potential. The level of protection provided by this project can be used as a base for additional measures of protection if the economic and political conditions demand a more intensive use of the flood plain. (Widman-Florida)
W72-11262

LAKE FOREST BEACH EROSION, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.

Available from the National Technical Information Service as PB-204 663D, $3.00 in paper copy, $0.95 in microfiche. October 27, 1971. 18 p, 1 map, 2 append.

Descriptors: *Administrative decisions, *Environmental effects, *Beach erosion, *Adoption of practices, *Shore protection, *Illinois, Beaches, Coastal engineering, Soil erosion, Tidal effects, Waves (Water), Administration, Comprehensive planning, Coordination, Alternate planning, Maintenance, Decision making, Project planning.
Identifiers: *Environmental Impact Statements.

This project will include the removal of 30 feet of permeable steel sheet piling groin and its replacement with an impermeable section, the extension of this groin 80 feet, and the extension of another steel sheet piling groin 140 feet to prevent further erosion and to restore the eroded and damaged beach at Forest Park in Lake Forest, Lake County, Illinois. Environmental effects include the prevention of continued degradation and ultimate loss of a significant portion of public beach by stabilizing and improving the shoreline and encouraging the healthful recreation of people. The adverse environmental effects will include a temporary reduction of the total amount of beach material presently nourishing and maintaining the downdrift shore. Alternatives include no development or other shore protection methods, such as replacement of beach sand in addition to construction of the authorized groins, construction of a seawall or revetment, or continual beach nourishment. Appendixed is the Illinois Shore of Lake Michigan Beach Erosion Control Study, which includes estimated costs of the Lake Forest project. (Widman-Florida)
W72-11264

OCEAN OUTFALL EXTENSION PROJECT, CARMEL SANITARY DISTRICT, CARMEL, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, San Francisco, Calif., and California State Water Control Board, San Francisco.
For primary bibliographic entry see Field 05E.
W72-11266

NAHUNTA SWAMP BASIN, WAYNE AND GREENE COUNTIES, NORTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Wilmington, N.C.

Available from the National Technical Information Service as PB-202 587D, $3.00 in paper copy, $0.95 in microfiche. February 19, 1971. 20 p, 4 plate, 5 tab.

Descriptors: *North Carolina, *Channel improvement, *Flood control, *Environmental effects, *Reservoir storage, Reservoirs, Water storage, Flood damage, Water control, Excavation, Anadromous fish, Drainage, Fishing, Recreation, Turbidity, Crops, Crop protection, Flood protection.
Identifiers: *Environmental Impact Statements.

This action involves the construction of a flood control project on Nahunta Swamp, in Wayne and Greene Counties, North Carolina. The project would include channel improvement and construction of a flood-storage reservoir. The basin is located in a rural and predominantly agricultural area and the cropland is subject to floods when the channel is overflowed. Damage to crops is extensive. The completed project would reduce the average annual damages to the crops by about 87 percent. The project would provide flood control and drainage benefits to farmers in the area. Channelization would be done during periods when the stream is not being used as a spawning area for anadromous fishes. The permanent pool of the flood control reservoir would create a warm-water fish habitat and fishing opportunities in the basin. The project would result in temporary turbidity in the stream. Alternatives considered were channel improvements without reservoirs and reservoirs without channel improvements. These alternatives were shown to be either more costly than the proposed project or not sufficiently effective in providing flood protection. (Nielson-Florida)
W72-11267

SCAPPOOSE DRAINAGE DISTRICT, OREGON, PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IMPAC STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-198 847D, $3.00 in paper copy, $0.95 in microfiche. April 2, 1971. 19 p, 1 map.

Descriptors: *Oregon, *Levees, *Canal construction, *Environmental effects, *Drainage districts, Levee districts, Drainage area, Coordination, Flood control, Multiple-purpose projects, Flood protection, Excavation, Pumping plants, Turbidity, Disposal, Spoil banks.
Identifiers: *Environmental Impact Statements.

The project will greatly increase the flood protection capabilities of the levee system in Columbia County, Oregon. Work will consist principally of canal excavation and miscellaneous construction activities associated with pumping stations and drainage structures. Excess material from canal excavation will be disposed of along stream banks in areas of lower elevation. All disturbed and construction areas will be seeded. Adverse environmental effects include temporary increase in turbidity and some minimum impact on fish and wildlife. Alternatives considered were construction of a new main pumping station and 'no action.' (Widman-Florida)
W72-11268

CLARKS FORK--BULLOCKS CREEK WATERSHED, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-11269

PLANS FOR PROTECTION OF PAULSBORO REFINERY DOCKING AREA FROM TIDAL CURRENTS: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Miss.
For primary bibliographic entry see Field 08B.
W72-11301

LOCK CULVERT OUTLET BASINS - HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Miss.
J. H. Ables, Jr., and M. B. Boyd.
Available from NTIS, Springfield, Va. 22151 as AD-733 848 Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper No 2-794, February 1966. 8 p, 8 plate, 7 tab.

Descriptors: *Hydraulic models, *Navigation, *Locks, *Ohio River, *Hydraulic design, Engineering structures, Diversion structures, Drops (Structures), Water levels, Streamflow, Channel morphology.
Identifiers: *Lock culvert, Outlet basins.

At several of the new Ohio River locks, difficulty has been experienced in fully emptying the lock chamber when riverflow conditions were near the maximum locking stage. Generalized tests of a typical lock culvert outlet basin were conducted in a 1:25 -scale model to investigate the feasibility of basin modifications to reduce the residual head across the lower miter gates. The predominant positions of the outlets at the Ohio River projects are normal to the lock wall and turned slightly downstream at a 65-degree angle to the wall. Tests with the outlet in these positions indicate that construction of the basic outlet walls so that their tops will be above the riverbed, or addition of vertical wall extensions, will result in a lowering of the lock chamber water-surface elevation. Test data also show that no advantage results from turning the outlet basin downstream (parallel to the lock wall). (Woodard-USGS)
W72-11302

ADEQUACY OF SUBMERGED ROCK WEIRS TO WITHSTAND PROPELLER WASH, ST. CLAIR RIVER, MICHIGAN: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Miss.
For primary bibliographic entry see Field 08B.
W72-11303

SIMULATION TECHNIQUE FOR SUSPENDED AND BED LOAD FOR SILT EJECTOR,
Central Water and Power Research Station, Poona (India).
C. V. Gole, S. V. Chitale, and K. S. Rajagopalan.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 1, Paris, France, p 25-32, Aug-Sept 1971. 4 fig, 1 tab, 3 ref, append.

Descriptors: *Suspended solids, *Bed load, *Sediment control, Sediments, Canals, Model studies, *Sediment transport, *Sedimentation.
Identifiers: *Ejectors, Test results, Sediment concentration, Sediment excluders, *Sedimentary similitude, Karman constant, India.

Arrangements for exclusion of sediment entering a canal are normally made at the diversion works, However, sediment concentration in the canal can still be excessive. A sediment ejector consisting of a number of tunnels across the canal near the bottom can be provided for sediment removal from the bottom layers. The escape discharge through the ejector tunnels is returned either to the river downstream of the diversion structure or to a drainage channel. Model tests were conducted on a geometrically similar model of the ejector on the East Kosi main canal. The hydraulic performance and efficiency of the ejector were studied. The simulation technique for suspended and bedloads is presented. Distribution of suspended sediment along the vertical profile was simulated by reproduction of a Z value, which is a ratio of the fall velocity to Karman mixing length coefficient and the shear velocity. The proportion of bedload to suspended load was simulated on the basis of Laursen's function. Experiments indicated a 35 to 50% increase in ejection efficiency could be attained by flattening the ramp slope immediately upstream of the ejector tunnel mouth. (USBR)
W72-11356

AERATION MITIGATES CAVITATION IN SPILLWAY TUNNEL,
Bureau of Reclamation, Denver, Colo.
D. Colgate, and J. Legas.
Preprint, American Society of Civil Engineers National Water Resources Engineering Metting, Atlanta, Ga., Jan 1972. 29 p. 10 fig.

Descriptors: *Cavitation, *Air entrainment, *Spillways, *Tunnels, *Damages, Hydraulic models, Erosion, Tunnel failure, Tunnel linings, Montana, Aeration, Prototypes.
Identifiers: Yellowtail Dam (Mont), Missouri River Basin Project, Model tests, Test results, Cavitation control, Spilling.

In 1967, sustained operation of Yellowtail Dam spillway tunnel caused cavitation damage to the concrete lining and, in 2 areas, advanced through the lining into the foundation rock. Described are: tunnel conditions prior to spill, operation during spill, resulting damage, repairs, construction of an air slot to introduce air along flow surfaces, the laboratory model used to optimize the location and configuration of the air slot, and prototype tunnel tests. Prototype tests of the spillway tunnel confirmed the results of hydraulic model tests relating to location and configuration of the aeration slot constructed to mitigate the damaging effects of cavitation. The prototype tests indicated that to prevent cavitation erosion, a sufficient volume of air was being supplied to flow surfaces in the vertical bend of the tunnel and in the tunnel reach immediately downstream from the bend. The 1970 test included, in critical areas of the lining, known surface irregularities duplicating the location and size of the surface irregularities which initiated heavy cavitation-induced damage during the demand spillway operation in the summer of 1967. (USBR)
W72-11367

INVESTIGATION OF NONMETALLIC WATERSTOPS: REPORT 8. EFFECT OF SPECIMEN SIZE AND LOW TEMPERATURE ON WATERSTOP TEST RESULTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08C.
W72-11465

VENTURA MARINA, VENTURA COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Los Angeles, Calif.

Available from the National Technical Information Service as PB-204 166D, $3.00 in paper copy, $0.95 in microfiche. November 5, 1971. 26 p, 1 map, 1 illus, 4 photo.

Descriptors: *Dredging, *California, *Environmental effects, *Breakwaters, *Marinas, Coastal structures, Harbors, Recreation facilities, Barriers, Concrete structures, Shore protection, Multiple-purpose projects, Administrative decisions, Comprehensive planning, Retaining walls, Project planning, Sport fishing, Boating, Navigation.
Identifiers: *Environmental Impact Statements, *Ventura Marina (Calif).

This project involves construction of a detached breakwater, dredging to form a sandtrap in the lee of the breakwater, construction of recreation facilities for sport fishing, construction of parking lots and sanitation facilities, and maintenance of general navigation features of a marina. The project, located in Ventura County, California, will provide a suitable and safe entrance to the marina for year-round boating activity. The breakwater construction will create sport fishing conditions from the jetty heads. The project will result in the direct loss of some marine biota. If increased navigation and development of the area is not controlled, such additional environmental problems as increased water and air pollution, and encroachment upon sand dunes and water marshes would result in the elimination of many species of marsh vegetation, waterfowl and wildlife. The structural alternatives that were considered would not have any environmental advantages over the recommended plan. A 'do nothing' alternative and non-structural alternatives were considered infeasible. (Widman-Florida)
W72-11507

BETHEL SMALL-BOAT HARBOR, BETHEL, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-11508

FALMOUTH LAKE, LICKING RIVER, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-203 221D, $3.00 in paper copy, $0.95 in microfiche. October 9, 1970. 4 p.

Descriptors: *Ohio River, *Dam construction, *Flood control, *Environmental effects, *Water supply development, Floods, Water storage, Flood damage, Flood protection, Flood plain zoning, Flood forecasting, Channel improvement, Dams, Recreation, Recreation facilities, Water supply, Wildlife, Wildlife habitats, *Kentucky, Ohio.
Identifiers: *Environmental Impact Statements, *Falmouth Lake (Kent).

The project would contribute to reduction of flood damages at Falmouth, Kentucky, and the Covington-Cincinnati area by the construction of a dam on the Licking River approximately nine miles upstream from Falmouth. The dam and lake would control an extensive drainage area and serve as a unit of the plan for flood control in the Ohio River basin. The conservation pool would provide recreational opportunities and fish and wildlife benefits. It would also serve as storage for water supply. The maintenance of a seasonal pool would inundate over 12,000 acres of land. Some 75 miles of free-flowing stream will be converted to slack water impoundment. Habitat carrying capacities for all upland-game and upland-fur species except raccoon would be reduced. Alternative structural measures involved levee alignments and channel improvements. These would not reduce flood damages on the Ohio River nor contribute to recreation or water supply enhancement. Nonstructural measures such as flood plain zoning, evacuation of the flood area, flood forecasting and flood insurance were considered but rejected. (Nielsen-Florida)
W72-11509

ARKANSAS-RED RIVER BASINS WATER QUALITY CONTROL STUDY--PART I, AREAS VII, VIII AND X, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 05G.
W72-11510

KANAWHA RIVER COMPREHENSIVE BASIN STUDY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Kanawha River Basin Coordinating Committee, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-11511

PEARL RIVER, MISSISSIPPI AND LOUISIANA--NAVIGATION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Service as PB-202 074D, $3.00 in paper copy, $0.95 in microfiche. April 23, 1971. 6 p, 1 plate, 1 map.

Descriptors: *Louisiana, *Environmental effects, *Channel improvement, *Cutoffs, Dredging, Turbidity, Siltation, Project benefits, Project purposes, Navigation, Water resources development, Deposition (Sediments), Wildlife habitats, Land use, River basin development, Disposal.
Identifiers: *Environmental impact statements, *Pearl River.

This project consists of channel improvement by means of cutoffs and easement of bends at eight locations in the Pearl River at St. Tammary Parish, Louisiana. Construction will relieve the navigation difficulties which exist due to the winding channel. Approximately 250 acres of cypress bottomland, swamps, and low salt marsh areas will be required for the cutoffs and spoil disposal. Adverse environmental effects would include a temporary loss of wildlife habitat along the banks from spoil disposal. Turbidity and increases in siltation will have localized adverse effects on the aquatic environment. The only alternative considered would be no project. The project will enhance short-term use of the area through increased navigation efficiency, and no significant lasting effect will alter the long-term productivity of the area. The only irreversible commitment of resources will be the 250 acres utilized for the cutoffs and spoil disposal. (Brackins-Florida)
W72-11513

BUFFALO CREEK AT MEADOW GROVE, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 04A.
W72-11529

WILLOW ISLAND LOCKS AND DAM, OHIO RIVER, OHIO AND WEST VIRGINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-202 310D, $3.00 in paper copy, $0.95 in microfiche. June 15, 1971. 39 p, 1 map, 1 dwg, 13 tab, append.

Descriptors: *Environmental effects, *Ohio River, *Dams, *Dredging, Dam construction, Flood control, Flood protection, Channel improvement, Excavation, Multiple-purpose projects, Replacement costs, Comprehensive planning, Project planning, West Virginia, Ohio, Turbidity, Locks, Spoil banks, Recreation.
Identifiers: *Environmental Impact Statements.

The project would involve construction of a high-lift, non-navigable, gated dam with a main and auxiliary lock; removal of three existing locks and dams; dredging required to utilize the new structure; and establishment of public access areas. The dam site is on the Ohio River about 3.4 miles upstream from Waverly, West Virginia, with the locks on the Ohio side of the river. Environmental impacts would include consolidation of pools of three low-lift dams to a single pool, changing the regimen of the river and lower reaches of tributary streams, inundating 790 acres of land, selective clearing of 1,200 acres of land, and changing biotic habitats. Adverse environmental effects would include inundation of land along the riverbank and on islands, deposition of soil on islands and riverside lands, removal of trees and shrubs along the shoreline with resultant loss of biotic habitat, reduction of dissolved oxygen content of the river, increased pollution potential resulting from increased barge and pleasure craft use, temporarily increased turbidity and sedimentation during construction, and potential for environmental problems associated with industrialization indirectly enhanced by the project. No apparent economically or structurally feasible alternative methods exist. (Widman-Florida)
W72-11531

SMALL NAVIGATION PROJECT, ANDREWS RIVER, HARWICH, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Waltham, Mass., New England Division.

Available from the National Technical Information Service as PB-202 919D, $3.00 in paper copy, $0.95 in microfiche. June 19, 1971. 52 p, 10 plate, 7 photo, 3 tab, append.

Descriptors: *Massachusetts, *Dredging, *Environmental effects, *Jetties, *Shore protection, Beach erosion, Erosion, Erosion control, Decision making, Comprehensive planning, Multiple-purpose projects, Project planning, Shoals, Turbidity, Channel improvement, Recreation, Aesthetics, Maintenance.
Identifiers: *Environmental Impact Statements, *Andrews River (Mass).

This project will involve the construction of a jetty and retaining wall on the Andrews River in Harwich, Massachusetts, to prevent shoaling of the entrance channel. Dredging and maintenance of the structure will also be necessary. Environmental impacts would include possible short term turbidity associated with the dredging, increased development of recreational resources, prevention of further beach erosion, and improved aesthetic view due to new beach area. The only alternative is no development. The only irretrievable commitment of resources would be the labor required for construction and maintenance. Included is an evaluation study of a previously deferred jetty project for this area. (Widman-Florida)
W72-11532

LONG LAKE AREA, HELENA, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.

Available from the National Technical Information Service as PB-202 803D, $3.00 in paper copy, $0.95 in microfiche. July 1971. 6 p, 1 map.

Descriptors: *Arkansas, *Environmental effects, *Dredging, *Channel improvement, Flood control, Comprehensive planning, Multiple-purpose projects, Culverts, Coordination, Environmental engineering, Mississippi River, Bayous, Levees, Silts, Agricultural chemicals, Wildlife habitats, Recreation, Crop production.
Identifiers: *Environmental Impact Statements, *Long Lake (Ark).

The project would require construction of a gated culvert through the main line Mississippi River Levee, an outlet channel and plug, and enlargement and cleanout of 5.6 miles of bayou in Phillips County, Arkansas. The proposed project will increase income available to farmers in the project area through a reduction in flood damages to cultivated lands, increase yields on these lands, and convert low-lying woodlands to crop production. The diversion of waters laden with silt, herbicides, and other agricultural chemicals should improve and enhance biological, recreational, and aesthetic values. Cleanout and enlargement of part of the bayou will result in the loss of the existing aquatic biota, including any associated commercial and sport fishing values. Conversion of woodlands to croplands and clearing of the required right-of-way will result in losses in small game and degrading of aesthetic values. Alternatives considered include additional channel enlargement and cleanout, and no development. (Widman-Florida)
W72-11533

DAVIDS CREEK LAKE, EXIRA, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.

Available from the National Technical Information Service as PB-202 909D, $3.00 in paper copy, $0.95 in microfiche. June 7, 1971. 19 p, 1 map, 5 tab.

Descriptors: *Iowa, *Dam construction, *Environmental effects, *Flood control, Multiple-purpose projects, Water management (Applied), Environmental engineering, Dams, Earth dams, Artificial lakes, Recreation, Migratory birds, Natural streams, Wildlife management, Flood protection, Project planning.
Identifiers: *Environmental Impact Statements, *Davids Creek Lake (Iowa).

The proposed flood protection plan consists of a dam and lake on Davids Creek approximately 1/2 mile north and east of Exira, Iowa. An earthfill dam having a height of 62 feet above the valley floor and a crest length of 2400 feet with a top width of 30 feet would be constructed. The recommended project includes recreational areas and facilities at selected locations adjacent to the conservation pool and development of the upper reaches of the reservoir as a wildlife management area. The environment would be benefited by the flood reduction and by the recreational development of project properties. The lake would improve the reliability of the well fields and is expected to attract migratory waterfowl. The project would require the resettlement of 24 families and would take approximately 3000 acres out of agricultural production. The aesthetic values associated with a natural stream would be lose. Aquatic plant growth may be excessive and detract from the lake's intended recreational use. Alternatives considered were floodplain zoning, channel improvement, levees, storage in remote areas, single-purpose dam, and no development. (Widman-Florida)
W72-11534

AN APPLICATION FOR MAJOR LICENSE FILED BY APPALACHIAN POWER COMPANY FOR CONSTRUCTED BYLLESBY AND BUCK HYDROELECTRIC PROJECT NO. 2514-VIRGINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Federal Power Commission, Washington, D.C. Bureau of Power.

Available from the National Technical Information Service as PB-202 716D, $3.00 in paper copy, $0.95 in microfiche. September 21, 1971. 22 p, 1 fig, 4 append.

Descriptors: *Virginia, *Federal Power Act, *Hydroelectric plants, *Environmental effects, *Permits, Administrative agencies, Regulation, Hydroelectric power, Comprehensive planning, Multiple-purpose projects, Administrative decisions, Project planning, Dams, Spillways, Reservoirs, Sluices.
Identifiers: *Environmental Impact Statements.

The proposed action is an application for license to the Federal Power Commission for two constructed projects located on the New River in Carroll County, Virginia. The Byllesby Development consists of a dam composed of a spillway section, two trash sluice sections, and an integral dam and powerhouse section; a side channel spillway connected to the integral dam and powerhouse; a reservoir; and an integral powerhouse containing four generating units. The Buck Development includes a dam composed of trash sluices and an integral dam and powerhouse; a separate spillway composed of tainter gate sections and flashboard sections; a reservoir; and an integral powerhouse containing three generating units. The applicant proposes to reserve land upstream from the Byllesby Dam for possible recreational development. Continued operation of the project should have no further significant effects on the aquatic or land forms utilizing project areas. Alternatives are denial or granting a license with added safeguards for environmental protection. Attached are the application and comments by interested federal and state agencies. (Widman-Florida)
W72-11535

LITTLE CEDAR CREEK, COOSA RIVER BASIN, GEORGIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-11537

POINT LOOKOUT STATE PARK, ST. MARY'S COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.

Available from the National Technical Information Service as PB-202 793D, $3.00 in paper copy, $0.95 in microfiche. July 1, 1971. 6 p, 1 map, 3 dwg.

Descriptors: *Maryland, *Beach erosion, *Chesapeake Bay, *Environmental effects, *Dredging, Erosion, Channel improvement, Soil erosion, Stream stabilization, Soil conservation, Administrative decisions, Multiple-purpose projects, Project planning, Erosion control, Marinas, Parks, Bulkheads, Navigation.
Identifiers: *Environmental Impact Statements, *Point Lookout State Park (Md).

This navigation improvement will provide for a channel 100 feet wide and 6 feet deep from the Potomac River to the proposed part marina in Lake Conoy, Maryland. The inlet will be protected on both sides by bulkheads, and a stone jetty will be provided along the northwest side of the channel. Beach erosion control along the Chesapeake Bay shoreline will consist of timber and steel bulkheads. Stone will be placed at the base of the bulkheads to prevent scour, and a concrete splash apron will be constructed to reduce damage from wave overtopping. Environmental impacts will be locally improved fishing conditions, improved recreation potential of the state park, and the development of a harbor for refuge. Adverse environmental effects include loss of natural lake bottom and vegetation, the short-term disturbance of dredged areas, and the location of a spoil disposal site. Alternatives considered were improvement of the existing inlet channel or no development. (Widman-Florida)
W72-11538

BOXELDER CREEK WATERSHED, COLORADO AND WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.

Available from the National Technical Information Service as PB-202 072-D, $3.00 in paper copy, $0.95 in microfiche. July 26, 1971. 8 p.

Descriptors: *Colorado, *Wyoming, *Watersheds (Basins), *Environmental effects, *Flood control, Channel stabilization, Adoption of practices, Decision making, Erosion, Environmental engineering, Multiple purpose projects, Flood protection, Watershed management, Land management, Stabilization, Flood frequency, Dams, Spillways.
Identifiers: *Environmental Impact Statements, *Boxelder Creek Watershed.

This watershed project, located in Larimer and Weld Counties, Colorado, and Albany and Laramie Counties, Wyoming, will consist of conservation land treatment supplemented by five floodwater-retarding structures and one stabilization structure. Project action will reduce average flood damages by 85%, protect homes and businesses from a 100-year frequency storm, reduce sedimentation in irrigation reservoirs by 77%, and reduce overflow deposition by 95%. The project will also reduce flood plain erosion by 90%, improve general farming and range conditions and wildlife habitat, and provide increased fire protection to range and forestland. Adverse environmental effects would include elimination of agricultural and wildlife land to be used for dams and spillways, periodic interruption of agricultural and wildlife use of 900 acres of dry cropland, disruption of irrigated cropland and rangeland which will be occupied by the sediment and detention pools of planned structures, and periodic inundation of a trout stream and intermittent flow channels. Alternatives considered include intensive use of flood plain for urban and commercial purposes, less intensive use of flood plain areas, and flood plain zoning and management in lieu of structural measures. (Widman-Florida)
W72-11540

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK, AT AND IN THE VICINITY OF BREWSTER, OHIO (DRAFT ENVIROMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 340D, $3.00 in paper copy, $0.95 in microfiche. May 14, 1971. 7 p.

Descriptors: *Ohio, *Environmental effects, *Flood protection, *Channel improvement, Levees, Pumping plants, Flood control, Stream improvement, Stream stabilization, Flow characteristics, Erosion rates, Turbidity, Sedimentation rates, Wildlife habitats, Project planning.
Identifiers: *Environmental Impact Statements, *Sugar Creek (Ohio).

The project will consist of modification and construction of levees and installation of a pumping station at Brewster, Ohio. Also included will be snagging and clearing to improve flow characteristics. The project will greatly reduce the risk of flooding in the area. Loss of some farmland and fish and wildlife habitat and temporarily increased erosion and sedimentation are the significant adverse effects. In addition to the alternative of no improvement, consideration was given to relocation or raising part of the village, acquisition of land and improvements, flood proofing existing structures, and modification of operating procedures of Beach City Dam. The lands required for the revisions to the levee and borrow and spoil areas will be irreversibly committed. (Widman-Florida)
W72-11541

ST. FRANCIS BASIN, MISSOURI AND ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.

Available from the National Technical Information Service as PB-200 339D, $3.00 in paper copy, $0.95 in microfiche. June 18, 1971. 23 p, 1 map.

Descriptors: *Missouri, *Arkansas, *Environmental effects, *Flood protection, *Drainage area, Administrative decisions, Detention reservoirs, Channel improvement, Floodways, Pumping plants, Flood control, Multiple-purpose projects, Water management (Applied), Vectors (Biological), Turbidity, Crop production, Overflow, Ditches.
Identifiers: *Environmental Impact Statements, *St. Francis Basin.

Project features include a detention reservoir, channel enlargement and realignment, a leveed floodway, pumping stations, control structures, and improvement of tributary ditches in the St. Francis Basin of Missouri and Arkansas. Continuation of this project will contribute to the general well being of both urban and rural residents throughout the St. Francis Basin. Homes and businesses will be subject to reduced frequency and duration of flooding. Improved crop yields will increase per capita income, thus raising standards of living to a level more in line with the rest of the nation. Though construction will cause temporary increases in water turbidity, the reduced frequency of overbank flows should improve water quality by a reduction in sediment and agricultural pollutants. Vector problems presently associated with overflow conditions will be greatly reduced. Woodland and wildlife losses will result from the project, and physical alteration of stream and existing ditch channels will have an overall adverse effect upon fishing. Alternatives considered include reservoir construction, flood plain management, and project abandonment. (Widman-Florida)
W72-11542

COPAN LAKE, LITTLE CANEY RIVER, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.

Available from the National Technical Information Service as PB-200 337D, $3.00 in paper copy, $0.95 in microfiche. December 21, 1970. 33 p.

Descriptors: *Oklahoma, *Flood protection, *Environmental effects, *Dam construction, *Lakes, Dams, Flood control, Multiple-purpose projects, Project planning, Water management (Applied), Water quality control, Water supply, Recreation, River basin development, Sport fishing, Impoundments.
Identifiers: *Environmental Impact Statements, *Copan Lake (Okla).

The project is comprised of a flood control, water quality control, water supply, fish and wildlife, and recreation lake located in Washington County, Oklahoma. This project will reduce annual flood damages in the river basins downstream from the dam. Downstream water releases will provide improved water quality. The lake will provide water supply for future municipal and industrial development in the region. Water oriented recreational ac-

tivities will be provided as well as good quality sport fishing. The overall status of the prairie chicken, considered rare and endangered nationally, is expected to be unaffected by the project. The maintenance of the conservation pool will inundate 4850 acres. The lake will cover 14 miles of natural stream. Some marginal oil production will also be terminated. Several buildings, highways, county roads, railroads, utilities, and two cemeteries will be affected by the project. Alternatives considered include diversion, levees, channel enlargement, channel rectification, nonstructural measures, and no development. (Widman-Florida)
W72-11544

MILLS RIVER DAM AND RESERVOIR (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Office of Health and Environmental Science, Chattanooga.

Available from the National Technical Information Service as PB-200 396D, $3.00 in paper copy, $0.95 in microfiche. June 29, 1971. 24 p, 5 fig, 1 tab, 1 append.

Descriptors: *North Carolina, *Environmental effects, *Dam construction, *Reservoir construction, *Flood protection, Reservoirs, Flood control, Dams, Comprehensive planning, Water management (Applied), Multiple-purpose projects, Land management, Wildlife habitats, Recreation, Impoundments, Turbidity, Project construction.
Identifiers: *Environmental Impact Statements, *Mills River Reservoir (N.C.).

The action would include construction of a dam and reservoir in Henderson County, North Carolina. The dam and 600 acre reservoir are expected to result in significant beneficial land use gains including new recreation uses and the more productive use of agricultural and urban lands now subject to flooding. Some temporary increases in turbidity are expected during the construction phase. Some minor wildlife habitat losses will result, along with loss of the availability of the impounded area for timber and agricultural use. A number of alternative sites or combination of sites were considered. Irreversible and irretrievable commitments of resources consist primarily of the land and water use commitments inherent in the impoundment of the river and the commitments of materials used in project construction. (Widman-Florida)
W72-11545

SMALL BOAT HARBOR, PORTSMOUTH STATE PARK, OHIO, OHIO RIVER (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-198 883D, $3.00 in paper copy, $0.95 in microfiche. March 24, 1971. 6 p.

Descriptors: *Ohio, *Ohio River, *Environmental effects, *Dredging, *Harbors, Excavation, Recreation facilities, Bulkheads, Channel improvement, Shore protection, Boat launching ramps, Parks, Recreation, Boating, Sewage treatment, Spoil banks, Parks, Project planning.
Identifiers: *Environmental Impact Statements, *Ohio River.

The proposed project consists primarily of developing a harbor adjacent to the Ohio River in Scioto County, Ohio, to provide docking and berthing facilities for recreational boats. The harbor will be created by excavating the low-lying flood plains at the confluence of existing streams. The project will include construction of a stone revetment and a bulkhead of sheet piling. A portion of the excavated material will be deposited on lands of the proposed state park and remaining material will be spoiled on the park lands. Also provided will be a boat launching ramp, parking facilities, a picnic area, restrooms, and a sewage treatment plant. Unavoidable adverse effects would include disruption of the ecosystem due to removal of some vegetation, excavation of the harbor, minor filling of low lying areas, and temporary increases in turbidity during construction. Alternatives considered include no project and alternate locations for the harbor. (Widman-Florida)
W72-11547

LEWIS AND CLARK CONNECTING CHANNEL, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-199 881D, $3.00 in paper copy, $0.95 in microfiche. March 31, 1971. 11 p, 1 map.

Descriptors: *Oregon, *Environmental effects, *Channel improvement, *Columbia River, Excavation, Waterfowl, Wildlife habitats, Dredging, Navigation, Lumbering, Vegetation effects, Vegetation regrowth, Aesthetics, Estuaries, Fisheries, Disposal, Project planning.
Identifiers: *Environmental Impact Statements, *Lewis and Clark River.

The project would involve construction of a navigation channel in Clatsop County, Oregon. The channel will be 10 feet deep and 4.5 miles long and will extend from the existing Young River channel to the mouth of the Lewis and Clark River. The area is mountainous and heavily timbered; the lowlands are largely agricultural. The project will provide safe and adequate passage beneficial to both commercial and recreational navigation interests. Environmental impact of the project would include excavation and disposal of approximately 227,000 cubic yards of material and alteration of vegetative cover, elevation, and appearance of the spoil area. The vegetation is expected to grow back and not be permanently lost. Adverse environmental effects include some damage to the river fishery from dredging and loss of waterfowl habitat in the spoil areas. Alternatives include no construction and varying channel dimensions. (Grant-Florida)
W72-11549

THE DUCK RIVER PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Office of Health and Environmental Science, Chattanooga.

Available from the National Technical Information Service as PB-200 442D, $3.00 in paper copy, $0.95 in microfiche. June 30, 1971. 35 p, 5 fig, append.

Descriptors: *Tennessee Valley Authority, *Land use, *Flood control, *Dam construction, *Environmental effects, Tennessee, Recreation, Rural areas, Flood protection, Reservoirs, Agricultural watersheds, Turbidity, Multiple-purpose projects, Administrative agencies, Federal government, River basin development, Water resources development.
Identifiers: *Environmental Impact Statements, *Duck River (Tenn).

The project calls for construction of two dams and reservoirs, one in Bedford and Coffee Counties and the other in Maury and Marshall Counties, Tennessee. The dams and reservoirs are expected to result in significant land use gains including new recreation uses and the more productive use of agricultural and urban lands now subject to flooding. The project will involve the loss of about 20,000 acres within the reservoir maximum flood zones. Some increase in stream turbidity will result from construction. Alternatives investigated include taking no action, taking action which does not involve multipurpose water resource development, undertaking multipurpose water resource development of a different design, and building only one unit. Irreversible and irretrievable commitments of resources consist primarily of the land and water use commitments inherent in the impoundment of the river and the commitments of materials used in project construction. (Waldron-Florida)
W72-11550

PALM BEACH COUNTY SEWAGE IMPROVEMENT PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 05D.
W72-11555

GREELEY, COLORADO--EPA PROJECT NO. COLO-261 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W72-11558

PROPOSED CONCRETE LINING OF MAIN OUTLET DRAIN, SOUTH GILA VALLEY, COLORADO RIVER FRONT AND LEVEE SYSTEM, ARIZONA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nevada. Region 3 Office.

Available from the National Technical Information Service as PB-206 102D, $3.00 in paper copy, $0.95 in microfiche. January 1972. 39 p, 5 map, 2 photo.

Descriptors: *Arizona, *Environmental effects, *Concrete construction, *Dam construction, *Linings, Alternate planning, Multiple-purpose projects, Administrative agencies, Levees, Water quality control, Water management (Applied), Seepage, Groundwater basins, Project planning, Watershed management.
Identifiers: *Environmental Impact Statements, *Gila River (Ariz).

The proposed project, located in Yuma County, Arizona, would line the 8 mile long Main Outlet Dam with concrete. This will stop seepage of saline water into the ground-water basin, thereby allowing improvement of the water quality delivered to Mexico and eliminating the deterioration of the ground water in the South Gila Valley. Present spoil banks will be eliminated and the drain channel will be narrowed, making more land available for other uses. There will be little adverse effect on recreation or wildlife programs in the area. There will be a temporary adverse effect on spawning habits of fish presently using the unlined drain. Construction will require additional fill material to be obtained from the Gila River flood plain. Drainage water will be bypassed in the Gila River Pilot Channel during construction. Alternatives considered were no construction, construction of a new concrete-lined drain north of the South Gila Levee, and construction of a new concrete-lined drain south of the existing unlined drain. (Widman-Florida)
W72-11560

8B. Hydraulics

RECLAMATION AND WATER MANAGEMENT (MELIORATSIYA I VODNOYE KHOZYAYSTVO).
Ministerstvo Melioratsii i Vodnogo Khozyaistva Ukrainskoi, Kiev (USSR).
For primary bibliographic entry see Field 05D.
W72-11120

GREAT LAKES CONNECTING CHANNELS, WIDENING AND DEEPENING BENDS IN ST.

MARY'S RIVER, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 04A.
W72-11175

CEDAR BAYOU, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-11183

VARIATION OF BED FORM AND FLOW RESISTANCE IN ALLUVIAL CHANNELS,
Illinois University, Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W72-11285

PLANS FOR PROTECTION OF PAULSBORO REFINERY DOCKING AREA FROM TIDAL CURRENTS: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Miss.
W. H. Bobb.
Available from NTIS, Springfield, Va. 22151 as AD-734 098 Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper No 2-797, February 1966. 43 p, 1 plate, 35 photo, 1 tab.

Descriptors: *Hydraulic models, *Delaware River, *Docks, *Engineering structures, *Tidal effects, Currents (Water), Dikes, Protection, Ships, Oil industry, Evaluation, Design criteria.
Identifiers: *Paulsboro (N.J.), Oil tankers, Docking facilities.

Hydraulic model studies of the Delaware River were made to determine the feasibility of extending the marine docking facilities at Paulsboro, N.J. The extension downstream from the present installation would accommodate larger tankers, resulting in considerably more exposure of the docked tanker to strong cross currents off the mud flats to the south. Tests were undertaken to determine if such a dike would effectively divert the objectionable currents flowing almost perpendicular to a moored ship during the flooding phase of the tidal current. The model studies show that: (1) a dike constructed on the proposed alignment will divert flow from the mud flats to the south; (2) a dike of insufficient length could cause forces against a tanker moored in the proposed new location; (3) in order to obtain the maximum benefit from a dike on the alignment tested, the dike should be no less than 700 ft. in length; and (4) consideration should be given to shifting the dike location to the north in the direction of the pile-supported platform. (Woodard-USGS)
W72-11301

LOCK CULVERT OUTLET BASINS - HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Miss.
For primary bibliographic entry see Field 08A.
W72-11302

ADEQUACY OF SUBMERGED ROCK WEIRS TO WITHSTAND PROPELLER WASH, ST. CLAIR RIVER, MICHIGAN: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Miss.
J. L. Grace, Jr.
Available from NTIS, Springfield, Va. 22151 as AD-733 871 Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper No 2-821, May 1966. 34 p, 1 fig, 5 plate, 1 tab, 17 photo.

Descriptors: *Hydraulic models, *Weirs, *Engineering structures, *Navigation, *Michigan, Rivers, Lake Huron, Harbors, Streamflow, Ships, Propellers, Testing, Washouts, Hydraulic design, Model studies.
Identifiers: *St. Clair River (Mich.), *Rock weirs.

A 1:20-scale model of submerged weirs, for modification of the discharge capacity of the St. Clair River, Michigan, was tested for effects of riverflow and propeller wash from passing ships. The conditions produced by riverflow and propeller wash from a ship moving downstream when the propeller was located 5 to 40 ft downstream of the weir center line were the most critical relative to the stability of the weirs. The effects on weir stability of riverflow only and of riverflow and propeller wash from ships moving upstream were insignificant compared to those created by riverflow and a ship moving downstream. Although stable weirs were developed utilizing the 50- to 90-lb stone capped with either precast units or large cover stone, selection of the most practicable weir design required investigation of the relative contractive effect and discharge characteristics of the submerged weirs. A mathematical expression describing the submerged-flow discharge characteristics of the weir is presented in addition to the graphical presentation of basic data. (Woodard-USGS)
W72-11303

LABORATORY INVESTIGATION ON HEAT TRANSFER IN THERMALLY STRATIFIED FLOW,
Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.
W. Majewski.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 1, Paris, France, p. 207-216, Aug-Sept 1971. 7 fig.

Descriptors: *Heat transfer, *Stratified flow, *Thermal stratification, Laboratory tests, Flow, Thermal powerplants, Hydraulic models, Stratification, Hydraulics, Model tests, Turbulent flow, Nuclear powerplants, Water temperature, Heated water, Thermal properties, Thermal water, Fluid dynamics, Fluid mechanics, Outlets.
Identifiers: Poland, Stratified waters, Temperature distribution, Velocity distribution.

Heat transfer in flowing water is mainly caused by turbulent diffusion and mixing of warm and cold water. A description is given of a hydrothermal laboratory investigation to determine the mixing process and stability condtions in thermally stratified flow. Temperature and velocity distributions in 2-dimensional, uniform flow, and changes in temperature distribution along a hydraulic flume were determined. From experiments in the horizontal hydraulic flume, the influence of the depth of cold water layer on thermal phenomena was assessed. The depths of stratified flow were 0.50, 0.30, and 0.20 m. During the investigations, conditions varying from fully, 2-layered stratified flow to complete mixing of the warm and cold layers were achieved. Thermal stratification appears in rivers, canals, lakes, and reservoirs. Thermal stratification often exists in natural condtions, but usually appears near thermal and nuclear powerplants or other industrial establishments. The determination of water temperatures in several points or cross sections of a river or reservoir is particularly important in problems of biological life, water management, or ice conditions. (USBR)
W72-11357

OPTIMIZED GEOMETRY FOR BAFFLE BLOCKS IN HYDRAULIC JUMPS,
Texas A and M Univ., College Station.
D. R. Basco.
Proceedings, 14th Congress of the International Association of Hydraulics Research, Vol. 2, Paris France, p. 142-148, Aug-Sept 1971. 5 fig, 6 ref.

Descriptors: *Baffles, *Geometry, *Hydraulic jump, *Hydraulic structures, Hydraulic models, Energy dissipation, Geometric shapes, Tailwater, Depth, Theoretical analysis, Non-uniform flow.
Identifiers: *Baffle blocks, *Drag-force, Energy dissipators, Water surface profiles, Wave height.

Baffle blocks properly placed in a hydraulic jump improve performance characteristics. The block geometry usually has been developed by hydraulic model tests; now an experimental technique enables the designer to determine the block geometry through knowledge of the drag forces on the baffle blocks. The maximum drag force consistent with a desirable water surface profile is the basic optimization criterion. Minimum jump lengths and low downstream wave heights also indicate the quality of performance. Block location, height, width, spacing, second-row location, and shape were investigated for Froude numbers from 3 to 10. For data correlation, a drag force ratio using the free jump, sequent depth pressure force proved more practicable than a classical drag coefficient. Resultant downstream water depths computed using the measured drag force compared favorably with the experimentally measured values. (USBR)
W72-11358

THE MAGNITUDE OF SHEAR STRESSES ACTING ON THE BOTTOM OF OPEN CHANNELS BY PROPAGATING SURGE WAVES,
Slovenska Akademie Vied, Bratislava (Czechoslovakia).
V. Strauss.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 2, Paris, France, p. 159-167, Aug-Sept 1971. 5 fig, 7 ref.

Descriptors: *Shear stress, *Open channel flow, *Instrumentation, Measurement, Shear, Propagation, Surges, Open channels, Unsteady flow, Shear forces, Hydraulic transients, Hydraulic models, Transducers, Canals, Laboratory tests.
Identifiers: *Direct shear, *Surge waves, Czechoslovakia, Test results.

The problems associated with direct shear measurement in unsteady flow on the wetted area of a channel are analyzed. A new device measures directly the time course of the shear stress near the point of the wetted area in unsteady flow conditions. The measuring equipment consists of a transducer, a measuring and registering device, and a calibrating device. Laboratory experiments confirmed the advantage of using the device for measuring shear stresses on the channel in unsteady flow conditions. The following conclusions are based on the experimental results: (1) Oscillation period of the shear stress is the same as the oscillation of the wave level. (2) A phase difference occurs between oscillations of the free surface and of the shear stress. (3) At various parameters of the wave, the value of the shear stress after passing of the peak may be much greater than the value of the shear stress of the initial steady flow. (USBR)
W72-11359

INFLUENCE OF DRAFT TUBE SHAPE ON SURGING CHARACTERISTICS,
Bureau of Reclamation, Denver, Colo.
U. J. Palde.
Preprint, American Society of Civil Engineers National Water Resources Engineering Meeting, Atlanta, Ga., Jan 1972. 25 p, 14 fig, 13 ref, 2 append.

Descriptors: *Draft tubes, *Surges, *Geometry, *Shape, Hydraulic turbines, Analysis, Hydraulic structures, Model tests, Resonance, Fluid mechanics, Hydraulic design, Vibrations, Properties, Hydrodynamics, Fluid flow, Pulsating flow, Laboratory tests, Vortices.
Identifiers: Friction coefficient, Experimental data, Natural frequency.

Draft tube surges were noted in hydroelectric plants before the surging was found to be caused by a flow phenomenon known as vortex breakdown. During 1940, Rheingans summarized experiences and presented an equation for estimating

the expected frequency of surging. Investigators now accept the fact that the draft tube surge is a hydrodynamic instability occurring in the draft tube as a result of rotation remaining in the fluid as it leaves the turbine runner and enters the draft tube throat. Experimental analysis and laboratory procedures are discussed. Draft tube shapes were studied and surge data obtained for over 50 distinct draft tube shapes. Conclusions are: (1) degree of divergence of a draft tube is the most significant geometric feature affecting surging characteristics; (2) surging can be minimized by using an equivalent expansion angle of about 15 deg through the entire length of the draft tube; and (3) resonance with known natural frequencies of other features of the powerplant can be checked using results presented. Resonance can be avoided by selecting proper geometric components in draft tube design. (USBR)
W72-11365

NON-DIMENSIONAL SURGE TANK ANALYSIS,
Washington State Univ., Pullman.
C. N. Lin, and J. S. Gladwell.
International Journal of Numeric Methods Engineering, Vol. 4, No. 1, p. 23-37, Jan-Feb 1972. 6 fig, 5 tab, 6 ref, 3 append.

Descriptors: *Surge tanks, *Analysis, Surges, Valves, Computer programs, Pressure conduits, Fluids, Numerical analysis, Head loss, Mathematical anlysis, Fluid mechanics, Hydraulic structures, Hydraulic transients.
Identifiers: *Runge-Kutta method, *Computer applications, Computer-aided design, Closures, Load rejection.

The basic principles of surge tank operation have been known for decades, but the literature has emphasized arithmetical and graphical solutions because of the nonlinearity of the operation. A computer program for surge tank analysis is presented. The computer output provides a complete history of water level within the surge tank and of the fluid velocity within the pressure conduit from the time valve closure is initiated. The governing equations are solved by a third-order Runge-Kutta procedure. Head losses in the pressure conduit and in the surge tank constriction are accounted for in the formulation of the equation. The nondimensional form of the governing parameters makes the program more usable for preliminary design. (USBR)
W72-11370

SLOPE-DISCHARGE RATINGS FOR CUTTHROAT FLUMES,
Colorado State Univ., Fort Collins.
G. V. Skogerboe.
Paper 71-746, 1971 Winter Meeting American Society of Agricultural Engineers, Chicago, Ill. Dec 1971. 28 p, 11 fig, 3 tab, 5 ref.

Descriptors: *Slope angles, *Discharge (Water), *Discharge coefficient, *Flumes, *Flow measurement, Effects, Floors, Hydraulic design, Hydraulic models, Hydraulic structures, Hydraulics.
Identifiers: *Cutthroat flumes, *Slope angles, Test results, Free flow, Submerged flow, Flow depth.

Frequently, flow measuring flumes in unlined channels settle at the exit end. The settlement is caused by uncorrected scouring action. Laboratory studies evaluated the effect of floor slope on the discharge ratings of rectangular cutthroat flow measuring flumes under both free flow and submerged conditions. Results indicated that the discharge coefficient (thereby the discharge) changes considerably as the downward slope of the flume floor is increased. Both the free flow exponent and submerged flow exponent have a unique value for each flume length and are not affected by throat width or flume floor slope. The effects of flume floor slope can be analyzed in terms of the free flow coefficient and submerged flow coefficient. These coefficients have a unique relation with flume floor slope for each flume length. (USBR)
W72-11373

THE HYDRAULICS OF SPATIALLY VARIED FLOW IN AN IRRIGATION DISTRIBUTION CHANNEL WITH FURROW OUTLETS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W72-11384

CONTRIBUTIONS TO THE THEORY OF WATER WAVES ON A SLOPING BEACH,
Wisconsin Univ., Madison. Dept. of Mathematics.
For primary bibliographic entry see Field 02E.
W72-11389

CHESAPEAKE BAY HYDRAULIC MODEL, MATAPEAKE, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.

Available from the National Technical Information Service as PB-201 531D, $3.00 in paper copy, $0.95 in microfiche. June 15, 1971. 8 p, 1 map.

Descriptors: *Research facilities, *Model studies, *Chesapeake Bay, *Environmental effects, *Hydraulic models, *Laboratory tests, Testing, Hydraulic engineering, Currents (Water), Alternate planning, Analytical techniques, On-site laboratories, Facilities, *Maryland, Project planning, Bulkheads, Bridges, Breakwaters, Jetties.
Identifiers: *Environmental Impact Statements, *Matapeake (Md).

The project would provide for the construction of a shelter to house an hydraulic model for Chesapeake Bay and surrounding waters at Matapeake, Maryland. The model will be used to predict the effect of alterations such as decreasing freshwater input from the tributaries; deepening channels into the major ports; deepening the Chesapeake and Delaware Canal; creating islands; and building bridges, bulkheads, breakwaters, and jetties. The model will be able to duplicate water currents, river volumes, salinities, temperatures, and bottom geometry as they exist in nature. Environmental impact of the proposed action would include reduction in percolation of precipitation due to the removal of vegetation and construction of a 14.5 acre building, changes in the use of the site from wooded space to a research and educational facility, and possible sedimentation during construction. Adverse environmental effects would include some depletion of available freshwater supply due to operation of the hydraulic model, and localized shifts in estuarine plants and animals due to the discharge of saline water into the Bay. Alternative sites were considered and rejected. (Widman-Florida)
W72-11557

SOME FACTORS AFFECTING FLOW INTO DRAINPIPES,
California Agricultural Experiment Station, Davis.
J. N. Luthin, and A. Haig.
Hilgardia, Vol 41, No 10, p 235-245, February 1972. 6 fig, 6 tab, 5 ref. OWRR A-031-CAL (3).

Descriptors: *Subsurface drains, *Flow characteristics, *Drains, *Pipes, Testing, Analytical techniques, Flow rates, Water table, Fluid mechanics, Head loss.
Identifiers: Controlled experiments.

Factors influencing flow into subsurface drainpipes were investigated in an experimental tank. Doubling the drain diameter from 2 to 4 inches increased the flow 35% to 60%. An increase of drain diameter from 2 to 7.48 inches caused a 90% to 130% increase in flow depending on the water-table height. Decreasing pipe-segment length from 3 to 1 foot increased the rate of flow into the pipe by 2.5 times. Discharge rates are greater when the holes are at the bottom of the pipe because of the greater hydraulic head. When outflow is adjusted for the hydraulic head there is no difference due to location of holes. In all the measurements, except for the largest drain and for the lowest reservoir level, the water table did not intersect the drain but was above it even though the drains were not running full. The only observable effect of various water levels in the drains was due to a slight change in the total hydraulic head. The effect was negligible. Flow into the drains was directly proportional to water-table height at the midpoint. (Woodard-USGS)
W72-11655

NATIONAL SHORELINE STUDY--TEXAS COAST SHORES REGIONAL INVENTORY REPORT.
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 02J.
W72-11674

8C. Hydraulic Machinery

APPARATUS AND METHOD FOR REMOVING FLOATING POLLUTANTS FROM A BODY OF WATER,
For primary bibliographic entry see Field 05G.
W72-11137

APPARATUS FOR REMOVAL OF OIL FLOATING ON WATER OR THE LIKE,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 05G.
W72-11154

POLLUTION CONTROL DEVICE,
For primary bibliographic entry see Field 05G.
W72-11155

SEWAGE TREATMENT STRUCTURE,
FMC Corp., San Jose, Calif.
For primary bibliographic entry see Field 05D.
W72-11157

METHOD AND APPARATUS FOR RECOVERING IMPURITIES FROM THE SURFACE OF A LIQUID,
Tetradyne Corp., Dallas, Tex.
For primary bibliographic entry see Field 05G.
W72-11160

FPC PROJECT NO. 1121--BATTLE CREEK HYDROELECTRIC PROJECT, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Pacific Gas and Electric Co., San Francisco, Calif.

Available from the National Technical Information Service as PB-199 496D, $3.00 in paper copy, $0.95 in microfiche. October 30, 1971. 47 p, 4 map, 4 dwg, 4 tab, 3 append.

Descriptors: *California, *Permits, *Hydroelectric plants, *Environmental effects, Administrative agencies, Powerplants, Electric powerplants, Project planning, Recreation, Multiple-purpose projects, Hydroelectric power, Water resources development, Streams, Productivity, Reservoir storage, Replacement costs.
Identifiers: *Environmental impact statements.

The redeveloped Battle Creek Project will consist of four new power plants as replacements for four older plants. The project area is located 35 miles east of Redding, California. Continued operation of the project will maintain the present environmental equilibrium. Licensee's development plan

proposes improving and expanding the recreational opportunities afforded by the project. There would be no adverse effects on environmental quality resulting from the continued operation of the project. One alternative to the issuance of a license would be continued operation of the existing project under the present license until the facilities are no longer useful. Past usage of the project area has not adversely affected the productivity of the area. Similarly, long term use would not adversely affect such productivity. Continued operation of the project does not involve any irretrievable commitment of resources. (Waldron-Florida)
W72-11174

SECOND POWERHOUSE, BONNEVILLE LOCK AND DAM, COLUMBIA RIVER, OREGON AND WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-202 125D, $3.00 in paper copy, $0.95 in microfiche. August 5, 1971. 28 p, 1 plate, 1 photo.

Descriptors: *Columbia River, *Bonneville Dam, *Environmental effects, *Hydroelectric plants, Multiple-purpose projects, Dam construction, Excavation, Rock excavation, Backfill, Water resources development, Relocation, Highway relocation, Turbidity, Fish migration, Fish ladders, Fish management, Dams, Project planning.
Identifiers: *Environmental Impact Statements.

The proposed project will involve construction of an eight-unit powerhouse at the existing Bonneville Dam project on the Columbia River, 42 miles east of Portland, Oregon. The powerhouse will have a capability of using 160,000 cubic feet per second of water, with a dependable capacity of 560 mega watts. Existing power lines and navigation facilities will not require alteration. Environmental impacts include highway and railroad relocations, removal of the town of North Bonneville, excavation of 18 million cubic yards of material, increased dependable electrical energy production, and fish migration disturbance due to streamflow alteration. Adverse impacts would include residential relocations, filling of 400 to 600 acres of low elevation area, temporary turbidity during construction, and noise and air pollution associated with construction. Alternatives include no development, different sized powerhouse, different powerhouse location, different powerhouse operation, and different power sources. (Grant-Florida)
W72-11261

HYDRODYNAMIC FORCES ON SINGLE INTAKE GATES,
Worcester Polytechnic Inst., Holden, Mass; and Tennessee Valley Authority, Norrsi. Engineering Lab.
G. F. Hecker, and R. A. Elde.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol 2, Paris, France, p. 229-238, Aug-Sept 1971. 10 fig.

Descriptors: *Intake gates, *Friction, Hydraulic gates, Hydraulic models, Gate hoists, Gate seals, Intakes structures, Geometry, Discharge (Water), Hydrodynamics, Hydraulic structures, Hydraulic machinery.
Identifiers: *Gate lips, *Model tests, *Emergency closures, Friction coefficient, Hydrodynamic pressure.

TVA's Tims Ford Project will use a single lift gate to effect emergency closure for the 40-mw hydroelectric unit. Model tests were conducted to ensure that the gate would function as an emergency closure device at flows up to the estimated turbine funaway discharge. These tests included investigation of the effects on the hydrodynamic and cable forces of varying intake geometry, lower gate lip angle, speed of gate closure, gate friction, initial discharge, and quantity of air venting. From online analog computer components, used to eliminate the known model friction variation, prototype cable forces were computed for a range of expected gate friction coefficients. These data indicated that some design parameters, such as the intake shape and gate friction, had pronounced effects on the gate performance; other parameters, such as speed of closure and air-venting, had no major effects. (USBR)
W72-11360

PROGRESS AND PROSPECTS FOR UNDERGROUND TRANSMISSION,
Westinghouse Electric Corp., East Pittsburgh, Pa.
C. J. Baldwin, and L. A. Kilar.
Proceedings, American Power Conference, Vol. 33, p 924-934, 1971. 6 fig, 1 tab, 5 ref.

Descriptors: *Costs, *Losses, *Limiting factors, Heat, Heat transfer, Economics, Water cooling, Electrical insulation, Electric potential, Electric current.
Identifiers: *Underground cables, *Underground transmission lines, *Transmission dielectrics, Capacitance, Dielectric absorption, Limiting current density.

A survey of the progress to date of underground transmission technology and an assessment of future prospects currently being explored are presented. Principal technical barriers prohibiting increases in voltage and power ratings of underground systems are identified and discussed. A summary of the power-handling capability of today's most popular types of cable is given. New concepts for underground transmission are presented, and major problems are given to indicate the need for aggressive research programs. A characteristic common to all underground transmission systems is high cost of materials and installation. Typical costs of underground vs. overhead systems are difficult to estimate, but ratios of from 10:1 to 30:1 for facilities having equal power-handling capabilities are common. Further developments in underground systems must be aimed at substantial cost reductions. Substantial breakthroughs will be necessary if underground transmission systems are to compete technically or economically with overhead transmission. (USBR)
W72-11372

A LABORATORY INVESTIGATION OF DISPERSION OF THE JET FROM A FIXED--CONE JET-DISPERSION VALVE DISCHARGING INTO A BODY OF WATER,
Department of Works, Canberra (Australia).
R. F. Goldfinch.
Institution of Engineers, Australia, Civil Engineers Transactions, Vol CE13, No 2, p 79-86, Oct 1971. 6 fig, 3 tab, 8 ref, append.

Descriptors: *Laboratory tests, *Dispersion, *Jets, *Penetration, Energy dissipation, Vibrations, Noise (Sound), Regulated flow, Velocity, Hydraulic valves, Hydraulic design, Hydraulic machinery, Theory, Impact, Valves.
Identifiers: *Howell-Bunger valve, *Jet diffusion, Small reservoirs, Valve vibration, Australia, Needle valves, Test results.

An investigation was made by the Melbourne and Metropolitan Board of Works to find a valve system suitable for discharging water downward at a high velocity into service reservoirs. The investigation showed that fixed-cone jet dispersion valves discharging into the atmosphere under controlled conditions may be used to deliver water into service reservoirs without causing severe vibration, noise, spray, or cavitation. The energy of a high velocity jet discharging downward from a fixed-cone jet dispersion valve can be dissipated in a relatively confined volume of water without using a special energy-dissipating structure. Methods are given for determining the shape and dimensions of the dispersion zone in which the energy of the jet is dissipated, and the average velocity of the jet at any likely point of impact with the floor or sides of the reservoir. Optimum performance of the 90 deg cone type valve can be achieved when the ratio, height of the apex of the cone above the surface of water in the reservoir to jet thickness, is about 60 for the valve fully opened. (USBR)
W72-11379

INVESTIGATION OF NONMETALLIC WATERSTOPS: REPORT 8. EFFECT OF SPECIMEN SIZE AND LOW TEMPERATURE ON WATERSTOP TEST RESULTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. Houston.
Available from NTIS, Springfield, Va 22151 as AD-737 174, Price: $3.00 paper copy; 95 cents microfiche. Technical Report No 6-546, January 1972. 30 p, 2 fig, 1 tab, 5 photo, 4 plate, 8 ref.

Descriptors: *Hydraulic structures, *Sealants, *Dams, *Design criteria, *Laboratory tests, Water conveyance, Outlets, Joints (Connections), Analytical techniques, Stress, Tensile strength, Plastics, Rubber, Pipes.
Identifiers: *Waterstops, Nonmetallic waterstops.

Six nonmetallic waterstops were tested for standards criteria, including two- and three-bulb shapes of natural rubber and polyvinylchloride (PVC), a three-bulb neoprene, and a corrugated flange shape PVC. Standard dumbbell specimens, 2-in-long sections of the finished waterstop cut in a transverse direction, and 2-in-long sections embedded in concrete blocks were tested for tensile strength and elongation at 73, 20, and 0 deg F. Specimens of these three types were also stressed to 90% of ultimate eleongation at 73 deg F, then placed in a controlled temperature room at -15 deg F for 2 weeks. Tensile strengths of PVC at 0 deg F were increased 45% to 105% and ultimate elongations were decreased 30% to 70% compared with results obtained at 73 deg F. The same trend was evident for neoprene and natural rubber, but was not nearly as pronounced. The tensile strengths of the 2-in-long full-width PVC specimens averaged about 25% lower than those of small dumbbells, while those of full-width rubber specimens were 40% to 50% lower than those of small dumbbells. Strengths of 2-in-long specimens pulled by use of special grips and those embedded in concrete were roughly the same. Ultimate elongation of 2-in-long PVC and rubber specimens averaged about 60% and 18%, respectively, lower than those of small dumbbells. Reducing temperature of the PVC and rubber specimens stressed to 90% of ultimate elongation to -15 plus or minus 2 deg F did not cause any failures. (Woodard-USGS)
W72-11465

GRAHAM BURKE PUMPING PLANT, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.

Available from the National Technical Information Service as PB-202 305D, $3.00 in paper copy, $0.95 in microfiche. July 1971. 13 p, 1 fig, 1 map, 2 photo.

Descriptors: *Arkansas, *Environmental effects, *Flood control, *Pumping plants, Water pumping, Flood plains, Levees, Flood protection, Wildlife habitats, Aquatic habitats, Hunting, Fishing, Air pollution, Alluvium, Land clearing, Drainage, Gravity.
Identifiers: *Environmental impact statements, *White River (Ark).

The pumping plant was constructed to evacuate impounded water runoff and seepage during periods when stages on the White River will not permit gravity drainage. The plant is located in Phillips County, Arkansas, and is designed to aug-

ment gravity discharge from alluvial lands protected by a levee system. The environmental impact resulting from plant operation includes minor air pollution from diesel motors used to operate pumps, reduced flood damages and improved drainage, and enhancement of fishing and hunting due to new sump elevations. Adverse environmental impacts will result if water is allowed to rise too high in the sump area causing flooding of farm land. If the water level falls too low waterfowl will be affected. The only other adverse effect would be air and noise pollution from the diesel engines. The only alternatives are to not operate the plant or to modify the schedule of elevations to be maintained. (Grant-Florida)
W72-11514

AN APPLICATION FOR MAJOR LICENSE FILED BY APPALACHIAN POWER COMPANY FOR CONSTRUCTED BYLLESBY AND BUCK HYDROELECTRIC PROJECT NO. 2514-VIRGINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Federal Power Commission, Washington, D.C. Bureau of Power.
For primary bibliographic entry see Field 08A.
W72-11535

8D. Soil Mechanics

SMITHVILLE LAKE, LITTLE PLATTE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-202 291D, $3.00 in paper copy, $0.95 in microfiche. August 2, 1971. 12 p, 4 tab.

Descriptors: *Missouri, *Environmental effects, *Dam construction, *Multiple-purpose projects, Flood control, Reservoir construction, Impounded waters, Impoundments, Water supply, Wildlife habitats, Aquatic habitats, Water quality, Recreation, Runoff, Rivers, Flood protection, Flood plains, Earth dams.
Identifiers: *Environmental impact statements, Little Platte River (Mo).

The project will involve construction of an earth-filled dam and lake in Clay and Clinton Counties, Missouri. The project will control runoff from a drainage area of 213 square miles and provide flood control, water quality, water supply, recreation and improved fish and wildlife habitats. Environmental impacts will include flood protection, inundation of agricultural land and fish and wildlife habitat, increased urbanization downstream, intensified agricultural use causing wildlife destruction, and mudflat development in the upper reaches of the lake. Adverse impacts will include habitat destruction from inundation and expected urbanization and agricultural use, soil erosion, and noise and equipment exhaust emmissions occurring during construction. Alternatives include pumping water from the Missouri River as a water source and constructing a smaller single-purpose reservoir. These are unacceptable due to cost and inflexibility. (Grant-Florida)
W72-11177

VANDALIA DRAINAGE AND LEVEE DISTRICT (DISTRICT 21), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.

Available from the National Technical Information Service as PB-202 910D, $3.00 in paper copy, $0.95 in microfiche. June 1, 1971. 31 p, 4 tab.

Descriptors: *Illinois, *Channel improvement, *Environmental effects, *Flood protection, Flood control, Levees, Environmental structures, Environmental engineering, Stream stabilization, Comprehensive planning, Coordination, Multiple purpose projects, Project planning, Cost-benefit analysis, Economic impact, Dredging.
Identifiers: *Environmental Impact Statements.

The project is designed to improve flood protection and interior drainage in Fayette County, Illinois. The plan of improvement consists of construction of an earth levee, limited channel improvements, two diversion ditches, and a pumping station. The proposed improvements will reduce the average area of cultivated lands flooded annually from 5770 acres to 210 acres. Approximately 460 acres of brush and forest land will be converted to cropland. Approximately 3000 feet of the natural channel of the Kaskaskia River will be removed by channel straightening to provide necessary channel stabilization. The conversion of brush and forest land in the district to cropland will have a depressing effect on the already limited small game habitat. Alternative studies included no structural improvements, levee alignments, impoundments, diversions, pumping stations, and various combinations of these developments. An economic analysis of the project is included. (Widman-Florida)
W72-11263

EXPERIMENTAL STUDIES IN SOIL-STRUCTURE INTERACTION,
Colorado State Univ., Fort Collins.
F. D. Nielson.
Paper, 51st Annual Meeting Highway Research Board, Washington, D.C. Jan 1972. 54 p, 24 fig, 19 ref.

Descriptors: *Steel pipes, *Pipes, Pipelines, Culverts, Deflection, Soil compaction, Stress, Construction methods, Pressure distribution, Soil density, Buckling, Moisture content, Pressure, Reviews, Bibliographies, Soil mechanics, On-site investigations.
Identifiers: *Buried pipes, *Pipe design, *Pipe tests, Test results, Soil-structure interaction, Imperfect ditch method, Soil modulus, Iowa formula, Photoelastic analysis, Spangler formula.

This literature review of experimental studies pertaining to soil-pipe interaction is divided into 2 parts: model studies, and field or fullscale tests. Requirements governing model studies are reviewed briefly and examples presented. Results of several pipe studies using model analyses are discussed, including: (1) effects of soil moisture and density on culvert deflection, (2) effects of differential soil compaction on culvert stresses, (3) imperfect ditch method of construction, (4) stresses on multiple pipe installations, (5) pressure distribution on pipe, and (6) soil properties. Field studies of the imperfect ditch method of construction, full-scale failure tests, and certain Canadian large pipe tests are discussed. A design method presented for circular culverts takes into account most of the variables affecting culvert performance. If the tests had been properly instrumented, much of the research work previously performed on pipe would have been of more value. (USBR)
W72-11368

PENN'S LANDING, DELAWARE RIVER, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.

Available from the National Technical Information Service as PB-204 013D, $3.00 in paper copy, $0.95 in microfiche. October 18, 1971. 13 p, 1 illus, 1 append.

Descriptors: *Pennsylvania, *Delaware River, *Environmental effects, *Landfills, *Land use, Environmental engineering, Land forming, Administrative decisions, Coordination, Comprehensive planning, Alternate planning, Multiple-purpose projects, Project planning, Land development, Legislation, Navigable waters, Non-navigable waters.
Identifiers: *Environmental Impact Statements.

The Penn's Landing development site is situated along the Delaware River in downtown Philadelphia. Legislation has been introduced in Congress (H.R. 2450, 92d Congress S. 1971) to declare this portion of the Delaware River non-navigable. Stage 1 of the project required 2.4 million cubic yards of fill which was obtained from the bed of the Delaware River in project vicinity. Approximately twice this amount of material will be necessary to complete Stages 11 and 111. Source of this remaining fill is not known at this time. Adverse environmental effects include permanent removal of 110 acres of navigable water and conversion to filled lands in order to open the site to recreational, institutional, residential and employment purposes. The only alternative to the project is no development, which will result in continued deterioration of this section of the port. The only irreversible commitment of resources will be a change of this area from a marine oriented area to essentially a land use area. A copy of H.R.2450 is included. (Widman-Florida)
W72-11526

8F. Concrete

JORDAN AQUEDUCT, BONNEVILLE UNIT CENTRAL UTAH PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11181

DETAILED PROJECT STUDY OF FLOOD CONTROL IMPROVEMENTS FOR WAIMANO STREAM, OAHU, HAWAII (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Corps of Engineers, Honolulu, Hawaii Pacific Ocean Div.

Available from the National Technical Information Service as PB-198 882D, $3.00 in paper copy $0.95 in microfiche. April 16, 1971. 6 p, 1 map.

Descriptors: *Hawaii, *Environmental effects *Flood control, *Channel improvement *Concrete-lined canals, Reinforced concrete Concrete construction, Canal construction, Sediment control, Flood protection, Sedimentation, Decision making, Turbidity, Stream improvement, Project planning, Canal linings.
Identifiers: *Environmental impact statements, Waimanu Stream (Hawaii).

The project is designed to provide flood protection to the southern coast of the island of Oahu. The project would substitute a reinforced concrete lined waterway for an inadequately lined, low capacity CRM channel. The proposed channel will control all floods up to a design flood of 5,600 cfs, which event is expected to occur about once every 100 years. During project construction, stream water would be discolored and turbid, but the long-term reduction in sediment transport into the estuary outweighs the short-term adverse effects. The alternative of no action was considered unacceptable because it would not improve the well-being of the area's populace. Other alternatives were found to be economically unfeasible and do not appear to offer environmental advantages over the proposed plan. Resources which would be of an irreversible and irretrievable nature are the labor and materials associated with the construction. (Widman-Florida)
W72-11182
For primary bibliographic entry see Field 08A.
W72-11191

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-11192

IE WORKABILITY OF CONCRETE SUB-
CTED TO VIBRATION,
rmingham Univ. (England).
P. Hughes.
ement and Concrete Research, Vol. 2, No. 1, p.
1-122, Jan 1972, 7 fig, 4 tab, 20 ref.

escriptors: *Concretes, *Aggregates, *Concrete
ixes, Concrete properties, Concrete construc-
n, Bibliographies, Forecasting, Concrete
chnology, Portland cements, Coarse aggregates,
ncrete tests, Concrete placing, Fine aggregates,
brations, Gradation, Shape, Density, Cements.
entifiers: *Work ability, Concrete compaction,
ix ratios, Great Britain, Vibratory compaction,
bration tests.

n accurate relation has been established which
early indicates how the workability of concrete,
aced using vibration, is affected by the following
riables: (1) mix proportions; (2) type, grading,
d maximum size of coarse aggregate; (3) type
d grading of fine aggregate; and (4) type of ce-
ent. Each variable has been related to a clearly
fined physical test on the aggregate or cement.
mprehensive but simple to apply charts are
rived to accurately predict the effect of any
riable upon the Vebe time. An examination of
e charts provides rational explanations, in quan-
tative terms, for many of the practical observa-
ns of the effects of each variable on concrete
orkability which have formerly had to receive a
ualitative description only. (USBR)
72-11366

ERATION MITIGATES CAVITATION IN
PILLWAY TUNNEL,
ureau of Reclamation, Denver, Colo.
or primary bibliographic entry see Field 08A.
72-11367

ONCRETE FOR LONG-TIME SERVICE IN
ULFATE ENVIRONMENT,
ureau of Reclamation, Denver, Colo.
. L. Kalousek, L. C. Porter, and E. J. Benton.
ement and Concrete Research, Vol. 2, No. 1, p.
9-89, Jan 1972. 1 fig, 3 tab, 4 ref.

escriptors: *Concretes, *Pozzolans, Concrete
sting, Criteria, Fly ash, *Concrete technology,
ailure (Mechanics).
dentifiers: *Concrete deterioration, *Sodium
lfate tests, *Sulfate attack, *Service life,
ulfate-resisting cements, Wetting and drying
sts, Accelerated tests, Water-cement ratio, Test
sults.

oncrete designed to resist sulfate attack may
main stable for only a few years, several
cades, or indefinitely. These variations in the
havior of high quality concrete made with Type
and Type V cements prompted the Bureau of
eclamation to undertake a long-term research
ogram of the sulfate problem. Investigations in-
uded effects of pozzolans, water and cement
ntents, admixtures, and moist curing and drying.
o predict service life, concrete samples were
aked continuously in a 2.1% sodium sulfate solu-
on and then alternately soaked and dried. 84% of
e concrete samples made with Type II and Type
cements showed life expectancies of less than
yrs. Concretes containing different pozzolans
owed a spectrum of effects ranging from
leterious to highly beneficial. 27 of 33 pozzolan
ncrete samples had life expectancies of more
an 50 yrs. Concrete made with fly ash, pumice,
d 2 calcined products had markedly improved
lfate resistance. Some concretes containing fly
h had a life expectancy of over 100 yrs. For long-
ne survival in a sulfate environment, concrete
ould be made with high quality pozzolans and a
lfate-resisting cement. Use of pozzolan should
eferably not increase the water requirements.
USBR)
72-11369

POLYMER LATEX MODIFIED MORTAR,
Inst. of Tech., Cambridge; and Illinois Univ., Chicago.
S. A. Frondistou-Yannas, and S. P. Shah.
Journal of the American Concrete Institute, Proceedings, Vol. 69, No. 1, p 61-65, Jan 1972. 4 fig, 4 tab, 12 ref.

Descriptors: *Mortars, *Portland cements, *Emulsions, Bonding, Durability, Surface sealing, Modulus of elasticity, Compressive strength, Curing, Flexural strength, Tensile strength, Sealants, Coatings, Concrete technology, Polymers, Chemical compounds.
Identifiers: *Polymer concretes, Polyvinyl acetate, Latex, Extensibility, Copolymers, Bondings strength, Sulfate-resisting elements, Volume change.

Polymer latex modified mortars are portland cement mortars to which polymer latex emulsions have been added during mixing. Mechanical and durability properties of modified mortars, the effects of curing history on modified mortars and latex films, and bond strength of modified mortar to plain mortar were studied. Because of significant improvements in extensibility, bonding properties, and durability, mortar modified by latex emulsion may be used for surface coatings, pavement toppings, and patching damaged concrete. Higher volume changes during wetting and drying, lower modulus of elasticity, and lower compressive strength were observed for modified mortars. Although continuous wet curing reduces the strength of modified mortars, subsequent drying increases strengths. For polyvinyl acetate emulsions, this phenomenon was partly explained by the performance of latex films in saturated lime solutions. Three polymer latex emulsions were used: (1) modified polyvinyl acetate (PVA) copolymer, (2) copolymer of polyvinyl acetate and dibutyl maleate, and (3) sytrene-butadiene emulsion. The ratio of polymer solids to emulsion water was approximately 50% by weight; the polymer-cement ratio was 0.20 by weight. (USBR)
W72-11375

COST FACTORS FOR CAST-IN-PLACE ARCHITECTURAL CONCRETE,
Gensert (R. M.) Associates, Cleveland, Ohio; and Carnegie-Mellon Univ., Pittsburgh, Pa.
R. M. Gensert.
Journal of the American Concrete Institute, Proceedings, Vol. 69, No. 1, p 36-45, Jan 1972. 14 fig, 1 photo, 1 tab, append.

Descriptors: *Cost comparisons, *Concretes, *Concrete construction, *Costs, Cements, Aggregates, Geometry, Structural shapes, Beams (Structural), Coatings, Cast-in-place structures, Formwork (Construction), Texture, Walls, Structural members, Architecture, Building materials, Construction materials, Columns.
Identifiers: *Architectural concrete, Structural concrete, Colored concrete.

Costs of architectural cast-in-place concrete are evaluated with charts and curves giving percentages of increase over costs of conventional structural concrete. Factors affecting the costs include: cements, aggregates, effect of overall surface geometry, surface indentations and projections, reveals, and soffits. Beam and column cross sections and profiles are based on relative costs, using linear members as the basic measure. Coloring, using pigments, is based on cost per cu yd of concrete; coloring by coatings is based on sq ft of surface coated. Texture of major form variations or form liners, or surfaces applied or removed is indicated as a cost per sq ft of surface affected. Suggestions on form tolerances and construction are included. (USBR)
W72-11378

PROPOSED CONCRETE LINING OF MAIN OUTLET DRAIN, SOUTH GILA VALLEY, COLORADO RIVER FRONT AND LEVEE SYSTEM, ARIZONA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nevada. Region 3 Office.
For primary bibliographic entry see Field 08A.
W72-11560

8I. Fisheries Engineering

ABUNDANCE AND DISTRIBUTION OF FINGERLING LARGEMOUTH BASS, MICROPTERUS SALMOIDES. AS DETERMINED BY ELECTROFISHING, AT LAKE NACIMIENTO, CALIFORNIA,
California State Dept. of Fish and Game, Sacramento.
C. E. Von Geldern, Jr.
Calif Fish Game. Vol 57 No 4 p 228-245. 1971.
Identifiers: Abundance, *Bass, California, *Distribution, Dorosoma petenense, Fishing, Micropterus salmoides, Lake Nacimiento (Calif).

Electrofishing gear was used for 4 consecutive summers at Lake Nacimiento to obtain data on the abundance and distribution of fingerling largemouth bass. Mean catches of fingerling bass per 1/4 m of shoreline were extremely variable, ranging from a low of 3.2 in 1968 to a high of 129.9 in 1967. Ninety-five percent confidence intervals about the means ranged from plus or minus 22.7 to plus or minus 46.7%. Factors associated with large fingerling bass year classes were: stable or rising water levels during the spawning period; high surface water elevations in April and May; and low abundance of adult threadfin shad (Dorosoma petenense). No relation between fingerling bass abundance and the abundance of spawners, yearling bass, or other game fish species was detected. Fingerling bass were most abundant in the westerly half of Lake Nacimiento where wind and wave action were relatively slight. The degree of shoreline slope was not a factor affecting the abundance of bass fingerlings. Shoreline sections relatively free of shelter produced larger average catches than sections containing moderate to large quantities of brush, rocks, or fallen logs.--Copyright 1972, Biological Abstracts, Inc.
W72-11328

THE WHITE PERCH IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Zoology.
G. L. Hergenrader, and Q. P. Bliss.
Trans Am Fish Soc. Vol 100, No 4, p 734-738. 1971. Map.
Identifiers: *Fish establishment, *White perch, Morone americana, Nebraska, Ponds, Spawning, Fish hatcheries.

Sexually mature white perch (Morone americana), brought into Nebraska in the spring of 1964, spawned successfully in hatchery ponds. Some of the progeny were stocked in several of the highly alkaline lakes in the Nebraska Sandhills while others were inadvertently introduced into a turbid flood control reservoir in southeastern Nebraska. The species became established in the reservoir where it made very rapid growth and achieved sexual maturity 1-2 yr sooner than in its natural range. Over a 3 yr period the white perch completely displaced the native black bullhead as the dominant species in the reservoir. This dominance is being maintained and the white perch population is becoming stunted. During periods of reservoir discharge in the spring large numbers of white perch escape through the spillway. The stream on which the reservoir is located is tributary to the Platte River which subsequently joins the Missouri River. There appears to be no barrier to the movement of white perch through this stream system to the Missouri as they have been captured throughout the system up to a point only 18 stream m from the juncture of the Platt and Missouri rivers. It appears likely that many white perch have successfully made the journey. The future prospects of the species in the Missouri River should be interesting.--Copyright 1972, Biological Abstracts, Inc.

W72-11342

THE EFFECT OF HYPOXIA AND ANEMIA ON THE SWIMMING PERFORMANCE OF RAINBOW TROUT (SALMO GAIRDNERI),
British Columbia Univ., Vancouver. Dept. of Zoology.
D. R. Jones.
J Exp Biol. Vol 55, No 2, p 541-551. 1971.
Identifiers: *Anemia, Branchial, Cardiac, *Hypoxia, Pumps, *Rainbow trout, Salmo-Gairdneri, *Trout, Fish management.

A series of increasing water velocity tests in a water tunnel was used to investigate the maximum swimmimg performance of 2 groups of rainbow trout, 1 acclimated to high temperature (21-23 deg C) and the other to low temperature (8-10 deg C). At temperatures close to their acclimation there was no significant difference between the maximum swimming speeds of the 2 groups of trout. Exposure to an environmental O2 tension of 1/2 the air saturation value resulted in 43% reduction in maximum swimming performance at low temperature and a 30% reduction at high temperature compared with normal animals. Reduction in hematocrit to 1/2 or 1/3 normal resulted in a 34% reduction in maximum swimming speed at low temperature and a 40% reduction at high temperature compared with control animals (blank injected). The results are discussed in terms of whether fish can be assumed to be in a steady state at all velocities below the critical velocity and whether it is possible to attribute the differences in performance, during anemia and hypoxia, to increased metabolic cost of the cardiac and branchial pumps.--Copyright 1972, Biological Abstracts, Inc.
W72-11683

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

SEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1970 - JUN 30, 1971.
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 09D.
W72-11277

9D. Grants, Contracts, and Research Act Allotments

SEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1970 - JUN 30, 1971.
Maryland Univ., College Park. Water Resources Research Center.

(1971), 135 p. OWRR A-999-MD (5).

Descriptors: *Water Resources Research Act, *Maryland, Grants, Research and development, Water resources development, Waste water treatment, Water quality, Groundwater, Hydrogeology, *Water Resources Institute.
Identifiers: *Water resources research (Md).

Summaries of allotment programs include: Treatment of Liquid Wastes from Food Processing Plants, (A-005-MD); Improvement of Quality of Water Resources by a Three-Fold Attack: Adsorption, Sedimentation and Mixing, (A-007-MD); Kinetic Studies of the Oxidative Degradation of Detergent and Related Species in Aqueous Solution, (A-009-MD); Investigation of the Public and Private Interests in the Development of the Chesapeake Bay Area, (A-010-MD); The Thermal Requirements and Tolerances of Key Estuarine Organisms, (A-011-MD); Agricultural Waste Water Accomodation and Utilization by Various Forages, (A-013-MD); Mechanism of Organic Adsorption on Activated Carbon, (A-014-MD); Physiology of Acidophilic Bacteria of Acid Mine Waters, (A-016-MD); The Transient Behavior of Recharge-Discharge Areas in Regional Groundwater Systems, (A-017-MD); A Statistical Investigation and Simulation of Hydroclimatological Events, (A-018-MD); and Pollution Loads in Percolate Water from Surface Spread Swine Wastes, (A-019-MD). Summaries of matching grant programs include: Water Quality Criteria to Protect the Fish Population Directly Below Sewage Outfalls, (B-066-MD); Effects of Economic Development Upon Water Resources, (B-007-MD); Biochemistry of Estuarine Ecosystem with Emphasis on Heavy Metals and Shellfish, (B-009-MD); and The Effects of Thermal Loading and Water Quality on Estuarine Primary Production, (B-010-MD).
W72-11277

THE NATIONAL WATER COMMISSION ANNUAL REPORT FOR 1971.
National Water Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11527

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication AND Distribution

MATHEMATICAL MODELLING IN HYDROLOGY,
Geological Survey, Fort Collins, Colo. Water Resources Div.
For primary bibliographic entry see Field 02A.
W72-11292

REPORT ON PRECIPITATION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 02B.
W72-11293

LAKE ERIE--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-11440

LAKE ONTARIO--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-11441

CHROMIUM IN WATER--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-11442

ALDRIN AND ENDRIN IN WATER--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-11443

10F. Preparation of Reviews

ADVANCES IN ECOLOGICAL RESEARCH, VOL. 7.
For primary bibliographic entry see Field 06G.
W72-11524

FLAME IONISATION DETECTION (FLAME IONISATION PHENOMENA),
Ceskoslovenska Akademia Ved, Brno. Ustav Instrumentalni Analyticke Chemie.
For primary bibliographic entry see Field 02K.
W72-11726

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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 20
OCTOBER 15, 1972

W72-11739 -- W72-12388

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

STRUCTURE OF WATER,
E. Forslind.
Quarterly Reviews of Biophysics, Vol 4, No 4, p 325-363, 1971. 18 fig, 5 tab, 46 ref.

Descriptors: *Physicochemical properties, *Water chemistry, *Water structure, *Biological properties, Model studies, Theoretical analysis, Reviews, Hydrogen bonding, Molecular structure.
Identifiers: *Monomers, *Lattices.

Reviewed are the structural properties of water that may throw some light on the molecular mechanism responsible for the appearance of the presumed anomalous behavior of the liquid. It is inferred that the anomalies could quite well be normal. Some theoretical developments regarding the water monomer structure and a comparison of experimental data are described. The problem of the double-well potential of the hydrogen bond and the association mechanism and the important theoretical verification of the hypothesis of cooperative bond reinforcement are discussed. A simple theory of the interstitial model of the water structure is described and numerically evaluated on the basis of experimental density data. This serves to introduce several anomalies appearing as discontinuities in the graphs describing theoretical parameters. A comparison is made with recent experimental findings from Raman spectra which seem to agree in considerable detail with the density data producing the anomalies. Some additional experimental anomalies are reviewed and compared with the theory. Although todays knowledge tends to favor the model of the defect lattice with stepwise thermal breakdown and structure stabilization by means of an interstitial non-associated phase, unclarified problems remain. (Casey-Arizona)
W72-12372

1B. Aqueous Solutions and Suspensions

THE STRUCTURE AND PROPERTIES OF WATER SOLUTIONS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
R. A. Pierotti, and A. A. Liabastre.
Available from the National Technical Information Service as PB-211 163, $3.00 in paper copy, $0.95 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Report ERC-0572, June 1972. 102 p, 24 fig, 28 tab, 50 ref, 2 append. OWRR A-017-GA (1).

Descriptors: *Aqueous solutions, *Water properties, *Water structure, *Solutes, *Organic compounds, Solubility, Water, Heavy water, Solvents, Energy transfer, Thermodynamics, Enthalpy, Gas chromatography, Molecular structure.

The objective was to separate the interaction of the solute with water into the solute-water interaction and the solute-solute interaction in the presence of water. The solubility of benzene, toluene, n-pentance, cyclopentane, cyclohexane, cyclopentene, cyclohexene, 1,4-cyclohexadiene and cycloheptatriene in H2O and D2O were measured using gas-liquid chromatographic techniques over the temperature range of 278 to 318 degrees K. This solubility data were used to compute Henry Law constants and from the temperature dependence of the Henry Law constants, the thermodynamic changes associated with the solution process were calculated. These thermodynamic properties were compared for the water and D2O solutions in terms of the transfer of solute from H2O to D2O. Free energies, enthalpies and heat capacities of transfer were determined as a function of temperature. Theoretical interpretations of Henry Law constants in terms of the molecular properties of the solute and solvent were investigated also. The scaled particle theory of solutions was used to obtain effective 'core diameters' and effective dispersion energy parameters for non-spherical solutes and solvents. This theory is adaptable to the study of the solubility of water in organic solvents as well as to the solubility of organic substances in water. (Conway-Ga. Tech)
W72-12099

02. WATER CYCLE

2A. General

A RAINFALL-RUNOFF SIMULATION MODEL FOR ESTIMATION OF FLOOD PEAKS FOR SMALL DRAINAGE BASINS,
Geological Survey, Washington, D.C.
D. R. Dawdy, R. W. Lichty, and J. M. Bergmann.
Available from GPO, Washington, D. C. 20402, Price 40 cents (paper cover). Geological Survey Professional Paper 506-B, 1972. 28 p, 15 fig, 12 tab, 23 ref.

Descriptors: *Mathematical models, *Parametric hydrology, *Peak discharge, *Simulation analysis, *Small watersheds, Urban hydrology, Storm runoff, Flood forecasting, Model studies, Computer models, Rainfall-runoff relationships.

A parametric rainfall-runoff simulation model may be used with data from a point rainfall gage and data on daily potential evapotranspiration to predict flood volume and peak rates of runoff for small drainage areas. The model is based on bulk-parameter approximations to the physical laws governing infiltraztion, soil-moisture accretion and depletion, and surface streamflow. Three case studies are presented in which an objective fitting method is used for determining optimal best-fit sets of parameter values for the data available for use in predicting flood peaks. Errors of prediction result both from errors in rainfall input and from lack of model equivalence to the physical prototype. These two sources of error seem to be of the same order of magnitude for a model of the level of simplicity of that presented. Major gains in accuracy of simulation will require improvements in both data and model. The limit of accuracy of prediction of flood peaks by simulation with a bulk-parameter model using data obtained from a single rain gage seems to be on the order of 25 percent. The effect of man-made changes on a basin can be related to changes in model parameters, so that measured 'before' conditions can be compared with simulated 'after' conditions of sufficient accuracy for planning purposes. (Knapp-USGS)
W72-11754

SALINITY AND THE HYDROLOGIC CYCLE,
Flinders Univ., Bedford Park (Australia). School of Physical Sciences.
For primary bibliographic entry see Field 03C.
W72-11757

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11773

GLACIOLOGICAL INVESTIGATIONS ON THE ABRAMOVA GLACIER IN ACCORDANCE WITH THE PROGRAM OF THE INTERNATIONAL HYDROLOGICAL DECADE (GLYATSIOLOGICHESKIYE ISSLEDOVANIYA PO PROGRAMME MEZHDUNARODNOGO GIDROLOGICHESKOGO DESYATILETIYA NA LEDNIKE AB RAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologischeskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11774

ADEQUACY OF HYDROLOGIC RECORDS FOR PARAMETER ESTIMATION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 07C.
W72-11991

VARIATIONS IN MINIMUM RUNOFF FROM SMALL BASINS (ALIVALUMAN VAIHTELUISTA PIENILLA ALUEILLA),
Vesientutkimuslaitos, Vesihallitus, Helsinki (Finland).
For primary bibliographic entry see Field 02E.
W72-12021

HYDRAULIC MODEL TEST ON THE DIFFUSION OF INDUSTRIAL WASTE-WATER IN THE SEA,
Mitsubishi Heavy Inudstries Ltd., Kobe (Japan). Kobe Technical Inst.
For primary bibliographic entry see Field 05B.
W72-12081

CAMP STREAM IHD EXPERIMENTAL BASIN NO. 12,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 02E.
W72-12374

MODEL HYDROGRAPHS,
Geological Survey, Washington, D.C.
W. D. Mitchell.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.45. Geological Survey Water-Supply Paper 2005, 1972. 85 p, 16 fig, 36 tab, 5 ref.

Descriptors: *Model studies, *Hydrographs, *Watersheds (Basins), *Hydrology, *Rainfall-runoff relationships, Streamflow forecasting, Hydrologic data, Watershed management, Mathematical studies, Correlation analysis.

An array of model hydrographs is presented with explanations of their development, their use, and their relation to unit hydrographs. Model hydrographs are developed from a dimensionless translation hydrograph, having a time base of T hours and appropriately modified for storm duration by routing through reservoir storage. Models fall into two distinct classes: (1) those for which the value of x (exponent in the relation between storage and outflow) is unity and which have all the characteristics of true unit hydrographs and (2) those for which the value of x is other than unity and to which the unit-hydrograph principles of proportionality and superposition do not apply. Twenty-six families of linear models and eight families of nonlinear models in tabular form comprise the principal subject of this report. Supplemental discussions describe the development of the models and illustrate their application. Methods of determining the hydrograph characteristics, both from observed hydrographs and from the physical characteristics of the drainage basin, are described. Five illustrative examples show that the models, when properly converted to incorporate actual rainfall excess and the time and areal

characteristics of the drainage basins, satisfactorily represent the observed flood hydrographs for the basins. (Woodard-USGS)
W72-12376

2B. Precipitation

A CAPACITOR-TYPE RAIN GAUGE WITH DC OUTPUT AND IMPROVED FLOW CHARACTERISTICS,
Bell Telephone Labs., Inc., Holmdel, N.J. Crawford Hill Lab.
R. R. Seibel.
Review of Scientific Instruments, Vol 43, No 8, p 1081-1085, August 1972. 8 fig, 1 ref.

Descriptors: *Rain gages, *Instrumentation, Monitoring, Flowmeters, Flow measurement, Gages, Rainfall.

A rain gage for continuously measuring rainfall rates in the range 0-800 mm/h is described. The collected rain water is channeled to flow through a capacitor which constitutes one arm of an RC bridge. The a.c. voltage across the bridge is processed to give a d.c. output which is nearly linearly proportional to rainfall rate. Low as well as high rain rates can be measured accurately. The output incorporates a time constant which can be switched into smooth fluctuations in rain rate. (Knapp-USGS)
W72-11748

METEOROLOGICAL CONDITIONS AND MEASUREMENT OF ABLATION ON THE ABRAMOVA GLACIER (METEOROLOGICHESKIYE USLOVIYA I RASCHET TAYANIYA NA LEDNIKE ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11776

SYNOPSIS OF THE METEOROLOGICAL OBSERVATIONS AT MELLE: AVERAGES 1962--1969,
Ghet Rijksuniversiteit (Belgium).
T. Behaeghe, and J. Traets.
Meded Fac Landbouwwet Rijksuniv Gent. Vol 35 No 4 p 991-997. 1970. Illus. English summary.
Identifiers: Averages, *Melle (Belgium), *Meteorological data, Synopsis.

From the begining of 1962 detailed meteorological observations were carried out on the experimental farm at Melle. The averages obtained during the period 1962-1969 are presented graphically. The system used was that of the 3-decade floating mean.--Copyright 1972, Biological Abstracts, Inc.
W72-11815

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA - WATER YEAR 1971.
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W72-11881

FACTORS CONTRIBUTING TO UNUSUALLY LOW RUNOFF DURING THE PERIOD 1962-68 IN THE CONCHO RIVER BASIN, TEXAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-11987

THE PRECIPITATION MEASUREMENT PARADOX--THE INSTRUMENT ACCURACY PROBLEM,
J. C. Rodda.
World Meteorological Organization Reports on WMO/IHD Projects, Report No 16, Contribution to International Hydrological Decade (IHD), 1971. 42 p, 13 fig, 62 ref.

Descriptors: *Rain gages, *Precipitation gages, *Calibrations, *Instrumentation, Gaging stations, Measurement, Data collections, Basic data collections, International Hydrological Decade.

There is no means of assessing the accuracy of the gages comprising the bulk of most national raingage networks--the so-called 'standard' gages. The problems of measuring precipitation at a point are discussed. Particular attention is given to the performance of the commonly used elevated type of raingage compared with measurements made by instruments installed with their rims at ground level. Studies of the behavior of pit gages and their relation to the national 'standard' gage are currently underway in a number of countries. These include Denmark, Hungary, Kenya, Netherlands, Sweden, United Kingdom, United States, and U.S.S.R. In addition to studies of the influence of wind on gage catch, the effect of wind in evaporating the collected rain has also been investigated. (Knapp-USGS)
W72-12032

ON THE ACCURACY OF ESTIMATING AVERAGES OVER GEOGRAPHIC AREAS,
R. Czelnai.
Available from NTIS, Springfield, Va 22151 as AD-733 808, Price: $3.00 paper copy; 95 cents microfiche. Air Force Systems Command Foreign Technology Division Edited Translation Report FTD-HC-23-815-71, August 1971. 16 p, 9 fig, 3 tab, 7 ref. Originally published in Idojaras (Weather), Vol 73, No 6, p 340-350, 1969.

Descriptors: *Meteorology, *Weather data, *Rainfall, *Average runoff, *Estimating, Methodology, Stochastic processes, Mathematical studies, Equations, Geographical regions, Forecasting.
Identifiers: Probable errors.

A method for determining the probable errors of calculated area averages of meteorological elements is presented. By using the structural function of the stochastic field of the investigated element, the probable error of the estimated area average is expressed in functions of network density and that of the respective area of averaging. The method is demonstrated by calculations concerning the accuracy of estimated area average rainfall depth. (Woodard-USGS)
W72-12034

WILL THE ARIZONA DROUGHT OF 1971 OCCUR AGAIN.,
Arizona Univ., Tucson. Dept. of Geography and Area Development.
D. Steila, and R. Gelpke.
Arizona Review, Vol. 21, No. 6-7, p 9-14, 1972.

Descriptors: *Arizona, *Droughts, *Probability, Precipitation (Atmospheric), Rainfall, Arid climates, Southwest U.S., Seasonal, Moisture deficit.

Drought is differentiated from aridity. Based on monthly precipitation data since 1931, it was determined that all seven of Arizona's climatic divisions suffered drought in 1971. Maps show the probability of mild and moderate droughts and severe and extreme droughts in each climatic division of Arizona. The southwest and south central divisions have the greatest chance of mild to moderate drought status. The northern half of the state is most prone to intense droughts. (Sherbrooke-Arizona)
W72-12356

BAJA CALIFORNIA'S CLIMATE,
Fresno State Coll., Calif. School of Social Science.
C. G. Markham.
Weatherwise, Vol 25, No 2, p 64-76, April 1972.

Descriptors: *Climatology, *Precipitation (Atmospheric), *Climatic data, *Mexico, *Weather patterns, Distribution patterns, Rainfall, Temperature, Seasonal, Regional analysis, Isohyets, Cloudbursts, Storms, Droughts, Dry seasons, Fog, Orography, Arid lands, Semiarid climates.
Identifiers: *Baja (Calif).

Data from a network of 120 stations of a cooperative weather observation program allow the construction of meteorological isopleths on maps of Baja California and a more detailed analysis of weather phenomena than previously possible. Mean annual rainfall places the entire peninsula in either arid or semi-arid of the Koppen system. In the north rain shadows occur on both sides of the mountains, changing with season and direction of moisture source. Deluge rainfall from hurricanes is important in the south and Gulf Coast and in these areas the median annual rainfall would be a better measure of normal rainfall than the mean. The central Pacific coast is subjected to heavy fogs, where seasonality is strong under the west Coast Regime (Ensenada), there is very little summer rain. Where seasonality is strong under the Tropical Regime (Cabo San Lucas), there is very little winter rain. Seasonality of temperature changes is discussed. (Sherbrooke-Arizona)
W72-12360

2C. Snow, Ice, and Frost

GEOCHEMISTRY OF MELTWATER STREAMS FROM NINE ALASKAN GLACIERS,
Memorial Univ. of Newfoundland, St. John's. Dept. of Geology.
R. M. Slatt.
Geological Society of America Bulletin, Vol 83, p 1125-1132, April 1972. 3 fig, 2 tab, 31 ref.

Descriptors: *Water chemistry, *Melt water, *Glaciers, *Alaska, Glaciohydrology, Geochemistry, Sampling, Water analysis, Suspended load, Leaching.

Melt-water streams from nine Alaskan valley glaciers eroding five different bedrock types were analyzed. The streams are similar in that Ca is the most abundant ion and the cold waters have a basic pH. Total (Na + K + Mg + Si) and suspended load concentrations vary in streams from glaciers on different bedrock types, from different glaciers on similar bedrock, and from the same glaciers during different sampling periods. Bedrock type is probably not the most important factor controlling the quantity of total (Na + K + Ca + Mg + Si) in glacial melt water, and suspended load concentration is controlled by stream conditions at the time of sampling. Ions are introduced to melt water by partial dissolution of suspended load and more Ca than other ions is introduced in this manner. (Knapp-USGS)
W72-11751

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), V. L. Shul'ts, and V. F. Suslov, editors, 1970. 136 p.

Descriptors: *Glaciers, *Glaciology, *Glaciohydrology, *Orography, Mountains, Elevation, River basins, Geomorphology, Meteorology, Snow, Snowpacks, Firn, Ice, Avalanches, Glacial drift, Mass wasting, Ablation, Melt water, Runoff, International Hydrological Decade.

Identifiers: *USSR, *Soviet Central Asia, *Kirgiz SSR, *Glacier mass balance, *Glacier wastage, Glacier runoff, Glacier tongues, Snow avalanches, Snow line, Firn line.

This collection of 15 papers presents the results of investigations conducted on the Abramova Glacier in southwest Kirgiz SSR in accordance with the program of the International Hydrological Decade. A number of papers deal with glaciers in different parts of Soviet Central Asia and with glacier runoff and its role in mountain streamflow. Specific topics examined include: (1) modern glaciers in the Koksu River basin; (2) meteorological conditions and measurement of ablation on the Abramova Glacier; (3) water regime of the Koksu River; (4) natural contamination of snow cover and formation of snowpacks in the Abramova Glacier basin; (5) mass balance of the Bol'shoy snowpack in the Chimganka River basin; (6) hydrologic regime of glaciers on the Alay Mountain range; (7) floodwaters in the Amu-Dar'ya River basin; (8) modern glaciers in the Sokh River basin; (9) ice melting under moraine cover; and (10) snow distribution and measurement of ablation on test plots. The text is intended to serve glaciologists, hydrologists, geophysicists, and geographers, as well as researchers and students at hydrometeorological institutes. (See W72-11774 thru W72-11782) (Josefson-USGS)
W72-11773

GLACIOLOGICAL INVESTIGATIONS ON THE ABRAMOVA GLACIER IN ACCORDANCE WITH THE PROGRAM OF THE INTERNATIONAL HYDROLOGICAL DECADE (GLYATSIOLOGICHESKIYE ISSLEDOVANIYA PO PROGRAMME MEZHDUNARODNOGO GIDROLOGICHESKOGO DESYATILETIYA NA LEDNIKE AB RAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologischeskii Institut, Tashkent (USSR).
Yu. N. Yemel'yanov.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 3-10, 1970. 3 fig, 6 ref.

Descriptors: *International Hydrological Decade, *Glaciology, *Glaciers, Ablation, Melting, Runoff, Msss wasting, Avalanches, Snowpacks, Snow cover, Firn, Ice, Water equivalent, Winds, Radiation, Elevation, Seasonal.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Alay Mountains, *Glacier mass balance, Glacier wastage, Snow avalanches, Firn line.

Like most glaciers of the Alay Mountain system in southwest Kirgiz SSR, the Abramova Glacier, covering 22.8 sq km, is in a stage of long-period shrinkage. In 1895-1967 the glacier diminished in size by 1,500 m, with the diminution in 1954-67 being 500 m. Length of the ablation season on the glacier ranges from 60 days in the accumulation zone to 120 days in the ablation zone. During the 1968 ablation season, the water equivalent of snow and ice at an elevation of 3,750 m was 5,600 mm and at elevations of 3,850 m and 3,950 m--3,000 mm and 1,500 mm, respectively. Total annual runoff from the basin of the Abramova Glacier in 1968 was 69.4 million cu m and in 1969, 58.8 million cu m. Average annual runoff for 1969 was 24.9 liter/sec/sq km and during the 1969 ablation season, it was 65.8 liter/sec/sq km. The vast amount of glaciological work conducted on the Abramova Glacier to determine the relation of glacial processes to both climatic change and streamflow reflects the basic objectives of the International Hydrological Decade for developing international research in hydrology. (See also W72-11773) (Josefson-USGS)
W72-11774

DATA ON MODERN GLACIERS IN THE KOKSU RIVER BASIN (NEKOTORYYE DANNYYE O SOVREMENNOM OLEDENENII BASSEYNA R. KOKSU),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. F. Suslov, and L. D. Podkopayeva.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 11-15, 1970. 1 fig, 4 tab.

Descriptors: *Glaciers, *Glaciology, *River basins, Geomorphology, Topography, Cirques, Ice, Glacial drift, Mass wasting, Elevation.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Koksu River, Glacial geomorphology, Valley glaciers, Corrie glaciers, Hanging glaciers, Firn line.

Tabulation of new data on modern glaciers in the Koksu River basin in southwest Kirgiz SSR was based on aerial photographs and large-scale maps. The total number of glaciers in the basin is 73, and the total glacier area is 81.5 sq km, which is 23% of the entire glaciated region of the southern slope of the Alay Mountain range or 15.6% of the glacierized area of the Kyzylsu River basin. Glaciers in the Koksu River basin range in size from 0.1 sq km to 22.8 sq km. The number of glaciers larger than 0.1 sq km and smaller than 1.0 sq km is 44. The number of glaciers larger than 1 sq km is 15 and includes the Abramova, Alaudin, and Livenskoy Glaciers. Most of the glaciers (94.5%) occur at elevations ranging from 3,800 to 4,600 m, with 3.6% found at elevations above 4,600 m and only 1.9% at elevations below 3,800 m. The area of greatest glacier development is around the upper reaches of the Koksu River and coincides with the location of the Abramova Glacier system. Valley glaciers are the most common type of glacier and account for over 45% of all glaciers and for over 80% of the total glacierized area. Glaciers in the Koksu River basin are wasting away, as evidenced by the presence of moraine deposits at the termini of modern glaciers by the occurrence of corrie and cirque forms of glacial relief. (See also W72-11773) (Josefson-USGS)
W72-11775

METEOROLOGICAL CONDITIONS AND MEASUREMENT OF ABLATION ON THE ABRAMOVA GLACIER (METEOROLOGICHESKIYE USLOVIYA I RASCHET TAYANIYA NA LEDNIKE ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Z. A. Gerasimova.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 16-24, 1970. 2 fig, 7 tab, 7 ref.

Descriptors: *Glaciers, *Glaciology, *Meteorology, *Ablation, Melting, Melt water, Ice, Heat balance, Air temperature, Humidity, Radiation, Albedo, Cloud cover, Winds, Synoptic analysis.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, Radiation budget.

Climatic and radiation characteristics of the 1968 ablation season on the Abramova Glacier in southwest Kirgiz SSR are examined. Total solar radiation in July-August was considerable and under clear skies varied between 1.59 cal/sq cm/min and 1.71 cal/sq cm/min. Daily totals ranged from 316 cal/sq cm under cloudy skies to 8.13 cal/sq cm on clear days. Average daily total solar radiation for the period of observations was 687 cal/sq cm. Albedo of the glacier under clear skies varied between 0.44 and 0.11. The average radiation value for July was 431 cal/sq cm/day and that for August--250 cal/sq cm/day. Daily totals of heat and moisture fluxes computed for 0.5-2.0 m- and 0.0-0.25 m-thick ice layers differed from rod measurement values of daily ice melting by the amount of refreezing melt water. (See also W72-11773) (Josefson-USGS)
W72-11776

WATER REGIME OF THE KOKSU RIVER (VODNYY REZHIM R. KOKSU),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. A. Akbarov, and V. A. Neupokoyev.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 25-36, 1970. 5 fig, 3 tab, 6 ref.

Descriptors: *Glaciohydrology, *Water balance, *Water levels, *Discharge (Water), Stage-discharge relations, Runoff, Floodwater, Low flow, Ablation, Melting, Melt water, Water sources, Ice, Snow, Precipitation (Atmospheric), Radiation, Air temperature, Seasonal, Headwaters, International Hydrological Decade.
Identifiers: USSR, *Soviet Central Asia, *Koksu River, *Glacier runoff, Glacier tongues, Snow line.

Investigations of water levels and precipitation at the headwaters of the Koksu River in 1967-69 were based on observations conducted according to the program of the International Hydrological Decade and on hydrologic studies carried out by the Kirgiz State Institute for the Planning of Water Economy in 1961-62. The hydrologic regime of the Koksu River is similar to that of many rivers which have their origin in glaciers. The maximum water level in 1968 was 158 cm and in 1969, 146 cm. Maximum average daily discharges in 1968 were observed in the middle of August and totaled 12.6 cu m/sec. Maximum average daily discharges in 1969 occurred at the end of July and in the middle of August and amounted to 12.8 cu m/sec and 10.7 cu m/sec, respectively. Water discharges at the beginning of the ablation season were samll and varied between 1 and 2 cu m/sec. During intensive melting of ice, water discharges reached 12 cu m/sec. During the 1968 ablation season, the runoff volume was 61.6 million cu m and in 1969 it was 54.9 million cu m. In 1968, the maximum amount of monthly runoff (33.7% of annual runoff) occurred in August, of which 87.9% was floodwater and 12.1% low flow. Average annual runoff of the Koksu River in 1968 and 1969 was 38.6 and 24.9 liter/sec/sq km, respectively. (See also W72-11773) (Josefson-USGS)
W72-11777

NATURAL CONTAMINATION OF SNOW COVER IN THE BASIN OF THE ABRAMOVA GLACIER (O YESTESTVENNOY ZAGRYAZNENNOSTI SNEZHNOGO POKROVA V BASSEYNE LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. K. Nozdryukhin.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 37-42, 1970. 2 tab.

Descriptors: *Glaciers, *Snow, *Firn, *Dusts, *Air pollution effects, Mountains, Orography, Elevation, Summer, Sampling.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, Snow avalanches.

The basin of the Abramova Glacier in southwest Kirgiz SSR was investigated in the summer of 1969 for dust content in the upper layer of snow and firn. A gradual increase in snow-surface contamination of the glacier was observed in the period between the beginning of summer and end

of August. At the end of June, the average amount of dust deposited on 1 sq km of glacier surface was 2.45 metric tons, increasing by the end of July and August to 6.37 and 10.73 metric tons, respectively. The amount of dust added to the 22.76 sq km glacier surface during the summer was 244.2 metric tons. Data are given on the altitudinal extent of snow-surface contamination for elevations ranging from 3,800 to 4,600 m. (See also W72-11773) (Josefson-USGS)
W72-11778

FORMATION OF SNOWPACKS IN THE BASIN OF THE ABRAMOVA GLACIER (FORMIROVANIYE NAVEYANNYKH SNEZHNIKOV V BASSEYNE LEDNIKA ABRAMOVA),
Sredneaziatski Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Yu. N. Yemel'yanov, and S. N. Temnikov.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 43-52, 1970. 4 fig, 3 tab, 4 ref.

Descriptors: *Glaciers, *Snowpacks, *Snow, *Winds, Wind velocity, Meteorology, Precipitation (Atmospheric), Air temperature, Radiation, Albedo, Density stratification, Glacial drift, Avalanches, Seasonal, Computers.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Glacier mass balance, Snow avalanches, Snow density.

Transport of a large amount of wind-driven snow and formation of snowpacks play an important role in mass balance of the Abramova Glacier in southwest Kirgiz SSR. A snowpack on an ancient moraine 300 m from a research base built on the glacier was investigated in October 1967-May 1968. Total length of the snowpack during the period of observations was 350 m, average width was 45-50 m, and total area and volume were 12,000 sq m and 60,000 cu m, respectively. Formation of snowpacks in the region of the Abramova Glacier is determined by precipitation and wind velocity. During the winter, the total amount of snow transported across the snowpack surface was 30,000 metric tons, 73% of which was deposited. Average rate of transport of wind-driven snow in the region of the glacier is 0.175 g/sq cm/min. (See also W72-11773) (Josefson-USGS)
W72-11779

HYDROLOGIC REGIME OF GLACIERS OF THE ALAY MOUNTAIN RANGE (GIDROLOGICHESKIY REZHIM LEDNIKOV ALAYSKOGO KHREBTA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. F. Suslov, and A. A. Akbarov.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 56-69, 1970. 5 fig, 4 tab, 14 ref.

Descriptors: *Glaciology, *Glaciers, *Hydrologic budget, *Orography, *Mountains, River basins, Slopes, Elevation, Meteorology, Air temperature, Radiation, Precipitation (Atmospheric), Snow, Firn, Ice, Ablation, Melting, Mass wasting, Streamflow, Runoff, Seasonal.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Alay Mountains, *Glacier runoff, Glacier tongues, Seasonal snow cover, Snow line, Firn line, Firn fields.

The role of the Bakalak, Raygorodskogo, and Abramova Glaciers in streamflow of the Alay Mountain range in southwest Kirgiz SSR was investigated in 1963-68. The total number of glaciers of the range is 1,119, and the total glacier area is 985.3 sq km. The total volume of water in the glaciers is estimated to be 35 cu km, which is only 4 cu km less than the water content in glaciers of the central Caucasus. Glaciers of the Alay Mountain range are characterized by gradual shrinkage in an easterly direction and by slight increase in average elevations of the glaciers' lower limit and firn line. Average elevation of the lower limit of glaciers on the northern slope of the Alay Mountains is 3,970 m, and the firn-limit elevation is 4,180 m. On the southern slope these values are 4,000 m and 4,300 m, respectively. Average total runoff from the glaciers in summer is 34.4% of the annual runoff and varies in individual basins between 24.5% and 48.3%. Runoff from glacierized areas is 20.2% of the total annual runoff of rivers of the mountain range. (See also W72-11773) (Josefson-USGS)
W72-11780

MODERN GLACIERS IN THE SOKH RIVER BASIN (SOVREMENNOYE OLEDENENIYE BASSEYNA R. SOKH),
Sredneaziatskii Nauchno-Issledovatelsii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. S. Shchetinnikov.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 80-91, 1970. 3 tab, 19 ref.

Descriptors: *Glaciology, *Glaciers, *River basins, *Geomorphology, Topography, Orography, Elevation, Precipitation (Atmospheric), Snow, Firn, Ice, Ablation, Melting, Melt water, Runoff, Mass wasting, Glacial drift, Seasonal.
Identifiers: USSR, *Soviet Central Asia, *Kirgiz SSR, *Sokh River, *Glacier runoff, Glacier mass balanace, Glacier wastage, Glacier tongues, Firn line, Firn fields.

According to 1968 figures, the total number of glaciers in the Sokh River basin in southwest Kirgiz SSR is 276, and the total glacier area is 258.7 sq km. The number of glaciers larger than 0.1 sq km is 265 and covers 258.2 sq km. The glaciers exist in a wide variety of forms and characteristics. Corrie glaciers are the most common type of glacier and cover 43.4% of the glacierized area, followed by valley glaciers which comprise 29.4% or almost one-third of all glaciers. Average elevation of the glaciers' lower limit is 3,900 m and average elevation of the upper limit is 4,512 m. Most glaciers (76.5%) terminate at elevations of 3,501-4,500 m, with only a small percentage (5.3%) terminating at an elevation of 3,000 m or less. About 68% of all glaciers occur at elevations of 3,800-4,600 m. Average height of the firn line is 4,100 m and varies in individual basins between 3,300 m and 4,500 m. Glacier runoff of the Sokh River is 30.2% of the annual runoff and 49.5% of the runoff for July-September. Runoff from glacier tongues is 74% and runoff from firn fields is 26% of the total glacier runoff. Average annual glacier runoff is 49.0 liter/sec/sq km. (See also W72-11773) (Josefson-USGS)
W72-11781

CHANGES IN RADIATION BUDGET ON A MORAINE-COVERED ICE SURFACE (NEKOTORYYE VOPROSY IZMENENIY RADIATSIONNOGO BALANSA NA ZAMORENENNOY POVERKHNOSTI L'DA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. A. Tikhanovskaya.
In: Voprosy glyatsiologii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 56 (71), p 92-96, 1970. 2 fig, 5 ref.

Descriptors: *Glaciology, *Glaciers, *Glacial drift, *Ice, *Radiation, Albedo, Elevation, Equations.
Identifiers: USSR.

Changes in radiation from an ice surface covered by a thin layer of moraine are investigated. The optimal area covered by moraine is defined as the area which produces maximum increase in radiation and depends on the ratio of total solar radiation to increased losses to long-wave radiation and albedo of the moraine surface. The optimal area increases with increase in glacier elevation and with decrease in size of individual moraine particles. When increased losses to radiation from a unit area of moraine cover are less than increased absorption caused by changes in albedo of the surface, radiation from moraine-covered ice will exceed radiation from clean ice. (See also W72-11773) (Josefson-USGS)
W72-11782

THE EFFECTS OF BURNING ON THE HEAT AND WATER REGIMES OF LICHEN--DOMINATED SUBARCTIC SURFACES,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W72-11885

A THEORETICAL AND EXPERIMENTAL STUDY OF CLIMBING-RIPPLE CROSS--LAMINATION, WITH A FIELD APPLICATION TO THE UPPSALA ESKER,
Uppsala Univ. (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 02J.
W72-11976

DEBRIS FALLS AT THE FRONT OF ARAPAHO ROCK GLACIER, COLORADO FRONT RANGE, U.S.A.,
Ohio State Univ., Columbus. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-11980

ICE CORED MOUNDS AND PATTERNED GROUND, SOUTHERN BANKS ISLAND, WESTERN CANADIAN ARCTIC,
Ottawa Univ. (Ontario). Dept. of Geography.
H. M. French.
Geografiska Annaler, Vol 53A, No 1, p 32-38, 1971. 5 fig, 1 tab, 23 ref.

Descriptors: *Permafrost, *Canada, Frozen soils, Arctic, Frost heaving, Ice, Cryology, Soil mechanics, Freezing, Thawing.
Identifiers: *Pingos, *Banks Island (Canada).

Small hydrolaccoliths (ice-cored mounds occur within low ice wedge polygons on poorly drained meadow tundra) soils in the Masik Valley, Banks Island, Canada. It is suggested that the process of ice segregation is brought about by a contraction of the water-saturated layer under cryostatic pressure and that the upstanding ice wedges, which bound the polygons, form the boundaries to the closed system. There is some similarity, therefore, between these features and the closed system pingos of the Mackenzie Delta with respect to genesis. (Knapp-USGS)
W72-11982

ICE CORED MORAINE FORMATION AND DEGRADATION, DONJEK GLACIER, YUKON TERRITORY, CANADA,
Ottawa Univ. (Ontario). Dept. of Geography.
P. G. Johnson.
Geografiska Annaler, Vol 53A, No 3-4, p 198-202, 1971. 4 fig, 11 ref.

Descriptors: *Glaciers, *Canada, *Glacial drift, Sediments, Ice, Ablation, Movement, Geomorphology, Regimen.
Identifiers: *Ice-cored moraines, *Donjek Glacier (Canada).

The ice core of moraines at the terminus of the Donjek Glacier, Canada, is primarily composed of glacier ice and not snow-bank ice. The widespread occurrence of these ice-cored moraines in the area is the result of two main processes, one a shear-push mechanism of buried stagnant ice, and the other due to ablation and fluvial deposits accumulating on a stagnant ice wedge being pushed in front of the presently surging glacier. Degradation of these moraines is due to five main processes, all of which are directly related to the occurrence of the ice core. (Knapp-USGS)
W72-11984

OXYGEN DEPLETION IN ICE COVERED RIVER,
Alberta Univ., Calgary. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-11989

MILITARY FACILITIES AND ENVIRONMENTAL STRESSES IN COLD REGIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-12014

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatel skiGidrometeorologicheski Institut, Tashkent (USSR).

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 44 (59), V. L. Shul'ts and V. K. Nozdryukhin, editors, 1969. 127 p.

Descriptors: *Glaciers, *Glaciology, *Glaciohydrology, Orography, Mountains, Elevation, Geomorphology, Meteorology, Albedo, Snow, Snowpacks, Firn, Ice, Avalanches, Glacial drift, Ablation, Runoff, Variability, Mapping, International Hydrological Decade.
Identifiers: USSR, *Soviet Central Asia, *Glacier mass balance, *Glacier runoff, Glacier tongues, Firn line, Snow line, Stereoplanigraphs.

This collection of 15 papers is devoted to a study of glaciers in various parts of Soviet Central Asia and to an examination of glacier runoff and its role in total streamflow. Specific topics include: (1) glaciers in upper reaches of the Koksu River; (2) modern glaciers in the Kashkadar'ya and Surkhandar'ya River basins; (3) variability of snow properties; (4) snowpacks in upper reaches of the Chimganka River (1962-66); (5) runoff regime of the Bakalak River; (6) computation of flow in glacier-fed rivers; (7) mass balance of the Imat Glacier; (8) mechanics of glacier movement; (9) classification and spatial variability of albedo of a homogeneous glacier surface during the ablation season; (10) use of a stereoplanigraph for mapping glaciers; and (11) glaciers of the Nuratoo Mountain range. (Josefson-USGS)
W72-12018

INVESTIGATIONS OF LAKE-EFFECT SNOWSTORMS,
Cornell Aeronautical Lab, Inc., Buffalo, N.Y.
W. J. Eadie, U. Katz, and C. W. Rogers.
Available from the National Technical Information Service as COM-72-10267, $3.00 in paper copy, $0.95 in microfiche. Cornell Aeronautical Laboratory, Inc Technical Report No VC-3034-M-1 (Final Contract Report E22-59-71 (N)), November 29, 1971. 44 p, 19 fig, 16 ref. Contract No E22-59-71 (N).

Descriptors: *Snow surveys, *Meteorology, *Data collections, *Model studies, *New York, Lake Erie, Lake Ontario, Snowfall, Storms, Crystals, Shape, Size, Gages, Hydrologic budget, Measurement, Forecasting, Numerical analysis, Correlation analysis.

Observational and mesoscale modeling studies of lake-effect snowstorms were carried out in the western New York area during the winter of 1970-71. A portable snow sampling system was developed to measure the fall velocities of snow crystals and to record the size and shape of the crystals. Data are presented for small snow pellets, plane dendrites, spatial dendrites, aggregates, and a variety of unclassifiable snow forms. Additional surface snow crystal observations were obtained in lake-effect snowstorms produced by Lake Erie and Lake Ontario. A test of a small network of automatic snow gages showed satisfactory correlations among the measurements of the individual gages in light-to-moderate snowfall. The single-layer Lavoie model for the steady state mesoscale circulations produced by the flow of cold air over Lake Erie was generalized to treat the joint Lake Erie-Lake Ontario system. Numerical experiments with moist modifications of the two-lake model are discussed. An example of a numerical experiment is based on a Lake Erie storm, in which narrow intense bands were predicted from both Lake Erie and Lake Ontario. Calculated water budget values for the predicted storm bands are described. (Woodard-USGS)
W72-12029

A STUDY OF THE EFFECTS OF A COMMERCIAL HYDRAULIC CLAM DREDGE ON BENTHIC COMMUNITIES IN ESTUARINE AREAS,
Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab.
For primary bibliographic entry see Field 05C.
W72-12083

PHYSICS OF ICE,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
H. Granicher, and F. Jona.
Available from NTIS Springfield, Va., 22151 as AD-738 154; Price $3.00 Paper copy; 95 cents microfiche. Army Cold Regions Research and Engineering Laboratory Draft Translation Report TL 303, January 1972. 15 p, 2 fig, 42 ref. (Originally published by Birkhauser Verlag, Basel and Stuttgart, February 3, 1960). DACW-35-68-C-0069.

Descriptors: *Ice, *Physical properties, *Crystallography, *Cryology, *Electrical properties, Electrical conductance, Hydrogen bonding, Physics.

A review and bibliography of the physics of ice are presented. The unusual structural and physical properties of ice create problems which were solved only recently by new research methods, mainly in neutron deflection, proton spin resonance, and study of disorder phenomena in crystals. The water molecules in ice crystals cohere solely through hydrogen bonds. Therefore, ice is a suitable research object for the study of these bonds and their properties. The great importance of hydrogen bonds in chemistry, particularly in organic and physiological chemistry, is receiving increasing recognition. Hydrogen bonds are also of interest to the crystallographer and to the physicist. The mobility of protons in ice greatly surpasses the usual mobilities involved in ionic conduction; it even can be compared with the electronic mobility of an average semiconductor. (Knapp-USGS)
W72-12375

DEFORMATION OF NATURAL SOIL WATER DISPERSION SYSTEMS UPON THAWING,
F. G. Bakulin, and V. F. Zhukov.
Available from NTIS, Springfield, Va 22151 as AD-738 183, Price $3.00 paper copy; 95 cents microfiche. Army Cold Regions Research and Engineering Laboratory Draft Translation Report TL 312, January 1972. 10 p, 4 fig, 10 ref. (Originally published in Izvestii Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, No 7, p 132-136, July 1955).

Descriptors: *Frost, *Ice, *Frost heaving, *Rock mechanics, *Frost action, Freezing, Frozen ground, Thawing, Cryology, Deformation, Mechanical properties, Pressure, Rock properties.

Frozen rocks, depending on the degree of dispersion of water, initial density, moisture, and cooling rate during freezing, possess definite structures which characterize the rock as a complex body with intercalations of ice and mineral jointings. A general increase in the size of a freezing rock caused by ice separation is accompanied by the formation and compaction of separated mineral aggregates containing slightly more moisture than the plasticity limit. Frozen rocks keep their structure to some extent while thawing. A frozen, heavily ice-saturated rock compacts while thawing because of a decrease in the size of the macropores. Mineral aggregates do not compact while thawing, even under a load up to 6-8 Kg/sq cm; their size can even increase because of swelling of clays. The only compaction of frozen rock during thawing occurs with disintegration of structure. Compaction must be determined under field conditions on the basis of a study of the structure of the entire mass of thawing rock. (Knapp-USGS)
W72-12386

SNOW ICE AND ITS SIGNIFICANCE IN COMPUTING THE THICKNESS OF THE ICE COVER,
A. G. Deriugin.
Available from NTIS, Springfield, Va. 22151 as AD-737 824, Price $3.00 Paper copy; 95 cents microfiche. Army Cold Region Research and Engineering Laboratory Draft Translation Report TL 299, January 1972. 30 p, 3 fig, 5 tab, 13 ref. (Originally published in Gosudarstvennyy Gidrologicheskiy Institut Trudy, Vol 148, p 29-44, Leningrad). DACW-35-68-C-0069.

Descriptors: *Snow, *Ice cover, *Freezing, Ice, Lakes, Rivers, Iced lakes, Lake ice, Air temperature.
Identifiers: *USSR.

The process of snow ice formation is considered and a correction of the formula for computing the thickness of the ice cover, taking into account this phenomenon, is proposed. On the lakes of the Leningrad, Novgorod, and Kalinin regions snow ice accounted in certain cases for 60%-70% of the total thickness of ice. Formation of snow ice is preceded by the appearance of water on the ice under the snow. Most of this water comes from below, from the body of water, as a consequence of overloading of the ice cover by snow, although a small amount of water may be added as a result of the melting of snow during thaws or from liquid precipitation. The flow of water onto the ice cover occurs not only through cracks of thermal origin, but also through shore-line cracks formed as a result of water-level fluctuations. In some cases the shore-line cracks are the main source of flooding the snow with water. The chief factors determining the process of snow ice formation in a quantitative expression are the thickness of the snow cover on the ice and the air temperature. (Knapp-USGS)
W72-12387

2D. Evaporation and Transpiration

COMPARISON OF EVAPORATION COMPUTATION METHODS, PRETTY LAKE, LAGRANGE COUNTY, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.

J. F. Ficke.
Available from GPO, Washington, D. C. 20402, Price 70 cents (paper copy). Geological Survey Professional Paper 686-A, 1972. 49 p, 31 fig, 21 tab, 34 ref.

Descriptors: *Evaporation, *Lakes, *Indiana, *Mass transfer, Instrumentation, Data collections, Energy budget, Water balance, Evaporation pans, Hydrologic budget, Evaporimeters, Meteorological data, Meteorology.
Identifiers: Pretty Lake (Ind).

Evaporation from Pretty Lake, Indiana, was computed for a 2-1/2-year period between 1963 and 1965 by 5 methods, including energy budget, mass-transfer parameters, a water budget, a class-A pan, and a computed pan evaporation technique. The seasonal totals for the different methods are within 8% of their mean and are within 11% of the rate of 79 centimeters per year determined from published maps based on evaporation-pan data. Period-by-period differences among the methods are larger than the annual differences, but there is a general agreement among the evaporation hydrographs produced by the different computation methods. The need for sophisticated equipment, frequent temperature surveys, and complex computations makes the energy budget the most expensive of the several methods used. The mass-transfer system proved to be an effective low-cost means of computing evaporation, a means that is well suited to low evaporation rates. Springtime and autumn evaporation rates computed by the mass-transfer methods were slightly higher than rates computed by other methods, and summer rates from mass-transfer computations were slightly lower than rates computed by other methods. Assuming that Pretty Lake is typical of the many small natural lakes in its region, in most cases the evaporation information needed for hydrologic studies can be provided with satisfactory accuracy by a combination of the mass-transfer method and one or two other methods, without the expense of a complex energy-budget study. (Knapp-USGS)
W72-11741

MAXIMUM POTENTIAL EVAPOTRANSPIRATION FREQUENCY--EAST CENTRAL U. S.,
Agricultural Research Service, Coshocton, Ohio. North Appalachian Experimental Watershed.
J. L. McGuinness, and L. H. Parmele.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers Vol 98, No IR2, Paper 8943, p 207-214, June 1972. 3 fig, 3 tab, 11 ref, append.

Descriptors: *Evapotranspiration, *Statistics, *Distribution patterns, *Variability, Probability, Irrigation, Planning, Lysimeters, Frequency analysis.

In the east-central United States maximum 1-day, 7-day, 15-day, and monthly values of evapotranspiration as measured by a lysimeter, and potential evapotranspiration as estimated by a computed lake evaporation are log-normally distributed. Equations were developed to estimate the two parameters of this distribution for any duration from 1 day to 1 month during the April to November season. A generalization of the data is made to a broad area of the east-central United States. (Knapp-USGS)
W72-11996

CENTRAL CALIFORNIA EVAPOTRANSPIRATION FREQUENCIES,
California Univ., Davis. Dept. of Water Science and Engineering.
W. O. Pruitt, S. von Oettingen, and D. L. Morgan.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers Vol 98, No IR2, Paper 8941, p 177-184, June 1972. 2 fig, 9 ref.

Descriptors: *Evapotranspiration, *Frequency analysis, *Irrigation design, Variability, Statistics, Statistical methods, Probability, Climatology, Lysimeters, Soil-water-plant relationships, *California.
Identifiers: *Davis (Calif).

Frequency distribution patterns of daily evapotranspiration are presented for an irrigated grass cover grown in a highly sensitive, weighing lysimeter at Davis, Calif., over a 10-yr period. In response to climate variation, patterns ranged from highly skewed ones in winter to very close to normal distributions in midsummer. The importance of basing irrigation-system design on a careful analysis of probable variation of evapotranspiration rather than on long-term mean monthly data was dramatically illustrated. Even for crop and soil conditions requiring very infrequent irrigations, a system design must be some 15% higher than the 10-yr monthly mean of 0.26 in. per day for June or July. In order to cover 99% of the cases under a crop-soil combination with only 1 in. of readily available moisture, the peak design rate would need to be 0.36 in. per day. (Knapp-USGS)
W72-11997

CONSUMPTIVE USE BY IRRIGATED HIGH MOUNTAIN MEADOWS IN SOUTHERN WYOMING,
Wyoming Univ., Laramie. Water Resources Research Inst.
T. J. Swartz, R. D. Burman, and P. A. Rechard.
Available from the National Technical Information Service as PB-211 125, $3.00 in paper copy, $0.95 in microfiche. Wyoming Water Resources Series No 29, May 1972. 89 p, 23 fig, 18 tab, 22 ref. OWRR B-003-WYO (4).

Descriptors: *Evapotranspiration, *Lysimeter, Hydrologic budget, Wetlands, Streamflow, *Consumptive use, *Wyoming.
Identifiers: *Medicine Bow River, *Jensen-Haise method.

An area along the Medicine Bow River in south central Wyoming was instrumented to obtain estimates of consumptive use (evapotranspiration) from irrigated high mountain meadows. Four basic methods were employed: non-weighing tank lysimeters, the hydrologic budget, the Modified Jensen-Haise method, and an adaptation of the Blaney-Criddle method. A description of the instrumentation required to secure the necessary data for these methods, the results of the application of these methods, and comparisons of the results are presented. Analysis revealed that estimates by the Blaney-Criddle method were consistently less than the values obtained by any of the other methods. Estimates by the Jensen-Haise method compared favorably, on a weekly basis, with the evapotranspiration measured from the tank lysimeters. Comparisons also showed that estimates by the Modified Jensen-Haise method produced the least discrepancy from the seasonal consumptive use determined by the hydrologic budget.
W72-12004

HYDROLOGY OF IRRIGATED LAND (GIDROLOGIYA OROSHAYEMYKH ZEMEL').
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 03F.
W72-12019

THE INFLUENCE OF POTASSIUM ON THE TRANSPIRATION RATE AND STOMATAL OPENING IN TRITICUM AESTIVUM AND PISUM SATIVUM,
Lund Univ. (Sweden). Dept. of Plant Physiology.
GH. Brag.
Physiologic Plantarum, Vol. 26, No. 2, p 250-257, 1972. 5 fig, 3 tab, 23 ref.

Descriptors: *Potassium, *Transpiration control, *Plant physiology, *Stomata, Sodium, Laboratory tests, Wheat, Leaves.

Very little attention has been paid to the influence of mineral nutrients on the transpiration rate and stomatal behavior of intact plants. It is unclear whether the relationship between K and stomatal opening is directly physiological or indirectly morphological. The influence of K on the transpiration rate of Triticum aestivum and Pisum sativum grown in nutrient solutions was investigated. Stomatal aperture and transpiration rates were found inversely proportional to K levels. In short term experiments, KCl additions to K-deficient Triticum plants resulted in transpiration rate decreases up to 50% in 2 hours. Comparative tests with NaCl gave the same results, indicating that this short-term reaction is not K-specific. The observed effect is probably explained by changes in stomatal aperture. (Casey-Arizona)
W72-12345

COASTAL CALIFORNIA EVAPOTRANSPIRATION FREQUENCIES,
Agricultural Research Service, Weslo, Tex. Soil and Water Conservation Research Div.; Agricultural Research Service, Beltsville, Md.; and Agricultural Research Service, Fort Collins, Colo.
P. R. Nixon, G. P. Lawless, and G. V. Richardson.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 98, No. IR2, p 185-191, June 1972. 3 fig, 3 ref.

Descriptors: *Evapotranspiration, *Lysimeters, *Frequency analysis, *Coasts, *Valleys, Topography, Crops, Advection, Climatic data, *California, Winds, Growth stages, Grasses, Temperature.
Identifiers: *Crop roughness.

Year-round mild temperatures moving through gradual gradations characterize the climate of the coastal valleys of central California more than do clearly defined seasons. Because of advective cooling, fog and clouds along the pacific coast, the climate of these coastal valleys is influenced to some degree by maritime conditions. Examples of these influences are presented with data collected in a coastal valley 8 miles (13 km) from the ocean near Lompoc, California. The data are from 1 cu m hydraulical-weighing lysimeters containing irrigated perennial rye grass as an evapotranspiration (ET) reference crop. Because of the inaccuracy of ET prediction equations all climatic data were ignored. Monthly frequency distributions of daily ET and frequency distributions of 1-day through 30-day mean ET summer rates are presented. Although it would be very desirable to have more than the 2-1/4 yr of data that were available, it was felt that the frequency based on these data should consider that distance from the ocean has an important effect on ET rates in coastal valleys. Crop roughness and stage of growth are also influencing factors as well as ocean breezes and topography. Peak ET rates from field crops in this coastal valley can be 15-20% greater than rates of the aerodynamically smooth rye grass. (Casey-Arizona)
W72-12352

PEAK WATER REQUIREMENTS OF CROPS IN SOUTHERN IDAHO,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
J. L. Wright, and M. H. Jensen.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 98, No. IR2, p 193-201, June 1972. 4 fig, 8 ref.

Descriptors: *Evapotranspiration, *Climatic data, *Lysimeters, *Estimating equations, *Alfalfa, Irrigation practices, Frequency analysis, Winds, Arid lands, Micrometeorology, Crop response, Advection, *Idaho.
Identifiers: *Potential evapotranspiration, *Crop roughness.

Because of increasing water costs, the nature of many new sprinkler systems and because many areas like southern Idaho produce high-value crops that are extremely sensitive to moisture stress, capacities of new irrigation systems must be designed to closer tolerances. Two years of lysimeter measurements of evapotranspiration (ET) and the associated energy balance components were used to develop and verify procedures for estimating ET from meteorological data. Peak water use requirements for well-watered alfalfa were determined for southern Idaho from frequency distributions of mean ET rates for 1-day, 3-day, 7-day, 15-day, and 30-day averaging periods. The daily ET computed showed large daily variations and demonstrated the need for frequency analysis and precise engineering planning for such arid regions. For the period of May through August, the peak single-day rate exceeded 0.4 in/day (10 mm). The peak 30-day period was from July 11 through August 10. As such information becomes available, it increases the need for yield estimates and economic return relationships of crops when managed at the various probability levels of peak ET rate. (Casey-Arizona)
W72-12353

WATER DEFICITS--IRRIGATION DESIGN AND PROGRAMMING,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 03F.
W72-12354

2E. Streamflow and Runoff

APPLICATION OF WATER TEMPERATURES TO THE PROBLEM OF LATERAL MIXING IN THE GREAT BEAR MACKENZIE RIVER SYSTEM,
British Columbia Univ., Vancouver. Dept of Geography.
J. R. Mackay.
Canadian Journal of Earth Sciences, Vol 9, No 7, p 913-917, July 1972. 4 fig, 6 ref.

Descriptors: *Water temperature, *Mixing, *Rivers, *Canada, *Remote sensing, Tracers, Tracking techniques, Water quality, Surveys.
Identifiers: Great Bear-Mackenzie River system (Canada).

Cross-river temperature profiles were run in mid-June 1971 at approximately 20 km intervals from the confluence of the Great Bear and Mackenzie Rivers, at Fort Norman, N.W.T., to the Mackenzie Delta, a distance of 650 km. As the Great Bear River was cold, and the Mackenzie River warm, the cross-profiles provide a record of the lateral mixing of the two rivers. A flow distance of 500 km was required for nearly complete mixing. The 1971 cross-river temperature profiles and aerial infrared imagery taken in 1969 show a good agreement in the mixing pattern. It is suggested that where water temperature contrasts exist, temperatures may serve as one of the easiest and most economical of the tracers suitable for mixing studies. (Knapp-USGS)
W72-11746

SEICHES OF SYDNEY HARBOR, N. S.,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
A. K. Easton.
Canadian Journal of Earth Sciences, Vol 9, No 7, p 857-862, July 1972. 4 fig, 2 tab, 7 ref.

Descriptors: *Seiches, *Bays, *Canada, *Mathematical models, Waves (Water), Numerical analysis, Surges, Wind tides, Winds, Weather.
Identifiers: *Sydney Harbor (Nova Scotia).

The periods and responses of the free oscillations were calculated using one-dimensional models of Sydney Harbor, Nova Scotia. After Rayleigh's mouth correction is taken into account, it is evident that the prominent wave often recorded at North Sydney is the fundamental seiche. The seiche is induced by the passage of weather systems along the coast of Nova Scotia. Its response could be reduced by building a dam across the North West Arm. (Knapp-USGS)
W72-11747

WATER RESOURCES INVESTIGATIONS IN OREGON, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11750

GLACIOLOGICAL PROBLEMS OF SOVIET CENTRAL ASIA (VOPROSY GLYATSIOLOGII SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11773

DATA ON MODERN GLACIERS IN THE KOKSU RIVER BASIN (NEKOTORYYE DANNYYE O SOVREMENNOM OLEDENENII BASSEYNA R. KOKSU),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11775

WATER REGIME OF THE KOKSU RIVER (VODNYY REZHIM R. KOKSU),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11777

HYDROLOGIC REGIME OF GLACIERS OF THE ALAY MOUNTAIN RANGE (GIDROLOGICHESKIY REZHIM LEDNIKOV ALAYSKOGO KHREBTA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11780

MODERN GLACIERS IN THE SOKH RIVER BASIN (SOVREMENNOYE OLEDENENIYE BASSEYNA R. SOKH),
Sredneaziatskii Nauchno-Issledovatelsii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11781

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS,
Alaska Univ., College. Inst. of Water Resources.
G. L. Guymon.
Available from the National Technical Information Service as PB-211 079, $3.00 in paper copy, $0.95 in microfiche. Institute of Water Resources, University of Alaska, Fairbanks, Alaska, Report no IWR-21, June, 1972. 105 p, 5 fig, 28 ref, 3 append. OWRR A-036-ALAS (2).

Descriptors: *Computer models, *Momentum transfer, *Ion transport, *Sediment transport, *Open channel flow, Mathematical models, Engineering, Water quality control, Water pollution control, Hydrodynamics, Surface waters, Aquatic, *Model studies.
Identifiers: *Finite-Element Method, Variational principle, Coupled problems.

Because of current and anticipated needs in resources planning and environmental conservation decision processes, greater levels of solution precision are required for the fundamentally complex problem of simulating pollutant movement and fate in the aquatic environment. The objective was to extend the technology for a general attack on solving surface water mass and momentum transport problems. Specifically, one class of the finite-element methods was explored to develop a general purpose computer program for modeling regional surface water systems. A quasi-linear variational principle and finite-element solution procedure was developed for the two-dimensional Eulerian equations of fluid motion. Continuity was included as a Lagrangian constraining condition. The resulting set of linear equations is solved in time by standard integration methods where the basic non-linearity of the governing equations of motion are handled by a psuedo-iterative technique. Additionally, an improved finite-element procedure for the mass transport equations is presented. A technique of dealing with semi-coupling of the mass and momentum problems is explored in addition to the coupling problem between separate chemical and biological species. Computer programs and algorithms are included. The conclusions are that the finite-element methods will provide a valuable tool, in addition to the finite-difference methods, for dealing with complex transport problems.
W72-11866

QUANTITATIVE ANALYSIS OF RESERVOIR AND STREAM YIELDS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 04A.
W72-11895

WATER RESOURCES OF THE CENTER HILL LAKE REGION, TENNESSEE.
Geological Survey, Nashville, Tenn.
G. K. Moore, and J. M. Wilson.
Tennessee Division of Water Resources, Water Resources Series No 9, 1972. 77 p, 27 fig, 8 tab, 31 ref, append.

Descriptors: *Water resources, *Tennessee, *Streamflow, *Groundwater, *Water yield, Water quality, Hydrogeology, Hydrologic data, Data collections, Water balance, Water resources development, Water wells, Springs.
Identifiers: Center Hill Lake Region (Tenn).

The Central Hill Lake region (909 sq mi) in central Tennessee is almost equally in the Central Basin and the Eastern Highland Rim. Land surface in the Central Basin generally consists of narrow valleys and the steep sides of narrow ridges. The soils range from 0 to 30 feet thick but average only 3 ft thick. Bedrock is flat-lying limestone of Ordovician age. The Highland Rim is a level to rolling plateau and the soil cover generally is 20 to 100 feet thick. Bedrock is flat-lying limestone of Mississippian age. Average precipitation is 53 inches. Evaporation and transpiration consume 36 inches; the remaining 17 inches leaves the area as streamflow. The average streamflow at 26 sites in the region is 1.4 cubic feet per second per square mile. Raw water from streams in the region generally meets the chemical standards recommended for drinking water. Maximum potential yields are 100 gpm from the soils, 200 gpm from alluvium, and several thousand gallons per minute from solution cavities. Water from wells generally meets the chemical standards for drinking water. Most springs are small, but 25% have flows ranging from 50 to 2,000 gpm. Spring water is similar in chemical quality to well water. (Knapp-USGS)
W72-11978

CHANNEL CHARACTERISTICS IN A MEANDERING TIDAL CHANNEL: CROOKED RIVER, FLORIDA,
Wisconsin Univ., Milwaukee. Dept. of Geography; and Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
G. H. Dury.
Geografiska Annaler, Vol 53A, No 3-4, p 188-197, 1971. 5 fig, 2 tab, 17 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Meanders, Florida, Geomorphology, Sediment transport, Tidal effects, Streamflow, Tides.
Identifiers: *Crooked River (Fla).

Crooked River, Florida, is a double-mouthed meandering tidal channel with an axial length of some 24 km and a mean sinuosity of 1.7, mostly in sediments derived from old beach systems but in contact at some places with bedrock of Tertiary limestone. Its hydraulic geometry accords generally, and in some respects closely, with the geometry of a wholly tidal creek. Maximum pool depth appears to be complexly determined, with deflection angle through pools and a radius factor supplying the chief definitions of controlling bend tightness: a pool width factor and the curvature ratio are also relevant. Some 51% of the variance in maximum depth is statistically accounted for, with an average discrepancy between observed and computed depth of less than 6%. (Knapp-USGS)
W72-11983

FACTORS CONTRIBUTING TO UNUSUALLY LOW RUNOFF DURING THE PERIOD 1962-68 IN THE CONCHO RIVER BASIN, TEXAS,
Geological Survey, Washington, D.C.
S. P. Sauer.
For sale by the Superintendent Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.35. Geological Survey Water-Supply Paper 1999-L, 1972. 48 p, 16 fig, 11 tab, 25 ref.

Descriptors: *Water yield, *Runoff, *Texas, *Droughts, Water balance, Rainfall-runoff relationships, Streamflow, Irrigation water, Diversion, Base flow, Rainfall intensity.
Identifiers: *Concho River (Tex).

To determine the reasons for the unusually low runoff in the Concho River basin of Texas during the period 1962-68, the physical developments and climatic changes in the basin were identified and related to changes in the regimen of streamflow. Land use, brush infestation, and land-treatment practices have not caused significant changes in the rainfall-runoff relationship. The base flow of the streams is materially reduced by surface-water irrigation diversions. Annual rainfall is highly variable, with little serial correlation. The frequency of monthly rainfall equal to or greater than 2.0 inches during the period 1943-68, and especially during the period 1962-68, was significantly less than the long-term averages. Analyses of annual runoff data, adjusted for depletions, show large variations in annual runoff. Coefficients of variation range from 0.8 to 1.4, and first-order serial correlations range from 0.01 to 0.28. The estimated recurrence interval of the 1962-68 drough.. is about 200 years. The basic cause for the relatively low runoff during the period 1962-68 was the lack of high-intensity, long-duration storms. (Knapp-USGS)
W72-11987

MATHEMATICAL MODEL OF RIVER HOOGHLY,
Manchester Univ. (England).
D. M. McDowell, and D. Prandle.
Journal of the Waterways and Harbors Division, American Society of Civil Engineers Vol 98, No WW2, Paper 8866, p 225-242, May 1972. 14 fig, 1 tab, 4 ref, append.

Descriptors: *Tidal bores, *Estuaries, *Numerical analysis, *Mathematical models, Water levels, Water level fluctuations, Tidal effects.
Identifiers: Hooghly River (India).

Finite difference solutions to the one-dimensional equations of motion for shallow water waves were applied to the tidal region of the River Hooghly. Reproduction of flow conditions was achieved by optimization of the friction parameters and refinements or adjustments to the available data. The mathematical model formulated is capable of satisfactory reproduction of tidal levels and velocities throughout the section of the river considered. The neglect of the tidal bore as a discontinuity did not adversely affect the overall reproduction of tidal elevations in the river. If a more detailed reproduction of the propagation of the bore is required recourse should be made to the method of characteristics. Comparison of the two finite difference schemes suggests that improvement in the overall accuracy of the model is unlikely to result from increased accuracy in the numerical solution of the equations of motion. (Knapp-USGS)
W72-11994

EFFECTS OF INFLOW CONDITION ON HYDRAULIC JUMP,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08B.
W72-11998

PARAMETER ESTIMATION FOR FIRST--ORDER AUTOREGRESSIVE MODEL,
Instituto Geografico Nacional, Guatemala City.
L. E. Garcia-Martinez.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY8, Paper 9119, p 1343-1349, August 1972. 1 tab, 9 ref, append.

Descriptors: *Mathematical models, *Regression analysis, *Markov processes, *Statistics, *Statistical methods, Simulation analysis, Probability, Stochastic processes.
Identifiers: Autoregressive models.

Stochastic simulation of streamflow depends upon estimation of the correlation structure of the series. Several estimators of the autocorrelation coefficient are investigated and all are biased for sample sizes beyond those usually encountered in hydrology. That estimator with least bias has greatest variance and that with least variance has greatest bias. The estimator chosen as best must be judged on the relative effects of bias and variance. (Knapp-USGS)
W72-11999

WATER RESOURCES INVESTIGATIONS IN SOUTH CAROLINA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12001

WATER RESOURCES INVESTIGATIONS IN OKLAHOMA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12002

WATER RESOURCES INVESTIGATIONS IN OHIO, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12003

WATER RESOURCES OBSERVATORY STREAMFLOW DATA - WATER YEARS 1965 THROUGH 1971,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W72-12005

VARIATIONS IN MINIMUM RUNOFF FROM SMALL BASINS (ALIVALUMAN VAIHTELUISTA PIENILLA ALUEILLA),
Vesientutkimuslaitos, Vesihallitus, Helsinki (Finland).
S. E. Mustonen.
Vesientutkimuslaitoksen Julkaisuja, No 1, Vesihallitus, Helsinki, 1971. 64 p, 11 fig, 10 tab, 23 ref, 2 append.

Descriptors: *Runoff, *Watersheds (Basins), *Small watersheds, *Variability, Correlation analysis, Regression analysis, Frequency analysis, Model studies, Mathematical models, Meteorology, Temperature, Precipitation (Atmospheric), Topography, Slopes, Forests, Soils, Peat, Drainage, Seasonal.
Identifiers: *Finland.

Assessment of the effects of certain climatic and basin characteristics on minimum runoff was based on observations made during winter and summer periods of 1958-69 at 32 small drainage basins in various parts of Finland. The purpose of the analyses was to construct models to determine minimum runoff during periods of low runoff, duration of low runoff, and intervals of recurrence of low runoff. Mean temperatures of February and July were significant climatic factors in almost all models developed and correlated with various terrain factors, such as slope of the ground and percentage of cultivated fields in the drainage basin. The most important basin factor was the slope, which showed a close positive correlation with the percentage of coarse soils in the drainage basin and with the degree of forest cover, and a negative correlation with the percentage of cultivated fields and peatlands and with temperature. The models are adaptable to basins which have climatic and terrain features similar to those in the small research basins which form the foundation of the models. (Josefson-USGS)
W72-12021

USING LONG-RANGE STORM FORECASTS TO ASSIST THE OPERATION OF A FLOOD CONTROL AND CITY WATER SUPPLY RESERVOIR,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 04A.
W72-12030

PRELIMINARY REPORT ON SMALL STREAMS FLOOD FREQUENCY IN MAINE,
Geological Survey, Augusta, Maine.
G. S. Hayes, and R. A. Morrill.
Available from the National Technical Information Service as PB-204 371, $3.00 in paper copy, $0.95 in microfiche. Geological Survey Preliminary Progress Report for Maine State Highway Commission, March 1971. 10 p, 3 tab, 2 ref, append.

Descriptors: *Streamflow, *Streamflow forecasting, *Peak discharge, *Frequency analysis, *Maine, Small watersheds, Regression analysis, Frequency curves, Hydrologic data, Analytical techniques.

Runoff records for 6 years were used to derive a formula for peaks of up to the 10-year frequency in small watersheds (1-50 sq mi) in Maine. The formula uses the following basin characteristics: drainage area, channel slope, channel length, storage, and forest cover. The formula is an adaptation of an earlier U.S. Geological Survey method

which was limited to large watersheds. Frequency curves were prepared graphically, using the annual peaks collected during the period 1964-69, for the 28 small drainage area stations in the project. Also for the same period, frequency curves were prepared for 25 long-term record gaging stations in Maine that were not affected by regulation. Peak discharges for the 2-, 5-, and 10-year recurrence intervals were computed for all 53 stations. (Woodard-USGS)
W72-12035

RESISTANCE COEFFICIENTS FOR STEADY SPATIALLY VARIED FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W72-12043

FLOW CHARACTERISTICS WITHIN A CHANNEL BOUNDARY OF COARSE MATERIALS,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 08B.
W72-12106

BORDER IRRIGATION ADVANCE AND EPHEMERAL FLOOD WAVES,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. E. Smith.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 289-307, June 1972. 13 fig, 16 ref.

Descriptors: *Mathematical models, *Floods, *Hydrology, *Irrigation, *Infiltration, Routing, Channels, Arroyos, Flood waves, Ephemeral streams.
Identifiers: *Kinematics, *Transmission loss.

A kinematic wave is a wave whose properties can be described by an equation of continuity and a stage-discharge relation, implying that momentum changes are negligible. A method is described of predicting advance rate, surface profiles and modifications with time to kinematic wave flow over an initially dry infiltrating plane. Point infiltration rate is considered to be a function of time since wetting. The model developed is shown to describe 2 common hydrological problems: border irrigation advance and attenuation in dry alluvial channels such as commonly occurs in the southwestern U.S. Numerical methods for solving the equations developed are described and illustrated. The partial differential equations for kinematic wave movement under time-varying space-varying lateral losses were reduced to 2 characteristic ordinary differential equations and combined with a third equation for shock movement. Sensitivity for advance rate to the infiltration functions is shown. The model may be used to route floods through dry infiltrating channels. (Casey-Arizona)
W72-12371

CAMP STREAM IHD EXPERIMENTAL BASIN NO. 12,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
L. K. Rowe, F. A. Johnson, and C. L. O'Loughlin.
Annual Hydrological Research Report No 3, 1970. 13 p, 7 fig, 4 tab, 6 ref, append.

Descriptors: *International Hydrological Decade, *Demonstration watersheds, *Data collections, *Gaging stations, Networks, Stream gages, Rain gages, Stations, Hydrologic data.
Identifiers: *New Zealand.

Work accomplished in IHD Experimental Basin no. 12, the Camp Stream catchment and Hut Creek, a new catchment to be incorporated in Camp Stream Experimental Basin, New Zealand, in 1969, is summarized. Work carried out in Camp Stream includes the collection of meteorological data and data on rainfall interception by mountain beech, calibration of the flume, construction of a small trap for bed-load measurement, and tests on streamflow conductivity. The Hut Creek project is designed to define some of the basic hydrological process controlling the behavior of a foothill catchment. In particular it is proposed to establish the relationships existing between rainfall and runoff, to determine the characteristics of the flood hydrograph, and to study erosion and sediment transport within the catchment. At the end of 1969 a network of seven rain gages was established in the catchment. Six of these are in a ring around the catchment and the seventh is sited almost in the center. (Knapp-USGS)
W72-12374

MODEL HYDROGRAPHS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W72-12376

2F. Groundwater

THE DETERMINATION OF DISPERSION COEFFICIENTS IN NON-HOMOGENEOUS MEDIA IN PROBLEMS OF SALT WATER CONTAMINATION OF FRESH GROUND WATER,
Societe Centrale pour l'Equipment du Territoire-International, Puteaux (France).
For primary bibliographic entry see Field 05B.
W72-11743

STATISTICAL PROCESSING OF LONG-TERM OBSERVATIONS OF GROUNDWATERS,
Ceskoslovenska Akademie Ved, Brno. Geograficky Ustav.
H. Kriz.
Journal of Hydrology, Vol 16, No 1, p 17-37, May 1972. 7 fig, 9 tab, 4 ref.

Descriptors: *Water level fluctuations, *Groundwater, *Data processing, *Statistical methods, Statistics, Water well, Water balance, Data collections, Hydrologic data.
Identifiers: *Czechoslovakia.

The processing of the seventy-year series (1901-1970) of weekly groundwater levels from observation well No. 12 in the Bohemian Cretaceous Plateau in Moravia illustrates the statistical methods used in Czechoslovakia. The so-called characteristic levels were derived from the weekly groundwater levels for the years 1901-1970. These are goundwater levels that, on the average, are exceeded for a certain number of days in the year and often reported also as a percentage of the total duration of observation. Further characteristics are the average monthly and annual groundwater levels, calculated as arithmetic means from the weekly levels recorded in the individual hydrological years, from which, in turn, the average values for the entire period under study were established. The highest and the lowest annual values were established in addition, as well as the absolute exteme levels for the entire period of 1901-1970. Based on the average annual groundwater levels, the hydrological years 1901-1970 were classified from the viewpoint of their yield rates. Long-term changes in the groundwater storages were studied from the plot of the course of weekly hydrographs. A detailed analysis of the groundwater level variations showed that the change in the storages proceeded, in general, in a regular rhythm. (Knapp-USGS)
W72-11744

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA: I. LINEAR PROBLEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W72-11745

WATER RESOURCES INVESTIGATIONS IN OREGON, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-11750

AVAILABILITY OF GROUNDWATER FOR IRRIGATION FROM GLACIAL OUTWASH IN THE PERHAM AREA, OTTER TAIL COUNTY, MINNESOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-11752

ELECTRICAL-ANALOG ANALYSIS OF THE HYDROLOGIC SYSTEM, TUCSON BASIN, SOUTHEASTERN ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-11753

THE GEOCHEMISTRY OF UNDERGROUND WATER,
Commonwealth Scientific and Industrial Research Organization, Chatswood (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 03C.
W72-11756

GROUNDWATER PROBLEMS OF THE INTERACTION OF SALINE AND FRESH WATER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 03C.
W72-11763

BALANCED UTILIZATION OF GROUNDWATER RESOURCES,
Layne-Western Co., Kansas City, Mo.
For primary bibliographic entry see Field 04B.
W72-11917

WATER RESOURCES OF THE CENTER HILL LAKE REGION, TENNESSEE.
Geological Survey, Nashville, Tenn.
For primary bibliographic entry see Field 02E.
W72-11978

PUMPING AN ARTESIAN SOURCE FOR WATER TABLE CONTROL,
Agricultural Research Service, Mandan, N. Dak. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04B.
W72-11995

WATER RESOURCES INVESTIGATIONS IN SOUTH CAROLINA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12001

WATER RESOURCES INVESTIGATIONS IN OHIO, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12003

APPLICATION OF AERIAL METHODS IN GROUNDWATER STUDIES,
N. G. Kell.

Indian National Scientific Documentation Center, New Delhi, 1971. 287 p. (TT68-50638 and TT70-57236; Originally published by Izdatel'stvo Akademii Nauk SSSR Moskva, 1962, Leningrad.)

Descriptors: *Groundwater, *Groundwater resources, *Aquifers, *Aquifer characteristics, *Aerial photography, Spectrophotometry, Remote sensing, Terrain analysis, Mapping, Surveys, Geomorphology, Topography, Bodies of water, Soils, Vegetation, Forests, Deserts, Glacial drift, Geographical regions, Instrumentation.
Identifiers: *USSR, *Turkmen SSR, *West Kazakhstan, *Northwestern RSFSR, *Estonian SSR, Aerial photographs, Photographic characteristics, Photo interpretation, Landscapes, Geobotany.

The use of aerial photography in the search for groundwater was based on photographic surveys made by the Laboratory of Aerial Surveying of the USSR Academy of Sciences in 1958-59 in desert, semidesert, and forest zones of the USSR. The areas photographed were the Turkmen Republic, the northern plains of the sub-Caspian lowlands between the Volga and Ural Rivers, and northwestern regions of the RSFSR, including the Leningrad, Pskov, Novgorod and Kalinin Oblasts, and parts of the Estonian SSR. The fundamental purpose of the surveys was to locate and evaluate sources of groundwater on the basis of landscape features identifiable with or indicative of the occurrence of groundwater. The results demonstrate the practicality of direct aerial observation in delineating and interpreting the surface extent of various lithologic units and their water-yielding properties. (Josefson-USGS)
W72-12023

WATER-TRANSMITTING PROPERTIES OF AQUIFERS ON LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
N. E. McClymonds, and O. L. Franke.
Available from GPO, Washington, DC 20402 - Price $2.25. Geological Survey Professional Paper 627-E, 1972. 24 p, 22 fig, 3 plate, 13 tab, 28 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *New York, Data collections, Hydraulic conductivity, Transmissivity, Groundwater movement.
Identifiers: *Long Island (NY).

Since 1900, more than 50,000 wells have been constructed on Long Island. For at least 2,500 of these wells, some information was recorded that is of value in interpreting the hydrologic character of one or more of the four principal aquifers--the upper glacial, the Jameco, the Magothy, and the Lloyd. Enough information is available to make a general interpretation of the hydraulic conductivity and the transmissivity of all aquifers throughout most of the island. A value of hydraulic conductivity was calculated for each lithology in each aquifer. Maps of average hydraulic conductivity were developed for each aquifer on Long Island. Maps of total aquifer transmissivity were developed by combining maps of average aquifer hydraulic conductivity and total aquifer thickness. The estimated average hydraulic conductivity values are about 1,700 gpd per sq ft for the upper glacial aquifer, about 1,300 gpd per sq ft for the Jameco, about 420 gpd per sq ft for the Magothy, and about 360 gpd per sq ft for the Lloyd. Average transmissivity values are about 200,000 gpd per ft for the upper glacial aquifer, , about 100,000 gpd per ft for the Jameco, about 240,000 gpd per ft for the Magoty, and about 90,000 gpd per ft for the Lloyd. (Knapp-USGS)
W72-12027

AN EVALUATION OF THE USE OF DRILLERS' LOGS IN LITHOLOGIC STUDIES OF THE OGALLALA FORMATION OF THE SOUTHERN HIGH PLAINS OF TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W72-12031

HYDRAULIC TESTS IN HOLE UAE-1, AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
W. C. Ballance.
Available from NTIS, Springfield, Va 22151 – Price $3.00 paper copy; 95 cents microfiche. Geological Survey Report USGS-474-102 (Amchitka-9), July 1972. 36 p, 20 fig, 2 tab, 3 ref. AEC. AT (29-2)-474.

Descriptors: *Boreholes, *Hydrologic data, *Data collections, *Hydrogeology, *Alaska, Groundwater movement, Deep wells, Water yield, Mining, Transmissivity, Specific capacity, Water levels, Injection, Drawdown, Water quality, Sampling, Aquifer characteristics.
Identifiers: *Amchitka Island (Alaska).

Inflatable straddle packers were used to isolate and test 12 intervals of about 61 meters each in hole UAe-1, Amchitka Island, Alaska. The static water levels in the intervals tested ranged from about 34 meters below land surface in the upper interval to about 37 m below land surface in the lower interval, indicating decreasing head with depth. The relative specific capacities of isolated zones ranged from 0.007 cu m/day/m of drawdown to more than 5 cu m/day/m of drawdown. The lowest relative specific capacities were found below a depth of 1,922 m. The objectives of the tests were to obtain hydraulic information for better prediction of direction and velocity of groundwater movement, to aid in selection of an interval suitable from a hydrologic standpoint for mining a chamber thousands of feet below the water table, and to obtain samples of water for chemical and radiochemical analysis. (Woodard-USGS)
W72-12037

DENSITY INDUCED MIXING IN CONFINED AQUIFERS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 05B.
W72-12041

EFFECT OF STORM RUNOFF DISPOSAL AND OTHER ARTIFICIAL RECHARGE TO HAWAIIAN GHYBEN-HERZBERG AQUIFERS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 04B.
W72-12101

GEOPHYSICAL MAPPING OF THE WATER TABLE IN EOCENE SEDIMENTS: FEASIBILITY AND RELIABILITY EVALUATION,
Mississippi State Univ., State College. Water Resources Research Inst.
F. E. Followill.
Available from the National Technical Information Service as PB-211 148, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, 1972, 38 p, 26 fig, 2 tab, 10 ref. OWRR A-053-MISS (1).

Descriptors: Aquifers, Geophysics, *Seismology, *Resistivity, *Geologic mapping, *Mississippi, *Water table, Hydrogeology, Sedimentation.
Identifiers: *Eocene sediments.

Shallow seismic refraction measurements and vertical electrical soundings in the outcrop area of Eocene aquifers at seven locations in central and north central Mississippi have been compared with surface and subsurface hydrologic and lithologic conditions. Deeper Wenner soundings were erratic and had to be smoothed prior to interpretation, but were satisfactory for shallow measurements when combined with the seismic refraction measurements for obtained depths to the water table. Dipole soundings using Direct-Currents proved unsatisfactory. Relative errors between depths and thicknesses estimated from the surface geophysical measurements and observed depths and thicknesses in adjacent wells ranged from 5% for shallow depths to a maximum of 15% for depths approaching 250 meters, for the combined measurements of seismic refraction and Schlumberger soundings. Positive identification of the water table was possible with the occurrence of significant increases in both the seismic velocities and electrical resistivities at the same depth.
W72-12104

A CASE STUDY OF THE HYDROGEOLOGIC CONDITIONS IN THE OUTCROP AREA OF AN AQUIFER,
Mississippi State Univ., State College. Water Resources Research Inst.
D. M. Keady, and E. E. Russell.
Available from the National Technical Information Service as PB-211 151, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, 1972, 29 p, 8 fig, 10 ref. OWRR A-058-MISS (1).

Descriptors: *Hydrogeology, Groundwater, *Landslides, *Mississippi, *Sands, Clays, Silts, *Permeability, Soils, Seepage, Aquifers.
Identifiers: *Tombigbee River (Miss), *Slump.

Hydrogeologic investigations in the outcrop area of the Tombigbee Sand Member, a minor aquifer in the Eutaw Formation, were conducted between Mattubby and Town Creeks in Monroe County, Mississippi. Focal point for the study was a large slump, exhibiting unusual features, along a bluff of the Tombigbee River. In the area studied, the Tombigbee Sand is unusually thick, about 190 feet. The member is composed chiefly of fine- to very fine-grained, glauconitic, micaceous sand, with variable amounts of silt and clay. The middle portion of the unit contains clay beds up to 30 feet thick, and one of these appears to be in a position to act as a glide surface for the slump. Permeability of the sand is generally low, but vertical permeability is increased by joints near the bluffs. Movement of water in soils, alluvium, and terrace deposits, which cover large portions of the outcrop, is important in the ground-water regimen. In the slump area, a small man-made lake has hindered normal drainage down the valley. Near the edge of the bluff constant seepage into joints has increased the moisture content of the sand, and has apparently decreased its shear strength, allowing large blocks to collapse when support is removed.
W72-12107

DRAINAGE IN SOILS WITH INITIAL GRADIENT,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W72-12369

HYDROLOGIC INTERPRETATIONS BASED ON INFRARED IMAGERY OF LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-12373

WELL LOSSES DUE TO REDUCED FORMATION PERMEABILITY,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 04B.
W72-12377

INVESTIGATION OF A LANDFILL IN GRANITE-LOESS TERRANE,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-12378

A BASIN STUDY OF GROUND-WATER DISCHARGE FROM BEDROCK INTO GLACIAL DRIFT: PART I--DEFINITION OF GROUNDWATER SYSTEM,
Oklahoma State Univ., Stillwater.
D. C. Kent, and L. V. A. Sendlein.
Groundwater, Vol 10, No 4, p 24-34, July-August 1972. 10 fig, 1 tab, 10 ref.

Descriptors: *Groundwater basins, *Hydrogeology, *Iowa, *Groundwater movement, *Mapping, Aquifers, Aquifer characteristics, Water quality, Discharge (Water), Recharge, Geophysics, Geohydrologic units.
Identifiers: *Skunk River basin (Iowa).

A regional preliminary groundwater investigation in the Upper Skunk River basin near Ames, Iowa, used a systematic basin approach integrating geological, geophysical, groundwater, and water quality investigations. First, second and final approximation maps were constructed. Interpretation of first approximation maps led to a field program which resulted in the second approximation maps. Examination and comparison of the second approximation maps pointed to problem areas which with further geophysical and geological field checks let to construction of the final approximation maps. A complex system of bedrock channels were defined using electrical resistivity, shallow seismic refraction and geological methods. Bedrock topography, subcrop geology, piezometric surface, sand and gravel thickness, distribution of water quality, resistivity data, and regolith lithology were mapped. A partially-confined bedrock aquifer and channel and shallow sands are hydraulically connected. The similarity of bedrock and piezometric surfaces is evidence of discharge from the bedrock into the channel sands and gravel. A bedrock recharge map was prepared in order to define zones of groundwater recharge from the bedrock. (Knapp-USGS)
W72-12379

APPLICATION OF HARRILL'S EQUATION TO A LIMESTONE AQUIFER,
New Mexico Inst. of Mining and Technology, Socorro.
W. K. Summers.
Groundwater, Vol 10, No 4, p 21-23, July-August 1972. 3 tab, 1 ref.

Descriptors: *Computer programs, *Aquifer testing, *Drawdown, New Mexico, Water yield, Transmissivity, Limestones, Data processing.
Identifiers: *Well efficiency.

A computer program is given for applying Harrill's (1971) equation for the determination of the coefficient of transmissivity from the water level recovery made following a step-drawdown test. The validity and applicability of the equation are shown by using step-test data from New Mexico. (Knapp-USGS)
W72-12380

PRACTICAL SOLUTIONS FOR PUMPING TESTS IN CARBONATE-ROCK AQUIFERS,
Ohio Dept. of Natural Resources, Columbus.
For primary bibliographic entry see Field 04B.
W72-12382

EFFECTS OF GROUNDWATER PUMPING IN PARTS OF LIBERTY AND MCINTOSH COUNTIES, GEORGIA, 1966-70,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 04B.
W72-12384

TECHNIQUE FOR PREDICTING GROUNDWATER INFLOW TO LARGE UNDERGROUND OPENINGS,
Geological Survey, Denver, Colo.
W. W. Dudley.
Society of Mining Engineers Transactions, Vol 252, p 149-153, June 1972. 6 fig, 2 tab, 8 ref.

Descriptors: *Groundwater movement, *Mathematical models, *Aquifer testing, *Dewatering, *Excavation, Drawdown, Transmissivity, Water yield, Artesian aquifers, Hydraulic conductivity, Permeability.
Identifiers: *Large underground openings.

The initial step in predicting groundwater inflow into large underground excavations involves hydraulic tests in exploratory drill holes. Zones within the area of interest are isolated in the drill hole by inflatable packers and are tested by measuring the water-level responses to applied hydraulic stresses. These responses may then be translated into significant hydraulic characteristics of the tested rocks such as transmissivity, hydraulic conductivity, hydraulic potential, and storage coefficient by using a type-curve solution. Once the geometry and necessary hydraulic characteristics have been determined for the rock in the vicinity of the proposed opening, a mathematical model can be developed. The mathematical method applied to the model considers conditions of partial penetration and nonsteady-state, leaky-artesian, constant-drawdown discharge of groundwater. A type-curve solution results in the variation of discharge (inflow) with time. This technique of predicting groundwater inflow has been used in planning construction of cylindrical chambers for use in underground nuclear experiments by the U.S. Atomic Energy Commission. These chaf ers have been constructed in low-permeability rocks at depths as much as 6000 ft and under hydraulic heads of thousands of feet. (Knapp-USGS)
W72-12388

2G. Water in Soils

SALINITY AND WATER USE.
For primary bibliographic entry see Field 03C.
W72-11755

CHEMISTRY OF SALINE SOILS AND THEIR PHYSICAL PROPERTIES,
Western Australia Univ., Nedlands. Inst. of Agriculture; and Western Australia Univ., Nedlands. Dept. of Soil Science.
For primary bibliographic entry see Field 03C.
W72-11760

HYDROLOGY OF SWELLING SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 03C.
W72-11761

TRANSPORT OF SALTS IN UNSATURATED AND SATURATED SOILS,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Soils.
For primary bibliographic entry see Field 03C.
W72-11762

RELATION BETWEEN THE DEGRADATION OF DDT AND THE IRON REDOX SYSTEM IN SOILS,
Agricultural Research Service, Beltsville, Md. Soils Lab.; and Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W72-11830

EFFECT OF PESTICIDE RESIDUES AND OTHER ORGANOTOXICANTS ON THE QUALITY OF SURFACE AND GROUND WATER RESOURCES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W72-11867

INFLUENCE OF FERTILIZER PRACTICES ON WATER AND THE QUALITY OF THE ENVIRONMENT,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-11880

THE EFFECTS OF BURNING ON THE HEAT AND WATER REGIMES OF LICHEN--DOMINATED SUBARCTIC SURFACES,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
W. R. Rouse, and K. A. Kershaw.
Arct Alp Res. 3 (4): 291-304. Illus. Maps. 1971.
Identifiers: *Burning, Evaporation, Heat, *Lichen, *Soil moisture, Water regimes, Soils, Subarctic.

Areas of ground lichen in the subarctic are particularly susceptible to fire either by man's activity or by natural causes. Experimental evidence from the Hudson Bay lowlands gathered in the summer of 1970 indicates that the burning of lichen has a pronounced effect on the ground water regime. Soil moisture measurements made in a mature lichen woodland with thinly spaced trees, and in areas of recent and older burning indicate that the soil moisture under the lichen-dominated surface was at least 40% greater than in either of the burned areas. This suggests that a mature lichen cover offers a high resistance to the evaporation of soil moisture. The nature of the evaporation regime was determined using the energy budget (Bowen Ratio) approach over each surface. These data were augmented by measurements of the moisture content of the lichen made at 3 levels with the canopy. The evidence indicates that lichen-dominated surfaces act as an effective mulch in preventing evaporation from the subsurface zone whereas the burned areas which are able to evaporate more water into the atmosphere when moist, also develop strong resistances to evaporation as the soil surface layers become drier. The role of ground lichen in the water budget of northern lands is significant because of its extensive cover and its destruction by fire must exert an important influence on the hydrologic and atmosphere water regimes.--Copyright (c) 1972, Biological Abstracts, Inc.
W72-11885

INFLUENCE OF SITE CHARACTERISTICS ON QUALITY OF IMPOUNDED WATER,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W72-11906

SUBGRADE MOISTURE UNDER OKLAHOMA HIGHWAYS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 04C.
W72-11993

LIQUID CRYSTALS IN QUICK CLAYS,
Swedish Inst. for Surface Chemistry, Stockholm.
S. Friberg, and K. Roberts.
Nature Physical Science, Vol 238, No 83, p 77-78, July 31, 1972. 2 fig, 11 ref.

Descriptors: *Quick clays, *Soil chemistry, *Surfactants, *Clays, *Clay minerals, Suspension,

Water chemistry, Dispersion, Colloids, Ion exchange.
Identifiers: *Liquid crystals.

A liquid crystal-stabilized dispersion, though highly stable, flocculates to large aggregates before sedimentation finally occurs. Such a dispersed system can be rendered unstable by addition of sufficient salt to transform the liquid crystalline phase to micelles. It is possible that the critical micelle concentration (c.m.c.) in quick clays is depressed enough for the total solution composition to lie within the micellar solution area. The Rosenqvist theory of quick clays requires a coagulated sediment which can be dispersed to a stable suspension. This is provided by a liquid crystal dispersant. The coagulation by salts of such a dispersion may depend on the proximity of the solution composition to the micellar phase boundary. This allows variations of salt content in quick clays. The presence of organic surfactants in clay deposits allows the possibility that associated surfactant phases are responsible for the quickness of certain clays. (Knapp-USGS)
W72-12013

NITRATE IN THE UNSATURATED ZONE UNDER AGRICULTURAL LANDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W72-12042

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, SAN MIGUEL COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-12098

A CASE STUDY OF THE HYDROGEOLOGIC CONDITIONS IN THE OUTCROP AREA OF AN AQUIFER,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 02F.
W72-12107

SOME ASPECTS OF WATER MOVEMENT THROUGH SOILS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 05B.
W72-12216

SOME PROBLEMS IN THE DIFFUSION OF IONS IN SOILS,
Oxford Univ. (England). Soil Science Lab.
For primary bibliographic entry see Field 05B.
W72-12217

CATION EXCHANGE IN SOILS,
Louvain Univ. (Belgium). Laboratoire Chimie Biologique.
For primary bibliographic entry see Field 05B.
W72-12218

SORPTION AND TRANSPORT IN SOILS,
Instituut voor Toepassing van Atoomenergie in de Landbouw, Wageningen (Netherlands).
For primary bibliographic entry see Field 05B.
W72-12219

BITTERBRUSH SEEDLING ESTABLISHMENT AS INFLUENCED BY SOIL MOISTURE AND SOIL SURFACE TEMPERATURE,
Forest Service (*USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W72-12357

WATER MOVEMENT IN LAYERED SOILS. 2. EXPERIMENTAL CONFIRMATION OF A SIMULATION MODEL,
Agricultural Univ., Wageningen (Netherlands). Lab. of Soils and Fertilizers; Agricultural Univ., Wageningen (Netherlands). Dept. of Theoretical Production Ecology; and Grenoble Univ. (France). Laboratoires de Mechani que des Fluides.
L. Stroosnijder, H. van Keulen, and G. Vachaud.
Netherlands Journal of Agricultural Science, Vol. 20, No. 1, p 67-72, 1972. 4 fig, 5 ref.

Descriptors: *Infiltration, *Hydraulic conductivity, *Model studies, *Soil water movement, Estimating equations, Evaluation, Hysteresis, Soil moisture.

A simulation model has been developed for predicting the movement of a rain infiltration front in a layered sandy soil. Computed results are compared with experimental results. Infiltration profiles obtained by the 2 methods are in satisfactory agreement, although there are minor deviations. The deviations may be due to incorrect assumptions concerning the hydraulic conductivity-water content relationship or to the neglect of hysteresis. The degree of agreement confirms the assertion that the behavior of soil water can be calculated accurately if the soil properties are known in sufficient detail. (Casey-Arizona)
W72-12358

DRAINAGE IN SOILS WITH INITIAL GRADIENT,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
A. J. Valsangkar, and K. Subramanya.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 309-315, June 1972. 5 fig, 11 ref.

Descriptors: *Trenches, *Non-Newtonian flow, *Groundwater movement, *Flow characteristics, *Soil water movement, Drainage water, Dupuit-Forcheimer theory, Confined water, Hydraulic gradient, Hydraulic models, Theoretical analysis.
Identifiers: *Unconfined flow, *Initial gradient.

Seepage through clayey and loamy soils is a common problem in the field and drainage engineering. Like many non-Newtonian fluids, seepage through such soils is initiated only when the hydraulic gradient exceeds a certain value called the initial gradient. Consequences of this type of non-Darcy behavior are of potential interest in several disciplines. In drainage problems nonrecognition of the initial gradient will result in inefficient layout of the drains. Assuming the Dupuit-Forcheimer assumptions to be valid, a general solution for unconfined flow into a trench has been derived. The importance of the initial gradient in affecting the spacing of the trench and discharge reduction, is emphasized. In confined flow, the presence of the initial gradient reduces the effective head. (Casey-Arizona)
W72-12369

BORDER IRRIGATION ADVANCE AND EPHEMERAL FLOOD WAVES,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02E.
W72-12371

DEFORMATION OF NATURAL SOIL WATER DISPERSION SYSTEMS UPON THAWING,
For primary bibliographic entry see Field 02C.
W72-12386

2H. Lakes

COMPARISON OF EVAPORATION COMPUTATION METHODS, PRETTY LAKE, LAGRANGE COUNTY, NORTHEASTERN INDIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02D.
W72-11741

SOME DISTINCTIVE FEATURES OF AUSTRALIAN INLAND WATERS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-11742

VARIATION OF MANGANESE, DISSOLVED OXYGEN AND RELATED CHEMICAL PARAMETERS IN THE BOTTOM WATERS OF LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 05B.
W72-11809

SURVIVAL OF SOME FRESHWATER FISHES IN THE ALKALINE EUTROPHIC WATERS OF NEBRASKA,
Hastings Coll., Nebr.
For primary bibliographic entry see Field 05C.
W72-11845

THE ALGAL BIOLOGY OF A TROPICAL MONTANE RESERVOIR (MLUNGUSI DAM, MALAWI),
Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 05C.
W72-11874

SEDIMENTATION OF WILLIAMS RESERVOIR, SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-11977

VOLUME WEIGHT OF RESERVOIR SEDIMENT IN FORESTED AREAS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02J.
W72-12000

IRON BACTERIA IN SOME LAKES OF THE KARELIAN ISTHMUS,
Laboratory of Limnology, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W72-12015

INVESTIGATIONS OF LAKE-EFFECT SNOWSTORMS,
Cornell Aeronautical Lab, Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 02C.
W72-12029

MERCURY POLLUTION CONTROL IN STREAM AND LAKE SEDIMENTS,
Advanced Technology Center, Inc., Dallas, Tex.
For primary bibliographic entry see Field 05G.
W72-12070

AQUATIC VASCULAR PLANT DISTRIBUTION IN CHEAT LAKE (LAKE LYNN), WEST VIRGINIA,
West Virginia Univ., Morgantown.

For primary bibliographic entry see Field 05C.
W72-12085

LAKE SUPERIOR PERIPHYTON IN RELATION TO WATER QUALITY,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 05C.
W72-12192

SEASONAL CHANGES OF THE HETEROTROPHIC MICROFLORA OF THE ILAWA LAKES BOTTOM DEPOSITS,
Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland).
For primary bibliographic entry see Field 05C.
W72-12254

THE INFLUENCE OF INCUBATION TEMPERATURE ON TOTAL COUNTS OF BACTERIA IN WATER (WPLYW TEMPERATURY INKUBCJI WYSIEWOW NA OZNACZANIE OGOLNEJ LICZBY BAKTERII W WODZIE),
Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland). Katedra Mikrobiologii Technicznej.
For primary bibliographic entry see Field 05C.
W72-12258

MICROBIOLOGICAL CHARACTERIZATION OF GROUND DEPOSITS IN THE LAKES OF THE DISTRICT OF ILAWA IN THE YEARS OF 1960-1963 (CHARAKTERYSTYKA MIKROBIOLOGICZNA OSADOW DENNYCH JEZIOR ILAWSKICH W LATACH 1960-1963),
Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland). Katedra Mikrobiologii Technicznej.
For primary bibliographic entry see Field 05C.
W72-12259

VEGETATION OF AN ALPINE BOG ON EAST MAUI, HAWAII,
R. J. Vogl, and J. Henrickson.
Pac Sci. Vol 25, No 4, p 475-483, 1971, Illus.
Identifiers: *Alpine bog, Bryophytes, Carex-Montis-Eeka-M, Deschampsia-Australis-M, *Hawaii, Hydrarch, Lichen, Maui, Oreobolus-Furcatus-M, Succession, Vaccinium-Pha Pahalae-D, *Vegetation.

Ten species of vascular plants, 2 bryophytes, and 1 lichen comprised the flora of a bog located on the northeast outer slopes of Haleakala Crater at 7440 ft elevation. The vegetation was dominated by Carex montis-eeka and Deschampsia australis, along with lesser amounts of Oreobolus furcatus and the dwarf Vaccinium pahalae. Despite its higher location, the area shares similarities with other Hawaiian bogs, except that it possesses a very simple flora. Lobelia and/or Argyroxiphium spp. may have once existed in the bog but could have been eliminated by past heavy grazing. The bog occupies a large saucer-shaped depression filled with acid peat. It is considered to have developed by the process of hydrarch plant succession rather than the usual site deterioration and plant retrogression.--Copyright 1972, Biological Abstracts, Inc.
W72-12273

THE CARP, CYPRINUS CARPIO, IN THE BUKHTARMINSKOE RESERVOIR,
L. A. Fedotova.
Vopr Ikhtiol. Vol 11, No 3, p 457-463. 1971.
Identifiers: *Fish management, Bukhtarminskoe reservoir, *Carp, *Chironomidae, Cyprinus carpio, Food, Parasites, USSR.

Biologic investigations were conducted on C. carpio, one of the most important commercial fishes, in the Bukhtarminskoe reservoir in eastern Kazakhstan from 1960-1969. Chironomidae larva were found to be the primary source of food for the carp; however, their food also consisted of macrophytes and plant and animal detritus. Eight orders of carp parasites were found to be widely distributed in the reservoir. Nevertheless, the rate of infectivity was very low. Recommendations were also made that fishing be limited to individuals at least 45 cm in length, and that fishing be entirely prohibited during spawning from May 15 to the end of June.--Copyright 1972, Biological Abstracts, Inc.
W72-12284

TEMPERATURE MICROSTRUCTURE IN CRATER LAKE, OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
V. T. Neal, S. J. Neshyba, and W. W. Denner.
Limnol Oceanogr. Vol 16, No 4, p 695-700. 1971. Illus. Map.
Identifiers: *Crater Lake, *Oregon, Temperature, Lakes, *Thermal stratification.

Vertical temperature profiles made in Crater Lake with a modified XBT system show that layers of nearly isothermal water, separated by sheets of relatively high temperature gradient, exist in the upper 265 m of the lake. The microstructure was better developed and more persistent in later than in early summer. The relationship between temperature microstructure and rate of vertical heat transfer in lakes is still undetermined.--Copyright 1972, Biological Abstracts, Inc.
W72-12351

WATER BUDGET AND QUALITY OF WATER STUDIES OF HUBBARD CREEK RESERVOIR, TEXAS, 1963-67 WATER YEARS,
Geological Survey, Austin, Tex.
B. N. Myers.
Texas Water Development Board Report 151, June 1972. 9 p, 1 fig, 2 tab, 15 ref.

Descriptors: *Reservoirs, *Hydrologic budget, *Water quality, *Texas, Data collections, Hydrologic data, Geology, Water balance, Precipitation (Atmospheric), Inflow, Discharge (Water), Evaporation, Infiltration.
Identifiers: *Hubbard Creek Reservoir (Tex).

The results of a water budget and chemical quality of water study of Hubbard Creek Reservoir (Texas) are presented. Data collected permitted computation of watershed precipitation, inflow and outflow of the reservoir, evaporation, and chemical analysis of water. Small water losses were attributed to saturation of alluvium in the reservoir basin during the initial filling of the reservoir. Because there are no groundwater aquifers of importance in the watershed, and because the sediments within the drainage basin are relatively impermeable, no large amounts of water are lost by infiltration. During the period 1963-67, about 110,000 acre-feet of water was lost by evaporation. This amount represents about 30% of the capacity of the reservoir at normal operating level. Water-sample analyses from tributaries passing through oil fields indicate that industrial waste contributes to mineralization of the reservoir water. (Woodard-USGS)
W72-12385

SNOW ICE AND ITS SIGNIFICANCE IN COMPUTING THE THICKNESS OF THE ICE COVER,
For primary bibliographic entry see Field 02C.
W72-12387

2I. Water in Plants

SALINITY AND THE WHOLE PLANT,
Adelaide Dept. of Agriculture (Australia).
For primary bibliographic entry see Field 03C.
W72-11767

SALINITY AND PLANT CELLS,
Sydney Univ. (Australia). School of Biological Sciences.
For primary bibliographic entry see Field 03C.
W72-11768

STUDIES ON THE HABITAT SEGREGATION OF PINUS DENSIFLORA AND P. THUNBERGII. I, (IN JAPANESE),
YoshitoOkimura.
Bull Fac Agric Shimane Univ. 3. p 35-39. 1969. English summary.
Identifiers: *Habitat, Moisture, *Pinus densiflora G, *Pinus thunbergii G, Segregation, Slope.

P. densiflora and P. thunbergii are generally segregated but partially overlap. Ridges and upper parts of a hillside are inhabited by P. densiflora. In dry valleys and lower parts of hillsides, both species appear equally. Dry places are inhabited mainly by P. densiflora, but scarcely by P. thunbergii. Both species occur together in moist places.--Copyright 1972, Biological Abstracts, Inc.
W72-11813

FURTHER SUGGESTIONS FOR A CLASSIFICATION OF SUBTERRANEAN BIOTOPES AND BIOCOENOSES OF THE FRESHWATER FAUNA,
Limnologische Fluss Station, Schlitz (West Germany).
S. Husmann.
Int Rev Gesamten Hydrobiol. Vol 55 No 1 p 115-129. 1970. English summary.
Identifiers: Biotopes, Ciocenoses, *Classification, *Aquatic animals, Terminology.

The 'attempt at an ecological classification of the interstitial groundwater into characteristic biotopes' (Husmann, 1966) is continued by the unification of terms for ecosystems, biotopes, and biocoenoses. The running water ecosystems 'rhithrocoen' and 'potamocoen' are contrasted with the ecosystem 'eulimnocoen' (lakes). The ecosystem in groundwater filled spaces of sandy and gravely lake basins is named 'eulimnostygocoen,' the interstitial biotope is named 'eulimnostygal' and the biocoenose is named 'eulimnostygon.' The biotopes and biocoenoses can be named more exactly according to the nature of the substrate: 'eulimnostygopsammal,' 'eulimnostygopsephal,' 'eulimnostygopsammon,' 'eulimnostygopsephon.' Epigean and endogean biotopes of the ecosystems 'rhithrocoen,' 'potamocoen' and 'eulimnocoen' are presented as ecological complexes of a higher order. The stygolimnological methods of classification used here, derived from Thienemann (1925) and Illies (1961), are contrasted with other methods for the classification of underground freshwater biotopes.--Copyright 1972, Biological Abstracts, Inc.
W72-11817

PHOTOSYNTHETIC RESPONSE OF BRIGALOW TO IRRADIANCE, TEMPERATURE AND WATER POTENTIAL,
British Columbia Forestry Service, Victoria. Research Div.
R. Van Den Driessche, D. J. Connor, and B. R. Tunstall.
Photosynthetica. 5 (3): 210-217, Illus. 1971.
Identifiers: Acacia-Harpophylla-D, Australia, *Brigalow-D, Irradiance, *Photosynthetisis, Water potential, Stomata, Temperature, *Xerophytes.

A laboratory study was made of effects of irradiance, temperature, and water potential on photosynthesis in phyllodes of brigalow (Acacia harpophylla F. Muell.), a xerophytic tree from semi-arid regions of subtropical Australia. The mean maximum rate of net photosynthesis (PN), of 13.6 mg CO2 dm-2h-1, was at least as high as PN values for temperate zone woody evergreens, but

the temperature for maximum PN, of 26 deg C, was not much higher than the temperature for maximum PN in other species. The ability to maintain some degree of PN down to water potentials of at least -60 bars was a striking feature of brigalow. PN was closely dependent on stomatal control over the ranges of irradiance, temperature, and plant water potential investigated, and the average minimum value for stomatal resistance to water vapor transfer was 4.5 s cm-1.--Copyright 1972, Biological Abstracts, Inc.
W72-11843

VARIATION IN INFRARED REFLECTANCE OF EUCALYPTUS RADIATA DC,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
R. Story, and G. A. Yapp.
Aust J Biol Sci. 24 (5): 945-953, Illus, 1971.
Identifiers: *Eucalyptus-Radiata-D, *Infrared reflectance, Water stress, *Leaves.

Various workers have reported that green plants which are diseased or in need of water have a lower IR reflectance and consequently a blue image on false color film. The IR reflectance of E. radiata leaves rises as they become dry, and produces no blueness of the false color image. It is suggested that blue images of E. radiata recorded in the field are due to lower reflectance of the IR wavelengths by flowers. Water stress is not likely to be detected on false color film until the plants are visibly affected.--Copyright 1972, Biological Abstracts, Inc.
W72-11851

THE VEGETATION AND ITS DISTRIBUTION ON RIDEAU RIVER ISLAND, OTTAWA,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
J. L. Cameron, and J. D. H. Lambert.
Nat Can. 98 (4): 675-689, Illus, Map, 1971, French summary.
Identifiers: Canada, *Distribution patterns, Flooding, Ice, Islands, Ottawa, *Populus-Balsamifera-D, Rideau River Island, Salix-Nigra-D, Scouring, Spring, Ulmus-Americana-D, *Vegetation.

The vegetational composition of a Rideau River Island was quantitatively determined. Three floristic units were delimited. The exposed south end was dominated by immature Populus balsamifera, the central portion of the island by mature Salix nigra, and the north end by mature Ulmus americana and P. balsamifera. The principal factors governing the composition of these units are the degrees of exposure to the scouring effects of ice and spring flood waters. Succession to more mesic species would require substantial soil development, a process that appears unlikely at present because the flood waters remove most if not all of the accumulated organic material each spring.--Copyright 1972, Biological Abstracts, Inc.
W72-11852

THE RESISTANCE TO DESICCATION AND HEAT OF THE ASEXUAL CYSTS OF SOME FRESHWATER PRASINOPHYCEAE,
Culture Centre for Algae, Protozoa, Cambridge (England).
J. H. Belcher.
Br Phycol J. 5 (2): 173-177. 1970.
Identifiers: *Asexual cysts, *Desiccation, Heat, Heteromastix, Monomastix, Pedinomonas, *Prasinophyceae, Pyramimonas, Scherffelia, Spermatozopsis.

Experiments were carried out on 11 clonal cultures representing the prasinophycean genera Heteromastix, Spermatozopsis, Monomastix, Pyramimonas, Pedinomonas and Scherffelia to determine the viability after desiccation of any resting stages, Resistance to dry heat was also tested. The results are discussed with reference to natural conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-11868

WAX FILAMENTS ON SORGHUM LEAVES AS SEEN WITH A SCANNING ELECTRON MICROSCOPE,
Duke Univ., Durham, N.C.
For primary bibliographic entry see Field 03F.
W72-12343

PLANT MOISTURE STRESS PATTERNS IN EUROTIA LANATA AND ATRIPLEX CONFERTIFOLIA,
Utah State Univ., Logan. Dept. of Range Science; and Utah State Univ., Logan. Ecology Center.
N. E. West.
Northwest Science, Vol. 46, No. 1, p 44-51, 1972. 2 fig, 3 tab, 13 ref.

Descriptors: *Xerophytes, *Ecological distribution, *Soil-water-plant relationships, *Moisture stress, *Halophytes, Saline soils, Rainfall, Plant physiology, Soil moisture, Biological communities, Arid lands, Diurnal, On-site data collections, Seasonal.
Identifiers: *Soil water potential, *Plant water potential.

The natural distributions of plants might be a reflection of their relative abilities to withstand low water potentials. The effects of soil moisture on xerophyte growth are difficult to interpret because plant moisture stress is a function of soil salinity as well as soil moisture and because many desert shrubs grow at soil moisture levels that are below the permanent wilting percentage for agronomic species. Using a pressure bomb, diurnal and seasonal internal plant moisture stress was measured in individuals of Eurotia lanata and Atriplex confertifolia in 3 different stands in Curlew Valley north of the Great Salt Lake: a pure Eurotia stand, a mixed stand and a pure Atriplex stand. The highest moisture stress values were recorded in early to mid-afternoons of the driest, hottest days. Stress values were immediately reduced by rainfalls of 8 mm or more. Species distribution differences could not be explained by plant moisture stress differences. Possible reasons for this are discussed. (Casey-Arizona)
W72-12344

THE INFLUENCE OF POTASSIUM ON THE TRANSPIRATION RATE AND STOMATAL OPENING IN TRITICUM AESTIVUM AND PISUM SATIVUM,
Lund Univ. (Sweden). Dept. of Plant Physiology.
For primary bibliographic entry see Field 02D.
W72-12345

DIURNAL ACTIVITY IN A SMALL DESERT RODENT,
Tel-Aviv Univ. (Israel). Dept. of Zoology.
A. Shkolnik.
International Journal of Biometeorology, Vol 15, No 2-4, p 115-120, 1971. 4 fig, 1 tab, 5 ref.

Descriptors: *Xerophilic animals, *Animal physiology, *Animal behavior, *Biological communities, *Water balance, Ecological distribution, Mammals, Arid lands, Temperature, Heat balance, Diurnal.
Identifiers: *Thermoregulation.

Two Murid rodents of the same genus, Acomys cahirinus (golden spiny mouse), Acomys russatus (common spiny mouse) are widely distributed in the same desert habitats in Israel, and are similar in their morphology and life history. They differ only in their activity patterns: the common spiny mouse is strictly nocturnal while the golden spiny mouse is active during the day. Two adjoining stone piles containing mixed populations of these rodents were studied. In one pile, mice were trapped, all common spiny mice caught were removed and all golden spiny mice caught were released. The other pile served as a control, with all mice caught being released. The trapping resulted in a major change in golden spiny mice behavior: individuals of the species became active and were trapped during the night. It appears that the golden spiny mice were temporally displaced by their more vigorous kindred and that they are physiologically more adaptable to the desert than the common spiny mice. The golden spiny can survive over a higher temperature range and it generates less metabolic heat. The animal has an exceptionally high evaporation rate which allows it to dissipate, at temperatures above 30 degrees C, over one-third of the heat it generates. The high evaporation is made possible by a water balance achieved through a very efficient kidney and a diet of succulent snails. Physiological thermoregulation is supplemented by behavioral avoidance of direct sunlight. (Casey-Arizona)
W72-12359

TOPOGRAPHIC RELATIONS OF VEGETATION AND SOIL IN A SOUTHEASTERN ARIZONA GRASSLAND,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 04A.
W72-12364

RESEARCH ON SUBTERRANEAN WATERS: THE COLONIZATION OF A WATER DRAINAGE CHANNEL LOCATED IN THE PERMANENT CIRCULATION ZONE BY HARPACTICOIDEA,
R. Rouch.
Ann Speleol, Vol 26, No 1, p 107-133, 1971, Illus, English summary.
Identifiers: Channels, Circulation, Colonization, Drainage, *Harpacticoidea, *Subterranean waters.

Harpacticoidea show a very peculiar way of colonization in the permanent circulation zone. The distribution of 8229 individuals shows the importance of the interstitial lacunar space for hypogeous species and makes conspicuous a passive transfer of epigeous species along the subterranean stream.--Copyright 1972, Biological Abstracts, Inc.
W72-12365

SPECIFIC STRUCTURAL ALTERATIONS OF THE CHLOROPLASTS OF SPINACH LEAVES BY NEUTRAL SALTS,
California Univ., Davis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 03C.
W72-12366

THE FISHES OF THE WOLF RIVER, TENNESSEE AND MISSISSIPPI,
Memphis State Univ., Tenn.
D. W. Medford, and B. A. Simco.
J Tenn Acad Sci, Vol 46, No 4, p 121-123, 1971, Illus.
Identifiers: Fish, Habitat, *Mississippi, Species, *Tennessee, *Wolf River.

The Wolf River in Tennessee and Mississippi was studied between July 18, 1967, and July 13, 1968. Fifty-two spp. of fish were collected in this study and observations are reported regarding the habitats in which each species was found.--Copyright 1972, Biological Abstracts, Inc.
W72-12368

DESICCATION TOLERANCE IN THREE RACES OF AMBYSTOMA TIGRINUM IN NORTH DAKOTA,
Dept. of Fisheries and Wildlife. Oreg. State Univ., Corvallis.
D. W. Larson.
Copeia. 4 p 743-747. 1971. Illus. Map.
Identifiers: *Moisture stress, *Adaptation, Resistance, Ambystoma tigrinum, Ambystoma tigrinum diaboli, Ambystoma tigrinum melanostictum, Ambystoma tigrinum tigrinum, Desiccation, North Dakota.

The probable relationship between the east-west moisture gradient and the distribution of 3 A. tigrinum races suggests possible specializations that might be of adaptive value under varying conditions of environmental moisture in North Dakota. The response of A. t. tigrinum and A. t. diaboli to desiccation is similar, and this supports the moisture relationships apparent in the state. The ability of A. t. melanostictum to tolerate greater water loss may be due to physiological adaptations which are selective in habitats where water availability poses a continual threat.--Copyright 1972, Biological Abstracts, Inc.
W72-12383

2J. Erosion and Sedimentation

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 02E.
W72-11866

EFFECTS OF CONSERVATION TECHNIQUES ON YIELD,
For primary bibliographic entry see Field 03B.
W72-11909

A THEORETICAL AND EXPERIMENTAL STUDY OF CLIMBING-RIPPLE CROSS--LAMINATION, WITH A FIELD APPLICATION TO THE UPPSALA ESKER,
Uppsala Univ. (Sweden). Dept. of Physical Geography.
J. R. L. Allen.
Geografiska Annaler, Vol 53A, No 3-4, p 157-187, 1971. 17 fig, 6 tab, 69 ref.

Descriptors: *Ripple marks, *Sedimentary structures, *Glacial drift, *Beds (Stratigraphic), Currents (Water), Sediment transport, Bed load, Alluvium.
Identifiers: *Eskers, *Sweden, *Cross-lamination (Stratigraphy).

The angle of climb of ripples in climbing-ripple cross-lamination depends theoretically on the net rate of deposition on the bed, the bed-load transport rate in the absence of net deposition, and a deposition rate difference between upstream and downstream ripple faces. Theoretically, the local size-sorting in cross-laminated deposits becomes less marked as the angle of climb increases. With increasing steepness of climb, the internal structure of the deposit changes from cross-laminae filling erosional troughs to laminae that are very continuous laterally. These various predictions are broadly confirmed in a series of laboratory flume experiments covering a 300-fold range of the angle of climb. Additional confirmation of the prediction concerning local size-sorting is obtained from measurements made on cross-laminated sands in the Uppsala esker at Loftsalot. Making use of a further theoretical relationship enabling mean flow velocity to be calculated from sediment mean size, rates of sediment deposition were estimated for beds with climbing-ripple cross-lamination in the Uppsala esker. The flows depositing the beds appear to have varied in discharge on a time scale varying between several hours and a few tens of hours. Such a periodicity is consistent with what is known of discharge fluctuations in modern glacial streams. (Knapp-USGS)
W72-11976

SEDIMENTATION OF WILLIAMS RESERVOIR, SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. R. Ritter, and W. M. Brown, III.
Geological Survey Open-file Report, April 6, 1972. 26 p, 8 fig, 6 tab, 11 ref.

Descriptors: *Sedimentation, *Reservoirs, *California, *Forest fires, *Sediment yield, Soil erosion, Reservoir silting, Sediment load, Data collections, Hydrologic data.
Identifiers: *Williams Reservoir (Calif), Santa Clara County (Calif).

Fifty-two acre-feet of sediment was deposited in Williams Reservoir, California, between 1913 and 1971. From calculations of the sediment yields in other nearby drainage basins in Santa Clara County, it was determined that 24 to 38 acre-feet of sediment would have been transported to Williams Reservoir between 1961 and 1971 under natural conditions. The difference (14 to 28 acre-feet) is probably a consequence of increased sediment yield due to a fire that destroyed much of the vegetation in the drainage basin in 1961. (Knapp-USGS)
W72-11977

DEBRIS FALLS AT THE FRONT OF ARAPAHO ROCK GLACIER, COLORADO FRONT RANGE, U.S.A.,
Ohio State Univ., Columbus. Dept. of Geology.
S. E. White.
Geografiska Annaler, Vol 53A, No 2, p 86-91, 1971. 4 fig, 2 tab, 4 ref. NSF Grant GP-2822.

Descriptors: *Rock glaciers, *Glaciers, *Colorado, *Debris avalanches, Mass wasting, Erosion, Movement, Geomorphology, Regimen, Ice, Sediment transport.
Identifiers: *Arapaho Rock Glacier (Colo).

Debris falls at the front of Arapaho Rock Glacier in Colorado Front Range were identified by photography from a monumented photo site over a 9-year period, 1961-1970. Volume of fallen debris gives annual movement of 5.3 cm/yr and discharge of about 211 cu m/yr. Direct correlation exists between surface movement of the whole rock glacier and debris-fall activity. Debris falls are spasmodic; pathways continue active for years, but eventually clog and are idle. Old inactive routes are cleared out and reactivated. Talus finally accumulates at the base, is overridden and possibly incorporated into the rock glacier. (Knapp-USGS)
W72-11980

SOME ASPECTS OF GRANITE WEATHERING AND TOR FORMATION ON DARTMOOR, ENGLAND,
London Univ. (England). Dept. of Geography; and Bedford Coll., London (England).
M. J. Eden, and C. P. Green.
Geografiska Annaler, Vol 53A, No 2, p 92-99, 1971. 3 fig, 3 tab, 23 ref.

Descriptors: *Weathering, *Erosion, *Granites, *Soil formation, *Geomorphology, Topography.
Identifiers: *Dartmoor (England), *Tors.

The products of weathering and pneumatolytic alteration on the granite of Dartmoor in southwestern England are described, and the relation of the weathered granite to the tors of the area is discussed. Textural and mineral investigations distinguish between the products of alteration and those of weathering, and the weathering resembles sandy weathering products on granite elsewhere in Europe. A deeply weathered zone differs in character from zones of deep weathering described in the humid tropics. Field seismic investigations suggest that the deep weathering on Dartmoor may have been confined to the margin of the granite and to the main river valleys. The tors of the Dartmoor granite were exhumed from the zone of deep weathering. (Knapp-USGS)
W72-11981

ICE CORED MOUNDS AND PATTERNED GROUND, SOUTHERN BANKS ISLAND, WESTERN CANADIAN ARCTIC,
Ottawa Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W72-11982

ICE CORED MORAINE FORMATION AND DEGRADATION, DONJEK GLACIER, YUKON TERRITORY, CANADA,
Ottawa Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W72-11984

TEMPERATURE EFFECTS IN LOW-TRANSPORT, FLAT-BED FLOWS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
B. D. Taylor, and V. A. Vanoni.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9105, p 1427-1445, August 1972. 10 fig, 5 tab, 14 ref.

Descriptors: *Sediment transport, *Bed load, *Water temperature, Roughness (Hydraulic), Streamflow, Discharge (Water), Hydraulic models, Model studies.

A 15 to 25 deg reduction in water temperature in an alluvial stream at constant discharge can effect relatively large changes in sediment discharge, and bed geometry and roughness. However, in streams the temperature effects on the various flow parameters are interrelated. In an attempt to untangle the temperature effects on sediment discharge close to the bed without introducing the complications of suspended load transport and nonplanar bed geometry, a bed was artificially flattened, and the bed shear stresses were near those necessary to produce incipient particle transport so that all sediment transport was by rolling and sliding along the bed. The bed materials in these experiments ranged from fine silica sand to coarse, synthetic clay-aggregate particles approximately 18.5 mm in diameter. In flat-bed flows where all of the sediment discharged moves by rolling and sliding along the bed the effects of a change in water temperature on sediment discharge depends on the roughness condition of the bed. If the bed is in the lower transition range an increase in water temperature (velocity and depth constant) will cause an increase in sediment discharge; if the bed is in the upper transition range an increase in temperature will cause a decrease in sediment discharge; and if the bed is hydrodynamically rough sediment discharge does not change with temperature. (Knapp-USGS)
W72-11986

VOLUME WEIGHT OF RESERVOIR SEDIMENT IN FORESTED AREAS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
W. F. Megahan.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY8, Paper 9129, p 1335-1342, August 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Reservoir silting, *Organic matter, *Water quality, *Forests, *Sedimentation, Density, Ecology, Variability, Sediments, Provenance.

Volume weights (weight per unit volume) of sediments deposited in small reservoirs on forested watersheds vary considerably even though watersheds have contiguous drainage divides and appear to be grossly similar. Further, volume weights differ greatly within a given reservoir and the variation cannot be explained simply by differences in particle settling velocities. The percentage of organic matter in sediment samples is a reliable basis for estimating volume weight, better than approaches that relate volume weight to sediment particle sizes. The volume weights of sediment vary with mineral particle-size distribution, primarily because the packing characteristics of particles dictate that the volume of voids decreases as particle size increases. However, submerged organic matter can strongly affect the volume weight of sediment because the specific gravity of organic components is considerably less than that of mineral sediments. In addition, organic particles and associated organic acids probably tend to aggregate sediments, especially fine sediments, by binding and flocculation phenomena. Organic sediments can help determine water quality. Consequently, an added dimension must be considered when evaluating the impacts of changes in land use of forested watersheds. (Knapp-USGS)
W72-12000

LIQUID CRYSTALS IN QUICK CLAYS,
Swedish Inst. for Surface Chemistry, Stockholm.
For primary bibliographic entry see Field 02G.
W72-12013

SOIL EROSION AND EROSION CONTROL (EROZIYA POCHV I MERY BOR'BY S NEY),
For primary bibliographic entry see Field 04D.
W72-12017

ENVIRONMENTAL STUDIES OF MERCURY AND OTHER ELEMENTS IN COAL AND LAKE SEDIMENTS AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 05A.
W72-12033

INTERPRETATION OF AERIAL PHOTOGRAPHS FOR GEOMORPHOLOGICAL RESEARCH,
For primary bibliographic entry see Field 07C.
W72-12036

MEASUREMENT OF LATERAL EROSION AT PROPOSED RIVER CROSSING SITES OF THE ALASKA PIPELINE,
Geological Survey, Anchorage, Alaska.
J. Brice.
Geological Survey Alaska District Report, 1971. 39 p, 17 fig.

Descriptors: *Erosion rates, *Alaska, *Stream erosion, *Meanders, *Pipelines, Bank erosion, Channel erosion, Erosion, Geomorphology, Topography, Photogrammetry, Terrain analysis, *Aerial photography.
Identifiers: *Alaska pipeline.

Lateral erosion rates were studied at proposed pipeline crossings of Alaskan rivers by comparison of aerial photographs. Most of the crossing sites were also examined in the field, in too brief a time to permit quantitative measurements but long enough to be of much assistance in interpretation of the aerial photographs. Where the proposed Alaskan pipeline is to be buried beneath stream channels, the design depth of burial should be greater than the estimated maximum depth of scour in the main channel of the stream. For each crossing site, the distance of lateral migration by the river was measured by precise superposition and matching of aerial photographs taken about 20 years apart. (Knapp-USGS)
W72-12040

FLOW CHARACTERISTICS WITHIN A CHANNEL BOUNDARY OF COARSE MATERIALS,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 08B.
W72-12106

HYDRAULIC STRUCTURE FOR RESISTING WAVE ACTION,
For primary bibliographic entry see Field 08A.
W72-12128

A DEVICE FOR SAMPLING IMMEDIATELY ABOVE THE SEDIMENT-WATER INTERFACE,
Woods Hole Oceanographic Institution, Mass.
K. L. Smith, Jr.
Limnol Oceanogr. Vol 16, No 4, p 675-677. 1971. Illus.
Identifiers: *Sampling, *Sediment-water interfaces.

A simple inexpensive device is described for sampling the water column immediately above the sediment surface. It consists of a bottom sled, hose, and deck pump and is easily operated from any stable platform.--Copyright 1972, Biological Abstracts, Inc.
W72-12299

2K. Chemical Processes

THE CARBON ISOTOPIC COMPOSITION AND THE CONCENTRATION OF THE DISSOLVED ANORGANIC CARBON IN THE ATLANTIS II DEEP BINES/RED SEA,
Bundesanstalt fuer Bodenforschung, Hanover (West Germany).
M. Schoell, and W. Stahl.
Earth and Planetary Science Letters, Vol 15, No 2, p 206-211, June 1972, 2 fig, 1 tab, 12 ref.

Descriptors: *Brines, *Carbon, *Stable isotopes, *Hydrothermal studies, Water chemistry, Geochemistry, Hot springs.
Identifiers: *Red Sea.

The Atlantis II Deep brines were investigated with respect to dissolved anorganic carbon. The C-12/C-13 ratios change continuously from sea water (-1.5 parts per thousand PDB) to the 49 deg C brine (-4.2 to -3.8 parts per thousand PDB). The 59 deg C brine has a uniform isotopic composition (-7.0 parts per thousand) throughout the whole brine pool. The anorganic carbon concentration data show a similar change from sea water 946 ml/liter) to the 49 deg C brine (55-75 ml/liter). The 59 deg C brine revealed concentrations of 48 ml/liter between a depth of 2060-2100 dbar. (Knapp-USGS)
W72-11749

GEOCHEMISTRY OF MELTWATER STREAMS FROM NINE ALASKAN GLACIERS,
Memorial Univ. of Newfoundland, St. John's. Dept. of Geology.
For primary bibliographic entry see Field 02C.
W72-11751

SALINITY AND WATER USE.
For primary bibliographic entry see Field 03C.
W72-11755

THE GEOCHEMISTRY OF UNDERGROUND WATER,
Commonwealth Scientific and Industrial Research Organization, Chatswood (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 03C.
W72-11756

THERMODYNAMICS OF SALINE WATER,
Commonwealth Scientific and Industrial Research Organization, Fishermen's Bend (Australia). Div. of Applied Chemistry.
For primary bibliographic entry see Field 03C.
W72-11758

CHEMISTRY OF SALINE SOILS AND THEIR PHYSICAL PROPERTIES,
Western Australia Univ., Nedlands. Inst. of Agriculture; and Western Australia Univ., Nedlands. Dept. of Soil Science.
For primary bibliographic entry see Field 03C.
W72-11760

TRANSPORT OF SALTS IN UNSATURATED AND SATURATED SOILS,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Soils.
For primary bibliographic entry see Field 03C.
W72-11762

SALINITY AND THE WHOLE ANIMAL,
Adelaide Univ. (Australia). Waite Agricultural Research Inst.
For primary bibliographic entry see Field 03C.
W72-11765

SALINITY AND ANIMAL CELLS,
New South Wales Univ., Kensington (Australia). School of Physiology and Pharmacology.
For primary bibliographic entry see Field 03C.
W72-11766

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY,
National Inst. of Environmental Health Sciences, Research Triangle Park, N.C.
For primary bibliographic entry see Field 05A.
W72-11797

USE OF A MAGNETIC TAPE CASSETTE RECORDER WITH AN ON-LINE GC DATA SYSTEM,
Eastman Kodak Co., Rochester, N. Y. Industrial Lab.
For primary bibliographic entry see Field 07B.
W72-11930

A NEW COMPUTING INTEGRATOR FOR CHROMATOGRAPHY,
Vidar Corp., Mountain View, Calif.
For primary bibliographic entry see Field 07B.
W72-11932

WATER RESOURCES INVESTIGATIONS IN OKLAHOMA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12002

HYDROGEN PEROXIDE CONTENT OF RIVER WATER AND A METHOD FOR DETERMINING IT,
Nauk SSSR, Moscow. Institut Biologii Akademiya Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W72-12016

SOLUBILITY OF HYDROCARBONS IN WATER UNDER STRATAL CONDITIONS (O RASTVORIMOSTI UGLEVODORODOV V VODE V PLASTOVYKH USLOVIYAKH),
Akaemiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopaemykh.
T. P. Zhuze, V. I. Sergeyevich, V. F. Burmistrova, and Ye. A. Yesakov.
Akademiya Nauk SSSR Doklady, Vol 198, No 1, p 206-209, 1971. 3 fig, 2 tab, 19 ref.

Descriptors: *Geochemistry, *Water chemistry, *Water types, *Organic compounds, Solubility, Saturation, Gases, Aqueous solutions, Electrolytes, Salinity, Pressure, Temperature, Inorganic compounds, Colloids, Emulsions, Soaps, Surfactants, *Oil.
Identifiers: USSR, *Hydrocarbons, *Aromatic hydrocarbons, Benzene, Toluene, Methylcyclohexane, Isobars.

To assess the role of water in the formation and destruction of oil deposits, solubilities of hydrocarbons were investigated in pure water, in water saturated with gases below 330 atm, and in mineralized water, at temperatures between 30 and 150 deg C. Solubilities of benzene, toluene, and methylcyclohexane in pure water increase with temperature, which is especially pronounced in aromatic hydrocarbons which dissolve in water better than other hydrocarbons with the same number of carbon atoms in the molecule. Saturation of the water with gas generally reduces the solubility of liquid hydrocarbons, depending on the hydrocarbon, gas, temperature, and pressure. Solubility of benzene in water decreases successively in water saturated with nitrogen, helium, methane, carbon dioxide, and propane. Higher saturation of the water with gas leads to a greater drop in the solubility of the hydrocarbon. Solubility of a mixture of hydrocarbons in gas-saturated water is less than in pure water. Between 80 and 145 deg C, solubility of toluene in calcium-chloride water was 35%-45% lower than that in pure water. Solubility of toluene in sodium-bicarbonate water at 115 to 125 deg C was similar to that in pure water but at 130 to 145 deg C was much lower. The presence of liquid hydrocarbons in water increases the solubility of gases and may account for the reported higher gas content of groundwater in contact with oil, as compared with the backgound values in these waters. (Josefson-USGS)
W72-12022

USE OF ATOMIC ABSORPTION SPECTROSCOPY IN THE DETERMINATION OF MICRO G/ LITER CONCENTRATIONS OF NA+, K+, CA2+, AND MG2+,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. E. Ragone, and R. Finelli.
Army Cold Regions Research and Engineering Laboratory Special Report 174, June 1972. 5 p, 2 fig, 2 tab.

Descriptors: *Spectroscopy, *Flame photometry, *Trace elements, *Water analysis, Chemical analysis, Spectrophotometry.
Identifiers: *Atomic absorption spectroscopy.

Routine analyses of concentrations of Na, K, Ca and Mg may be made by atomic absorption spectroscopy, with good sensitivity down to 2 micrograms/liter. Standard solutions can be kept for relatively long periods of time with no change in concentration or interference between cations. Relative deviation of absorption increases with decreasing concentration, but never exceeds 100% even at 2 micrograms/liter, so detection limits can be assured to this level. (Knapp-USGS)
W72-12025

THE STRUCTURE AND PROPERTIES OF WATER SOLUTIONS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 01B.
W72-12099

DETERMINATION OF NITRILOTRIACETIC ACID (NTA) WITH ION-SELECTIVE ELECTRODES,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12110

MECHANISTIC STUDIES ON THE VALINOMYCIN-BASED POTASSIUM ELECTRODE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12111

ION-ELECTRODE STUDY OF THE CALCIUM--ADENOSINE TRIPHOSPHATE SYSTEM,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12114

SULFATE ION-SELECTIVE MEMBRANE ELECTRODE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12115

IODINE CONTENT IN MILK AND WATER IN WROCLAW VOIVODESHIP,
Instytut Zootechniki, Krakow (Poland).
Z. Ewy, H. Pyska, and H. Styczynski.
Rocz Nauk Roln Ser B Zootech. Vol 91, No 3, p 335-346. 1969. Illus. Maps. English summary.
Identifiers: *Iodine, Milk, Poland, *Nutrient requirements.

Milk and water samples from 26 dairy cooperatives were analyzed for I content. On the basis of the sampling, the supplementation of cattle diets with iodized salt was recommended.--Copyright 1972, Biological Abstracts, Inc.
W72-12167

INHERENT ERRORS IN PERPENDICULAR ALLOCATION OF OVERLAPPING CHROMATOGRAPHIC PEAKS,
Osaka Univ. (Japan). Dept. of Applied Chemistry.
K. Kishimoto, H. Miyauchi, and S. Musha.
Journal of Chromatographic Science, Vol. 10, No. 4, p 220-223, April 1972. 5 fig, 5 ref.

Descriptors: *Statistical methods, Mathematical studies, Equations, Methodology, Quality control, Numerical analysis, Separation techniques, Pollutant identification, Digital computers, Data processing, *Chromatography.
Identifiers: *Chromatographic peaks, *Errors, *Perpendicular allocation method, Error curves.

An investigation has been designed to mathematically evaluate the inherent errors of the perpendicular allocation method of resolving composite wave forms in chromatographic analysis. It has been determined that the error increases with a decrease in the separation factor and the sign of the error is determined by the relative magnitude of the two peak heights. The tendency toward bias of the error to one side of the sign becomes pronounced as the first peak becomes sharper. Only the form of the error curves calculated from appropriate equations and data is shown and correction techniques are not provided. However, it is shown via numerical evaluation that the errors strangely depend upon the shape of the peaks. (Mackan-Battelle)
W72-12168

THE TRACE ELEMENTS AND THEIR IMPORTANCE TO LIFE,
Universitaet des Saarlandes, Homburg (West Germany). Medizinische Fakultaet.
R. Ammon.
Rev Port Quim. Vol 12, No 4, p 193-201. 1970. Illus. Map.
Identifiers: *Nutrient requirements, *Trace elements, Environment, Life.

Fe, Zn, F, Cu, Mn, I, Co and Mo are necessary for life. Of possible importance are As, Cr, Ni, Se, Si, V and B. Al, Br, Cs, Hg, Pb, Rb and Sr are unavoidable in the environment. Radioelements present in the environment include Cs137, Sr90, Sr89, Ru106, Nb95, Ce144, Pm147 and Zr95.--Copyright 1972, Biological Abstracts, Inc.
W72-12346

STRUCTURE OF WATER,
For primary bibliographic entry see Field 01A.
W72-12372

WATER BUDGET AND QUALITY OF WATER STUDIES OF HUBBARD CREEK RESERVOIR, TEXAS, 1963-67 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02H.
W72-12385

2L. Estuaries

THE DETERMINATION OF DISPERSION COEFFICIENTS IN NON-HOMOGENEOUS MEDIA IN PROBLEMS OF SALT WATER CONTAMINATION OF FRESH GROUND WATER,
Societe Centrale pour l'Equipment du Territoire-International, Puteaux (France).
For primary bibliographic entry see Field 05B.
W72-11743

THE TRANSPORT OF SALT IN RIVERS AND ESTUARIES,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 03C.
W72-11764

DISTRIBUTION AND ABUNDANCE OF PLANKTONIC CRUSTACEA IN STURGEON BAY AND SHAWANAGA INLET, GEORGIAN BAY, ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
J. C. H. Carter.
Journal of Fisheries Research Board of Canada, Vol. 29, No. 1, p 79-83, January 1972. 3 fig, 1 tab, 7 ref.

Descriptors: *Crustaceans, *Distribution patterns, *Zooplankton, Water temperature, Electrolytes, *Seasonal, Marine animals, Plankton nets, Copepods, Conductivity, Physical properties, Waterfleas, Water quality, Aquatic populations, Sampling, Temporal distribution, Daphnia.
Identifiers: *Macroinvertebrates, *Sturgeon Bay, *Georgian Bay, Daphnia ambigua, Diaptomus reighardi, Diaptomus sicilis, Limnocalanus macrurus, Eubosmina coregoni, Bosmina longirostris, Tropocyclops prasinus mexicanus, Leptodora kindtii, Polyphemus pediculus, Sida crystallina, Diaphanosoma leuchtenbergianum, Holopedium gibberum, Daphnia longiremis, Daphnia galeata mendotae, Daphnia retrocurva, Ceriodaphnia lacustris, Ceridophnia quadrangula, Chydorus sphaericus, Epischura lacustris, Eurytemora affinis, Diaptomus minutus, Diaptomus ashlandi, Diaptomus oregonensis, Cyclops scutifer, Cyclops vernalis, Cyclops bicuspidatus thomasi, Mesocyclops edax.

The distribution, numbers, and seasonal succession of planktonic crustaceans in a semi-enclosed bay and a long open inlet were studied during a 9-month period in 1970-71. Crustacean plankton was sampled at 6 stations, 2-5 km apart and in water 9-13 m deep, using a conical nylon plankton net hauled from near bottom to the surface at a rate of about 0.5 m/sec. Water temperature was taken during the same sampling period with a Whitney underwater thermistor (1 m to bottom) and water samples collected from mid-depth and later analyzed for conductivity at 25 C. Most species were found at all stations on at least some occa-

sions in 1970, although some differences in periods of maximum abundance between stations, probably related to temperature, were noted. Daphnia ambigua and Diaptomus reighardi were confined to the inner stations and Limnocalanus macrurus and Diaptomus sicilis were absent during periods of highest water temperatures. Eubosmina coregoni, although found throughout the system in February 1971, was restricted to the outer stations in 1970. A marked late-summer drop in populations of all species except Bosmina longirostris and Tropocyclops prasinus mexicanus in 1970 might have been due to either normal seasonal fluctuations or heavy predation by planktivorous fish. (Holoman-Battelle)
W72-11795

ECOLOGICAL STUDIES ON MACROINVERTEBRATE POPULATIONS ASSOCIATED WITH POLLUTED KELP FORESTS IN THE NORTH SEA,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-11854

ENVIRONMENTAL CHANGES ASSOCIATED WITH A FLORIDA POWER PLANT,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 05C.
W72-11876

MICROFLORA IN SUPRALITTORAL ROCKPOOLS IN A COASTAL AREA SOUTH OF BERGEN, NORWAY,
Bergen Univ. (Norway). Biological Station.
Tor Saugestad.
Sarsia. 46. 79-96. Illus. 1971.
Identifiers: *Bergen (Norway), *Brachiomonas-Submarina, Coastal areas, Englenoids, Littoral, *Microflora, *Oxyrrhis-Marina, Pools, Rock, Salinity.

The microflora in 58 supralittoral rockpools in the archipelago outside the Biological Station, Espegrend was studied during shorter periods of summer-autumn 1962 and spring-summer 1963. Water samples from the pools were centrifuged and the sedimented microflora was studied in a live condition with a microscope. The salinity in each sample was determined. Data on depth and area of the pools are presented. The pools were classified accoring to the rockpool system of Levander, with some modifications. Of the pools, 44% had a predominant marine influence and 32% a predominant limnetic influence. The rest of the pools (24%) showed transitions between these 2 groups, due to variations in the marine influence in the 2 yr. Only 10% of the limnetic pools could be classified as rainwater pools. Chlorophyceans were recorded once or more in 48 pools while dinophyceans and euglenophyceans were recorded in 40 and 29 pools, respectively. The wide distribution of chlorophyceans and dinophyceans was mainly due to the prevalence of single species, Brachiomonas submarina and Oxyrrhis marina, respectively. Few of the microflora species showed preference for one pool type only. Roughly, the microflora could be divided into a euhaline, limnetic, and mixohaline category. The microflora in the Espegrend pools was compared with records from other areas, mainly the Baltic. Species found in the Espegrend pools with their main distribution in salinities higher than 5% seem not to inhabit rockpools in the Baltic area.--Copyright (c) 1972, Biological Abstracts, Inc.
W72-11883

CHANNEL CHARACTERISTICS IN A MEANDERING TIDAL CHANNEL: CROOKED RIVER, FLORIDA,
Wisconsin Univ., Milwaukee. Dept. of Geography; and Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02E.
W72-11983

A LAGRANGIAN METHOD FOR PREDICTING POLLUTANT DISPERSION IN BOLINAS LAGOON, MARIN COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-11985

MATHEMATICAL MODEL OF RIVER HOOGHLY,
Manchester Univ. (England).
For primary bibliographic entry see Field 02E.
W72-11994

COUNTING AND RECORDING EQUIPMENT FOR COASTAL AND ESTUARINE POLLUTION STUDIES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-12057

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
Bureau of Fisheries and Wildlife Service, Sacramento, Calif. Div. of River Basin Studies.
For primary bibliographic entry see Field 05B.
W72-12077

CONTAMINATION OF THE SEAS AND OCEANS BY ARTIFICIAL RADIOACTIVITY,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W72-12084

BIOLOGY OF ALABAMA ESTUARINE AREAS - COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY,
Alabama Marine Resources Lab., Dauphin Island.
H. A. Swingle.
Available from the National Technical Information Service as COM-72-10265, $3.00 in paper copy, $0.95 in microfiche. Alabama Marine Resources Bulletin, No. 5, August 1971. 123 p, 1 fig, 58 tab, 80 ref, 1 append.

Descriptors: *Alabama, *Estuaries, *Sampling, *Fish, *Invertebrates, *Plankton, *Trawling, *Nets, Distribution patterns, Areal, Seasonal, Oysters, Density.
Identifiers: Historical fisheries statistics.

An inventory was conducted in the estuaries of Alabama. Monthly samples were taken from January 1968 through March 1969 at twenty trawl stations, five seine stations and four plankton stations. One hundred and sixty-two species of fishes and forty-four species of invertebrates were collected. Areal and seasonal distributions of the species are presented along with data on the density of oysters on the public reefs. Historical fisheries statistics are reviewed. (Ensign-PAI)
W72-12093

GENERAL THEORY OF SELF-PURIFICATION IN THE SEA, (THEORIE GENERALE DE L'AUTO-EPURATION DE LA MER),.
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 05G.
W72-12095

BIG BEEF ESTUARY PHYTOPLANKTON AND BACTERIA STUDIES 1968-1969,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05C.
W72-12097

RAPID RECOVERY OF ESCHERICHIA COLI FROM ESTUARINE WATER,
Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit.
For primary bibliographic entry see Field 05B.
W72-12178

RADIOACTIVE CONTAMINATION OF THE VENICE LAGOON FROM 1964 TO 1969 (L-'INQUINAMENTO RADIOATTIVO DELLA LAGUNA DI VENEZIA DAL 1964 AL 1969),
Padua Univ. (Italy). Instituto di Igiene.
For primary bibliographic entry see Field 05B.
W72-12206

ESCAPEMENT LEVELS AND PRODUCTIVITY OF THE NUSHAGAK SOCKEYE SALMON RUN FROM 1908 TO 1966,
Washington Univ., Seattle. Coll. of Fisheries.
Ole A. Mathisen.
US Fish Wild Serv Fish Bull. Vol 69, No 4, p 747-763. 1971. Illus. Maps.
Identifiers: *Alaska, Decline, Escapement, Nushagak, Productivity, Run, Salmon, *Sockeye, Spawner, *Bristol Bay.

Since the inception of a commercial fishery for sockeye salmon in the Nushagak District, Bristol Bay, Alaska, the annual yields have followed a definite pattern. Catches increased during a relatively short development phase of the fishery, then stabilized for some years and then declined in 2 steps separated by periods of relative stability. For years the cause of the decline had been thought to be overfishing, and various measures of curtailment had been placed upon the fishing industry. Evidence is presented that the average escapement or the potential egg deposition remained about the same during each of 3 periods (1908-1919, 1925-1945, and 1946-1966); hence the diminution in the runs was due not to lack of spawners but to a decline in the rate of return per spawner. So that the cause or causes of the present low reproductive potential can be ascertained, the effects of fishing on the stocks of salmon must be examined. Besides removing part of the run, the yearly commercial fishing operation may have altered either the age composition or the distribution of the escapement. Available historical records were examined for evidence of these types of changes but largely with a negative result; therefore, the y hypothesis was advanced that the observed declining rate of return per spawner is caused by a declining basic productivity of the nursery areas. The latter is then ascribable to the cumulative effect of relatively little enrichment of bioenergetic elements from salmon carcasses since the instigation of commercial fishing operations in comparison with the prefishing era when the entire virgin run escaped to the spawning grounds.--Copyright 1972, Biological Abstracts, Inc.
W72-12319

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THERMODYNAMICS OF SALINE WATER,
Commonwealth Scientific and Industrial Research Organization, Fishermen's Bend (Australia). Div. of Applied Chemistry.
For primary bibliographic entry see Field 03C.
W72-11758

BETTER TOOLS FOR WATER RESOURCES,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 03B.
W72-11891

BIBLIOGRAPHY OF SALINE WATER CONVERSION LITERATURE,
Rocketdyne, Canoga Park, Calif.
J. J. Schamus.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.75. Office of Saline Water Research and Development Progress Report no 146, Sept. 1965. 373 p, 4 fig. OSW 14-01-0001-356.

Descriptors: *Bibliographies, *Desalination, Documentatior, Desalination processes.

A bibliography by subject matter, an alphabetical author index keyed to the subject bibliography, and an alphabetical, permuted cross index to the subject bibliography are included. Over 8000 reference titles were screened. Of these, over 1500 were eliminated as duplicates, and approximately 450 did not contain sufficient information for inclusion. The bibliography was built from about 6,120 individual references, and contains an estimated 12,000 entries (each entry appears under an average of slightly less than 2 subject headings). (OSW)
W72-12044

RESEARCH ON ION TRANSPORT ACROSS MICROBIAL MEMBRANES,
TRW Space Technology Labs., Redondo Beach, Calif.
B. H. Goldner.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.30. Office of Saline Water Research and Development Progress Report no 160, Dec. 1965. 37 p, 15 fig, 4 tab. OSW 14-01-0001-416.

Descriptors: *Membranes, *Ion transports, *Biological membranes, *Permeability, *Desalination processes, Osmosis.
Identifiers: *Microbial membranes, *Salt transport, Cytoplasmic membranes, Light scattering, Glycolytic inhibitors.

The mechanisms involved in the transport of inorganic ions across cytoplasmic membranes were investigated. A systematic and comparative investigation of certain salt transport characteristics was begun to determine the relationship between the divergent salt tolerance properties of two bacteria and membrane structure and function. The permeability and transport rates of the chloride salts of sodium, lithium, potassium, magnesium, strontium and calcium were examined by suspending resting cells in hypertonic salt solutions. The resulting plasmolysis was measured by an increase in light scattered by the cell suspension. The immediate increase in light scattering was followed by a gradual decline in light scattering, attributable to salt accompanied by water re-entering the cell (deplasmolysis). The phase of growth at which the cells were harvested influenced both the magnitude of the plasmolytic response and the rate at which cations permeated the cells. The youngest cells produced the largest response and were the most resistant to deplasmolysis. The transport of salt is an active process and appears to be dependent upon the energy derived from the dissimilation of the endogenous reserve material, glycogen. The glycolytic inhibitors, iodoacetate and mercuric ion, completely retarded or inhibited the rate of salt transport. The respiratory inhibitors, 2,4 dinitrophenol, arsenite and cyanide, accelerated the rate of salt uptake. The rate of transport was suppressed when the cells respired formate. Hydrogen ion concentration modified the response to the salts-the higher the pH, the greater the plasmolytic response, and the faster the rate of transport. Salts were transported more slowly when oxygen was absent than under aerobic conditions, possibly reflecting the influence of the redox potential of the suspending medium. Shaking the cell suspension vigorously in air resulted in enhanced rates of salt transport, however, these results can not yet be explained. (OSW)
W72-12045

DESIGN STUDY OF LARGE MULTIPLE PHASE EJECTOR DRIVEN DESALINATION PLANTS,
Kaye Instruments, Inc., Cambridge, Mass.
G. F. Harper, and J. H. Leigh.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.75. Office of Saline Water Research and Development Progress Report no 748, Oct. 1971. 64 p, 10 fig, 9 ref. OSW 14-01-0001-2256.

Descriptors: Economics, *Cost analysis, *Desalination plants, Thermodynamics, Vapor compression distillation, Computer programs, *Optimumization, Flowsheets, *Multistage flash distillation.
Identifiers: *Multiple phase ejectors, *Systems descriptions, Verticle tube evaporation.

Large sea water distillation plants driven by Multiple Phase Ejectors (MPE) were evaluated and the characteristics and costs of the most promising configurations determined. The optimum plant combined a multi-stage flash (MSF) feed heater with vertical tube evaporator (VTE) effects, was selected for mathematical modeling. The parametric calculations were performed by a computer program. Oak Ridge National Laboratory added a cost analysis to the computer program to enable determination of an optimum cost 8.0 MGD-MPE/VTE/MSF distillation plant. The plant consists of 16 VTE effects with 42 MSF stages. A single ejector drives 4 of the VTE effects. Energy for the system is furnished by a fossil-fuel-fired boiler. Electrical power is furnished by a steam turbine-driven generator integral with the plant. Water production from the MPE-driven VTE effects is 42.7 percent of total plant production; 43.9 percent of the total is produced in the remaining VTE effects, and 13.4 percent in the MSF stages. The plant performance ratio is 15.36 pounds of product water per 1000 BTU. Capital cost of the plant is estimated to be $1.02 per daily gallon of capacity and product cost to be 44.68 cent per 1000 gallons under the cost estimates and ground rules of the study. (OSW)
W72-12046

APPARATUS AND PROCESS FOR OBTAINING POTABLE WATER FROM SALINE SOLUTIONS,
R. A. Nye, and D. M. Nye.
U.S. Patent No. 3,549,522, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 4, p. 1556, December 22, 1970.

Descriptors: *Patents, *Desalination, *Heat exchange, *Refrigeration, *Gravity, Thermal diffusion, Brine, Sea water, Potable water, Reverse osmosis.

This invention provides a concept to overcome problems which develop in other desalination activities. This process utilizes a three-stage semi-reversible, heat exchange and refrigeration procedure which takes advantage of operating characteristics which require low operating energy and low production costs. This is done by subjecting the entering solution to super cooling temperatures to develop strong thermal diffusion forces in the solution, and then conducting the lighter components of the water upward through a reverse osmosis, semi-permeable section containing hydrophylic and brine-repelling substances. The procedure is aided by catalytic forces, gravity, and thermal diffusion acting on the brine as it separates from the solution. (Sinha-OEIS)
W72-12127

REMOVAL OF SULFATES FROM BRINES,
Department of the Interior, Washington, D.C.
W. Pechenick, and G. P. Gelblum.
U.S. Patent No. 3,547,579, 4 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1079, December 15, 1970.

Descriptors: *Patents, *Brines, *Desalination, *Sulfates, Metals, *Ion exchange, *Resins.
Identifiers: Barium, Barium hydroxide, Barium hydrosulfide.

The brine is contacted with an ion exchange resin in the form of barium. Sulfates are thereby precipitated as barium sulfate and the resin is converted into a metal form. Barium sulfate is reduced to barium sulfide which is leached with water to form an equimolar solution of barium hydroxide and barium hydrosulfide. Sodium hydroxide and sodium hydrosulfide solutions resulting from resin regeneration are then used to produce valuable by-products. The process may be used to remove sulfates from brines prior to procedures in saline water conversion. (Sinha-OEIS)
W72-12135

TUBULAR REVERSE OSMOSIS EQUIPMENT,
Aqua-Chem Inc., Waukesha, Wis.
G. B. Clark.
U. S. Patent No. 3,542,204, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1315, November 24, 1970.

Descriptors: *Patents, *Desalination, *Reverse osmosis, *Membranes, Sea water, Potable water, Equipment, Semipermeable membranes.
Identifiers: *Tubular membranes.

The equipment designed to remove dissolved solids from liquids by reverse osmosis (as in desalination) consists of a membrane of generally uniform cross section. It includes a tubular film formed of a semipermeable membrane material and is supported by a rigid tube. An end cap has at least one channel in fluid communication with the interior of the tubular film. The sealing device includes a gasket having a portion of greater radial extent than the membrane structure. (Sinha-OEIS)
W72-12144

SPIRAL REVERSE OSMOSIS DEVICE,
Desalination Systems, Inc., Escondido, Calif.
R. D. Hancock, and D. T. Bray.
U. S. Patent No. 3,542,203, 4 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1315, November 24, 1970.

Descriptors: *Patents, Sea water, *Desalination, Potable water, Water purification, *Reverse osmosis, *Membranes.

A housing is provided for a reverse osmosis spiral membrane module. The housing is in the form of a tubular pressure container which is easily separable for removal and replacement of the module. The reverse osmosis membrane module includes a membrane sheet assemblage wound onto a sealed tubular casing and covering apertures in the longitudinal surface for the flow of product water through the membrane and apertures into the casing and through its projected outlet tube. (Sinha-OEIS)
W72-12145

REVERSE OSMOSIS WATER PURIFICATION UNIT,
D. T. Bray, and R. M. Brown.
U. S. Patent No. 3,542,199, 4 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1314, November 24, 1970.

Descriptors: *Patents, *Water purification, *Reverse osmosis, Brine, Brackish water, Water quality, Water quality control, *Waste water treatment, *Activated carbon.

This invention comprises a casing holding a semipermeable membrane cartridge having a central collector6'or the purified water. Water passes through a bed of activated carbon or other purifying agent before reaching the outlet. Clarification by means of a filter, and a treatment chemical may be applied to the incoming feed water. Since the product water relief connection is between two

restricted conduits, pressure will be maintained in the product water system at a level depending on the resistance in each of the restricted conduits. (Sinha-OEIS)
W72-12146

DISTILLATION CONDENSATION APPARATUS WITH VAPOR COMPRESSION AND SEMI--PERMEABLE MEMBRANE,
L. J. Guarino.
U. S. Patent No. 3,540,986, 2 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 979, November 17, 1970.

Descriptors: *Patents, *Distillation, Semipermeable membranes, Separation techniques, *Vapor compression distillation, *Condensation, Water treatment, Sea water, Potable water, Evaporation.

This device uses a semipermeable conduit as an evaporative surface. Heated distilland liquid is rapidly circulated through the membrane conduit in a path that is provided by the membrane's internal support and the membrane. The support is hollow in order to permit the passage of the compressed vapor. The semipermeable membrane conduit permits a rapid circulation of the distilland liquid which in turn causes a higher rate of evaporation through the membrane wall. The porosity of the membrane prevents the passage of chemical contamination and suspended solids. The rapid circulation of the distilland liquid prevents the accumulation of deposits in the membrane pores. (Sinha-OEIS)
W72-12148

EVAPORATION-CONDENSATION RECOVERY OF FRESH WATER USING GAS-TRAVERSABLE POROUS BED,
G. Tufo.
U. S. Patent No. 3,539,454, 9 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 583, November 10, 1970.

Descriptors: *Patents, Sea water, *Desalination, *Distillation, Evaporation, Condensation, Sewage treatment, Liquid wastes, Water treatment, *Waste water treatment, Separation techniques, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Water purification.

The process begins with adsorbing a solution, or a mixture of liquid and solid or solids to be separated, on the surface of a solid substrate material. A heated, inert carrier gas is then directed across the surface to vaporize the liquid where the gas first contacts it. The geometry and physical size of the substrate material are such that, as the carrier gas continues its traversal of the solution-carrying surface, it loses heat until its temperature is sufficiently low that a condensation of the previously vaporized liquid component occurs. The carrier gas and entrained droplets are directed to a separation zone where known techniques and apparatus are used for recovery of the droplets from the carrier gas. (Sinha-OEIS)
W72-12153

EVAPORATION OF LIQUID NATURAL GAS WITH AN INTERMEDIATE CYCLE FOR CONDENSING DESALINIZED WATER VAPOR,
Linde A. G., Munich (West Germany). (assignee).
H. Linde, and G. Linde.
U. S. Patent No. 3,535,210, 3 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 879, No 3, p 869, October 20, 1970.

Descriptors: *Patents, *Desalination, *Heat exchangers, Evaporation, *Condensation, Sea water, Potable water, *Flash distillation, Natural gas, Separation techniques, Propane.
Identifiers: *Liquefied natural gas, *Ethane.

After flash evaporation of saline water at about 12 degrees C under vacuum, the water vapor is condensed in indirect heat exchange with liquefied propane or ethane. The vaporized propane or ethane is used in a closed cycle to vaporize the natural gas, simultaneously liquefying the propane or ethane. Ice formation is avoided by mixing cycle liquid with cycle vapor under conditions which yield a condenser coolant of 1 - 6 degrees C. (Sinha-OEIS)
W72-12157

REVERSE OSMOSIS CONCENTRATION OF DILUTE PULP AND PAPER EFFLUENTS,
Institute of Paper Chemistry, Appleton, Wis. Div. of Industrial and Environmental Systems; and Pulp Manufactures Research League, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W72-12189

RECYCLING OF SALINE WASTES,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 05D.
W72-12285

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES',
Centre d'Etude de l'Energia Nucleaire, Mol (Belgium).
For primary bibliographic entry see Field 05D.
W72-12286

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES',
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 05D.
W72-12287

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES',
Bostock, Hill and Rigby, Birmingham (England).
For primary bibliographic entry see Field 05D.
W72-12288

3B. Water Yield Improvement

PHOTOSYNTHETIC RESPONSE OF BRIGALOW TO IRRADIANCE, TEMPERATURE AND WATER POTENTIAL,
British Columbia Forestry Service, Victoria. Research Div.
For primary bibliographic entry see Field 02I.
W72-11843

BETTER TOOLS FOR WATER RESOURCES,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
J. E. McKee.
Journal of the American Water Works Association, Vol 58, No 2, p 131-137, February 1966. 10 ref.

Descriptors: *Water resources, *Nuclear energy, *Nuclear explosions, *Water reuse, Evaporation control, Desalination processes, Groundwater basins, Groundwater recharge, Legal aspects, Water demands, Weather modification, Aerial photography, California, Underground, Excavation.
Identifiers: *Evaporation suppression, Legal analysis, Western States Water Council, California water plan.

The major problems in water resources relate to the time and space distribution of fresh water. New tools, now in use or in need of development, are needed to make water available at the right place and the proper time. These include nuclear energy for power, excavation, subsurface storage and desalting. Extended use of computer is needed in planning, execution and operation. Communication systems must be vastly improved. Operations analysis and personnel to use this tool in the water industry will become common. Other tools include wastewater reclamation, aerial photography, evaporation suppression, desalting groundwater development, improved materials, weather modification, and improved legal analysis. (Flack-AWWARF)
W72-11891

CRITERIA FOR ANALYSIS OF INTERREGIONAL TRANSFERS OF WATER,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 06B.
W72-11897

EFFECTS OF CONSERVATION TECHNIQUES ON YIELD,
U. Stephens.
Journal of the American Water Works Association, Vol 56, No 8, p 991-1000, August 1964. 4 tab, 11 ref.

Descriptors: *Water conservation, *Soil conservation, *Impoundments, *Stock water, *Farm ponds, *Water yield, Runoff, Sedimentation rates, Consumptive use, *Texas.
Identifiers: *Depletion, Stock ponds, Suspended sediment, Elm Fork, Lake Fork Reservoir.

The effects of soil conservation practices on water yield have been extensively investigated but many questions remain. Based on investigations in Texas, the effects of upstream retention on yield are: (1) reduction in runoff and yield, (2) yield reduction is insignificant in years of above average rainfall but substantial in dry years, (3) reservoirs should be designed for critical, not average, conditions, (4) all affected parties should be involved in watershed improvement planning, (5) the minimum number of ponds should be built and (6) research is needed on seepage from upstream reservoirs. (Flack-AWWARF)
W72-11909

SURVEY OF METHODS FOR EVAPORATION CONTROL.
American Water Works Association, New York. Committee on Evaporation Control.

Journal of the American Water Works Association, Vol 55, No 2, p 157-168, February 1963. 54 ref.

Descriptors: *Evaporation control, *Monomolecular films, *Reservoir evaporation, *Water conservation, Water yield improvement, Evaporation pans, Waves (Water), Reservoir sites, Reservoir silting, Alcohols, Hexadeconal, Underground storage, Octadecanol, Windbreaks, Phreatophytes, Arid climates, Seepage.
Identifiers: Australia, Western United States.

Reservoir evaporation in the 17 western states has been estimated at 15,600,000 acre-ft per year. Reducing evaporation is a key to supplying new sources of cheap water - 5 to 15 cents per 1000 gal. Methods of control include silting of the reservoir to reduce surface area, avoiding shallows by fills or dikes, reduction of phreatophytes, building windbreaks, covering including underground storage, reduction of seepage and use of monolayers. Hexadecanol and octadecanol are used as evaporation suppressants. Australian field trials report evaporation control at 2 to 3 cents per 1000 gallons saved. (Flack-AWWARF)
W72-11912

REDUCING POND EVAPORATION WITH PERLITE ORE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
K. R. Cooley, and C. B. Cluff.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers Vol 98, No IR2, Paper 8953, p 255-266, June 1972. 5 fig, 6 tab, 8 ref.

Descriptors: *Evaporation control, *Reservoir evaporation, *Perlite, Water conservation, Water yield improvement, Dissolved oxygen, Water temperature, Winds.

Floating solid and granular materials appear to provide a practical means of reducing evaporation losses from open water surfaces. The increased efficiency of these materials over monomolecular films is due to their ability to reflect a greater portion of the incoming radiation. Perlite ore reduced pond evaporation 19%, over a 9-month period, for $0.36/1,000 liter, which compares with previous studies conducted on small tanks. Temperatures were reduced 1 deg C to 3 deg C at the surface and 3 deg to 5 deg at the 91-cm depth. Wind caused the perlite to compact and windrow; however, the perlite redistributed when the wind receded. A complete perlite cover did not affect fish growth significantly during the cool months, but was detrimental during the hot summer season. Oxygen content of the covered pond was also reduced during the hot season. (Knapp-USGS)
W72-11990

PLANT MOISTURE STRESS PATTERNS IN EUROTIA LANATA AND ATRIPLEX CONFERTIFOLIA,
Utah State Univ., Logan. Dept. of Range Science; and Utah State Univ., Logan. Ecology Center.
For primary bibliographic entry see Field 02I.
W72-12344

ROOTING CUTTINGS OF SALTBUSH (ATRIPLEX HALIMUS L.),
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy.
S. J. Ellern.
Journal of Range Management, Vol 25, No 2, p 154-155, March 1972. 1 fig, 5 ref.

Descriptors: *Shrubs, *Xerophytes, *Range management, *Cutting management, *Humidity, Forages, Greenhouses, Vegetation establishment, Plant root systems.
Identifiers: *Saltbush, *Plant cuttings, *Vegetative propagation.

Saltbushes (Atriplex sp.) grow well and supply nutritious browse to livestock in arid and semiarid regions and on saline soils. Salt (NaCl) content and oxalate levels affect livestock intake. There is considerable seasonal and between-plant variability in these plants, so efforts have been made to propagate selected planting material quickly and cheaply. Tips of young branches of saltbush 8-10 cm long were detached and planted under high humidity conditions for 2 months in cheap chambers of transparent plastic sheeting. The cuttings were of 2 kinds: green and soft (1-3 mm diameter) and young but woody (2-5 mm diameter). In the first experiment the cuttings were taken from the peak of the spring flush, while in the second experiment, branches bearing seed were avoided. The kind of cutting used was unimportant and spring seemed preferable to autumn for taking cuttings. Over 76% of the cuttings rooted and remained green. (Casey-Arizona)
W72-12348

SPONTANEOUS VEGETATION OF THE MURRAY SPRINGS AREA, SAN PEDRO VALLEY, ARIZONA,
California Univ., Los Angeles.
S. L. Woodward.
Journal of the Arizona Academy of Science, Vol 7, No 1, p 12-16, February 1972. 3 fig, 13 ref.

Descriptors: *Ecological distribution, *Biological communities, *Xerophytes, *Drainage basins, *Grasses, Plant groupings, Arroyos, Surveys, *Arizona, Deserts, Shrubs, Environmental effects, Mode of Action.
Identifiers: *Pedro Valley (Ariz).

Dense thornscrub, an enclave of the Chihuahuan Desert flanks the calcareous lower bajadas of the upper San Pedro River in Cochise County, Arizona. Fossil animal bones and human artifacts have been unearthed there and a postglacial pollen record has been extracted as part of the effort to reconstruct the landscape over which ancient peoples roamed in search of large game. To make sense of the pollen record with respect to vegetation and climatic changes, the modern pollen rain must be analyzed in terms of present vegetation. It is therefore important to identify existing vegetation and determine whether it is climatically, edaphically or culturally controlled. The only grass-covered areas in both the Chihuahuan Desert proper and the Arizona outlier are on flood plains and shallow depressions on the interfluves. The perennial grama grasses of the desert grasslands are absent. A vegetational analysis of the dominant species reveals a striking similarity to Chihuahuan Desert vegetation. This, together with the grass communities, suggest that the thornscrub is edaphically controlled and does not represent a recent invasion of grassland similar to what has been found at higher elevations in Cochise County. These conclusions are supported by Land Office survey notes going back to 1879. (Casey-Arizona)
W72-12362

3C. Use of Water of Impaired Quality

SALINITY AND WATER USE.

Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div of John Wiley and Sons, Inc, New York, T. Talsma, and J. R. Philip, editors, 1971. 296 p.

Descriptors: *Salinity, *Water utilization, *Research and development, *Water resources development, Irrigation water, Municipal water, Desalination, Groundwater, Land reclamation, Land management, Water management (Applied), Geochemistry, Water quality, Australia.

This second Australian symposium on hydrology aims at providing an up-to-date review of the scientific and, to some extent, the social problems which arise from natural and man-made salinity. The papers vary from detailed consideration of the effects of salinity on plant and animal cells to administrative and legal aspects of saline water, use and management. (See W72-11756 thru W72-11772) (Knapp-USGS)
W72-11755

THE GEOCHEMISTRY OF UNDERGROUND WATER,
Commonwealth Scientific and Industrial Research Organization, Chatswood (Australia). Div. of Mineralogy.
D. J. Swaine, and J. L. Schneider.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, Sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc., New York, p 3-23, 1971. 7 fig, 2 tab, 45 ref.

Descriptors: *Water chemistry, *Connate water, *Groundwater, *Diagenesis, *Geochemistry, Brines, Saline water, Saline water systems, Chemical reactions, Water quality, Ion exchange, Water circulation, Groundwater movement, Salinity, Water utilization.

The geochemical aspects of underground waters, starting with the origin of the waters and effects occurring during diagenesis and compaction are discussed. Other important factors, dealt with in detail, are the composition of water and the nature of the aquifer, the modification of composition by membrane filtration effects, evaporation, sulphate reduction, and ion exchange. The means of studying changes in chemical composition are also outlined, Examples are given of investigations in Chad, Cap Vert Peninsula, North Cameroon and the Gironde Estuary. Hydrochemical maps are most helpful in the assessment of water use and in the monitoring of pollution. The processes that connate waters have undergone are summarized as follows: diagenetic changes associated with the action of bacteria and the decomposition of organic matter during the early stages of sedimentation; reactions between constituent minerals and interstitial water at various stages of diagenesis and metamorphism; compaction during sedimentation; membrane filtration; and other effects, such as contact with evaporites. In sedimentary rocks, the freshest waters are located in siliceous sands and sandstones, essentially formed by quartz. The most mineralized waters are those in contact with deposits of evaporites. The chemical composition of groundwater often changes during circulation due to concentration, dilution, ion exchange and reduction phenomena. (See also W72-11755) (Knapp-USGS)
W72-11756

SALINITY AND THE HYDROLOGIC CYCLE,
Flinders Univ., Bedford Park (Australia). School of Physical Sciences.
J. W. Holmes.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971. Wiley-Interscience, Div. John Wiley and Sons, Inc., New York, p 25-40, 1971. 6 fig, 8 tab, 21 ref.

Descriptors: *Saline water systems, *Hydrologic cycle, *Path of pollutants, *Water chemistry, Saline water, Soil chemistry, Rainfall, Runoff, Water balance, Hydrologic budget, Ion transport, Aqueous solutions, Water quality, Salts, Salinity, Water utilization, Groundwater, Surface waters.
Identifiers: Salt cycle.

The hydrologic cycle is a concept to allow orderly description of the ways in which precipitation on the land surface is partitioned between evaporation, run-off, and other lesser consumption. The cycle is usually in a natural steady state, or at least, natural perturbations have a time scale of the order of thousands of years. The salt cycle also usually exists in a steady state. Irrigation and other less drastic changes in land utilization, which affect the components of the water budget, perturb the hydrologic and salt cycle with a time scale that may be of the order of tens of years. Deterioration of water quality in rivers and secondary salinization of soils are two major consequences of a disruption of the natural regime initiated by civiliation. (See also W72-11755) (Knapp-USGS)
W72-11757

THERMODYNAMICS OF SALINE WATER,
Commonwealth Scientific and Industrial Research Organization, Fishermen's Bend (Australia). Div. of Applied Chemistry.
J. E. Lane, and W. W. Mansfield.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australia Academy of Science, Nov 2-4, 1971. Wiley-Interscience, Div of John Wiley and Sons, Inc., New York, p 43-60, 1971. 2 fig, 18 ref.

Descriptors: *Saline water, *Water chemistry, *Thermodynamics, Thermodynamic behavior, Chemical potential, Saline water systems, Geochemistry, Ion exchange, Equilibrium, Free energy, Enthalpy, Entropy, Physicochemical properties, Temperature, Desalination, Distillation, Reverse osmosis, Freezing, Adsorption, Salinity, Water utilization.

The thermodynamic state of a saline solution is completely specified by the temperature, pressure and chemical potential of the components that are present. The chemical potential can be defined rigorously in mathematical terms but in this form often provides difficulty in conception. In order to overcome this difficulty for solutions, it is useful to relate the chemical potential to some ideal reference solution; the deviation between real and ideal solution is formalized in terms of an activity coefficient, and sometimes in the case of a solvent by an osmotic coefficient. The activity coefficients can be obtained from experiment, and are well tabulated. Changes in the chemical potentials of the components of a saline solution due to variations in temperature, pressure, environment or the external field can be obtained by the use of very simple expressions; any additional information required is measurable. These relationships are applied to desalination by distillation, by freezing and by reverse osmosis, to Donnan membrane equilibria, to the resting potential of a nerve fibre, and to surface effects in a porous solid. (See also W72-11755) (Knapp-USGS)
W72-11758

A SURVEY OF THE PRINCIPLES OF METALLIC CORROSION AND ITS CONTROL IN SALINE WATERS,
Commonwealth Scientific and Industrial Research Organization, Garden City (Australia). Div. of Mineral Chemistry.
W. T. Denholm, and E. C. Potter.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 61-78, 1971. 4 fig, 19 ref.

Descriptors: *Corrosion, *Saline water, *Water chemistry, *Inhibition, Corrosion control, Well casings, Chemical reactions, Electrolysis, Well screens, Oxidation-reduction potential, Hydrogen ion concentration, Salinity, Water utilization.

An outline of the theory of corrosion processes is presented, using pH-potential diagrams to summarize theoretical and experimental data relating to corrosion. The pitting corrosion of iron in chloride-containing waters is treated in some detail. The complicating effects of many factors which influence corrosion behavior in practical cases are discussed and the more common methods of corrosion control explained. (See also W72-11755) (Knapp-USGS)
W72-11759

CHEMISTRY OF SALINE SOILS AND THEIR PHYSICAL PROPERTIES,
Western Australia Univ., Nedlands. Inst. of Agriculture; and Western Australia Univ., Nedlands. Dept. of Soil Science.
J. P. Quirk.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 79-91, 1971. 2 fig, 1 tab, 32 ref.

Descriptors: *Saline soils, *Expansive soils, *Clays, Water chemistry, Permeability, Irrigation, Clay materials, Water pollution effects, Ion exchange, Adsorption, Electrolytes, Osmosis, Leaching, Salinity, Water utilization.

An outline of the forces involved in clay particle interaction (swelling and dispersion) is given as a background for the interpretation of the physical behavior of sodic soils, especially in relation to electrolyte levels. The electrolyte concentration below which appreciable decreases in soil permeability are encountered has been termed the treshold concentration and this concentration increases with the degree of sodium saturation of the soil colloids. The application of the treshold concentration concept to the management and reclamation of sodic soil is discussed. (See also W72-11755) (Knapp-USGS)
W72-11760

HYDROLOGY OF SWELLING SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
J. R. Philip.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 95-107, 1971. 7 fig, 23 ref.

Descriptors: *Expansive soils, *Soil water movement, *Expansive clays, Soil moisture, Water chemistry, Saline soils, Saline water, Unsaturated flow, Saturated flow, Moisture content, Hydraulic conductivity, Salinity, Water utilization.

Hydrologic difficulties often arise in drainage and reclamation of swelling clays in flat landscapes. Recent progress in the theory of water equilibrium and movement in swelling soils is reviewed. Neglect of the fact of swelling may lead to serious errors of interpretation. In swelling soils, the potential includes an additional component, the overburden potential. Classical concepts of groundwater hydrology, tacitly based on the behavior of nonswelling soils, fail in many important ways for swelling ones. Aspects which differ profoundly from those of nonswelling soils include the following: equilibrium moisture profiles, the distribution of hydraulic conductivity relative to the water table, the effect of topography on moisture distribution, the variation of specific yield with water table elevation and stratum thickness, and the character of steady and unsteady vertical flows. (See also W72-11755) (Knapp-USGS)
W72-11761

TRANSPORT OF SALTS IN UNSATURATED AND SATURATED SOILS,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Soils.
A. J. Peck.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 109-123, 1971. 1 fig, 68 ref.

Descriptors: *Ion transport, *Soil water movement, *Dispersion, *Saline water, Diffusion, Percolation, Ion exchange, Adsorption, Convection, Salinity, Water utilization, Saline water systems, Mass transfer, Osmosis, Saturated flow, Unsaturated flow.

Transport of soluble salts in soils results from movement of the soil solution as a whole and molecular diffusion within the soil solution. At very slow rates of solution flow, molecular diffusion is the dominant transport mechanism but diffusion in solution is a very slow process. The presence of the solid and gaseous phases in soils, and exchange or adsorption of solutes result in even lower diffusion coefficients in soils than in bulk solution. In the vicinity of the plant roots, molecular diffusion may be the dominant transport process at somewhat greater rates of convection due to the possible association of a relatively high concentration gradient and low nutrient concentration. In general, molecular diffusion interacts with the convection of solutions and each process contributes to the dispersion of solutes. Thus inert solutes are mostly transported at the average velocity of the solution, but there is a superimposed dispersion of solutes about the mean position at any instant. Mathematically this dispersion may be treated as a diffusion-like process. Solutes which experience adsorption or exchange on soil surfaces travel at less than the average pore velocity. (See also W72-11755) (Knapp-USGS)
W72-11762

GROUNDWATER PROBLEMS OF THE INTERACTION OF SALINE AND FRESH WATER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
R. A. Wooding.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 125-139, 1971. 55 ref.

Descriptors: *Groundwater movement, *Stratified flow, *Mixing, *Saline water-freshwater interfaces, Salinity, Water utilization, Saline water systems, Saturated flow, Aquifer characteristics, Convection, Diffusion, Dispersion.

Hydrodynamical aspects of flow of saline groundwater in a nonreacting medium are reviewed. Topics covered include macroscopic scales and dimensionless parameters, conditions for stable flow, problems of stably-stratified flows, and stable and unstable mixing layers. For groundwater flow under saturated conditions, the driving head is usually gravitational, whether due to differences in phreatic-surface level or to density differences arising from nonuniform distribution of salinity. Systems in which the density increases in the upward direction tend to be gravitationally unstable. A reduction in potential energy can be achieved by overturning the fluid. A further mechanism of instability arises when a nonhomogeneous fluid is driven in a direction of increasing viscosity. In groundwater flow, the appearance of instability is associated with either positive upward density gradients or an increase of viscosity in the direction of flow, or a combination of both. (See also W72-11755) (Knapp-USGS)
W72-11763

THE TRANSPORT OF SALT IN RIVERS AND ESTUARIES,
New South Wales Univ., Kensington (Australia). Water Research Lab.
I. R. Wood.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 141-157, 1971. 8 fig, 30 ref.

Descriptors: *Saline water intrusion, *Stratified flow, *Mixing, *Dispersion, *Estuaries, Saline water-freshwater interfaces, Ion transport, Mass transfer, Salinity, Water utilization, Diffusion, Convection.

In order to follow the transport of salt in rivers, estuaries and lakes, it is not only necessary to be able to analyze the flows in these systems but also to understand the diffusion processes in these flows. Progress in understanding these processes and in analysing cases of engineering importance is reviewed. In well mixed flows, the variations in salt concentration are so small that the effect on the flow properties of the system may be neglected. In this case tha analysis is based on Taylor's classic papers on dispersion. In stratified flows the salt concentration gradients acted on by the gravitational field cause internal flows which

dominate the transport of salt. In this case the flow may be analyzed as two distinct layers. For simple cases of partially mixed flows, the analysis used is the same as that for a well mixed flow but with a greatly increased dispersion coefficient. (See also W72-11755) (Knapp-USGS)
W72-11764

SALINITY AND THE WHOLE ANIMAL,
Adelaide Univ. (Australia). Waite Agricultural Research Inst.
W. V. MacFarlane.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 161-178, 1971. 2 fig, 4 tab, 62 ref.

Descriptors: *Salinity, *Physiological ecology, *Pathology, *Osmosis, *Biochemistry, Biological properties, Water pollution effects, Animal physiology, Metabolism, Environmental effects, Osmotic pressure, Translocation, Water balance.
Identifiers: *Salinity effects (Animals).

Land mammals have mechanisms to maintain intercellular and intracellular electrolyte concentrations. Sodium conservation is highly developed. In the ocean and in arid hot areas the salinity of water reaches four or more times that of the body fluids. The toxicity of Na salts is complex. They may reduce plasma K levels, which leads to circulatory inadequacy. High plasma and cellular Na also reduces appetite, causes drowsiness, incoordination, spasticity, and finally autogenous firing of neurones. Potassium salts come mainly from plants and large quantities of K can be readily excreted. Potassium retention causes spontaneous firing of nerves and muscles, heart irregularities, and filbrillation. Calcium salts in hard saline waters are not readily absorbed but rather cause water loss through diarrhea. When Ca is absorbed it facilitates conduction in nerve and muscle, increases the force of skeletal and heart muscle contraction, and facilitates nerve-muscle transmission. Stones of Ca oxalate, carbonate or phosphate may form in the kidney or renal tract in dry regions. The degree to which growth, fertility and efficiency are reduced by saline waters is determined by species or breed of animal; and the effects are modulated by food, air temperature, age and lactation. (See also W72-11755) (Knapp-USGS)
W72-11765

SALINITY AND ANIMAL CELLS,
New South Wales Univ., Kensington (Australia). School of Physiology and Pharmacology.
P. W. Gage.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 179-191, 1971. 4 fig, 10 ref.

Descriptors: *Salinity, *Physiological ecology, *Pathology, *Osmosis, *Biochemistry, Biological properties, Animal physiology, Metabolism, Environmental effects, Osmotic pressure, Translocation, Water balance.
Identifiers: *Salinity effects (Animals).

Biological cells exist in a saline environment which differs in ionic composition from the intracellular solution. Potassium is more concentrated inside, whereas sodium is more concentrated outside cells. In the resting state, cell membranes are much more permeable to potassium than to sodium ions and this results in an electrical potential across the membranes. The transmission of electrical signals, communication between cells, and the production of electrical signals all depend on an inflow of sodium ions into cells as a result of an increase in the sodium permeability of the cell membrane. The basic unit of electrical signalling is the action potential which is initiated by depolarization and consists of a brief reversal of membrane potential. To recharge after current has been drawn, ionic pumps driven by metabolic energy regulate salinity by a delicate balance between an organism's intake, storage, and excretion of salts and water. Calcium is essential for the maintenance of the normal ionic permeabilities of cell membranes, for the secretion of neurotransmitters and hormones, for contraction in muscle, for some enzyme reactions, for the cohesion of cells, and for bone and teeth formation. Maintained concentration gradients of sodium and potassium ions are necessary for normal membrane potentials and action potentials. (See also W72-11755) (Knapp-USGS)
W72-11766

SALINITY AND THE WHOLE PLANT,
Adelaide Dept. of Agriculture (Australia).
J. B. Robinson.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 193-206, 1971. 1 fig, 3 tab, 43 ref.

Descriptors: *Plant physiology, *Salinity, *Osmotic pressure, Biochemistry, Environmental effects, Metabolism, Osmosis, Physiological ecology, Translocation, Water balance.

Present knowledge concerning the behavior of ionic species within the plant is discussed, with particular reference to the leaf, and a possible experimental approach is developed. With techniques presently available the dynamic state of the extracellular part of the ionic content of plants with respect to any particular ion can be determined. Using tissue slices, and duplicating the native state of the leaf cell, information on the ionic and water relations of the leaf cell could be obtained. Extrapolation of such data to the native state may enable distinction to be drawn between the 'osmotic' and 'specific ion toxicity' theories of salt damage. (See also W72-11755) (Knapp-USGS)
W72-11767

SALINITY AND PLANT CELLS,
Sydney Univ. (Australia). School of Biological Sciences.
L. C. Campbell, and M. G. Pitman.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 207-224, 1971. 6 fig, 3 tab, 45 ref.

Descriptors: *Plant physiology, *Salinity, *Osmotic pressure, Biochemistry, Environmental effects, Metabolism, Osmosis, Physiological ecology, Translocation, Water balance.

Regulation of ionic content by plant cells and possible ways salinity may disrupt cell function and development are discussed. Selective uptake of K relative to Na has some importance but in general, plants seem less dependent on ionic balance than do animal cells. The effect of salinity and osmotic pressure on the activity of mitochondria and chloroplasts is discussed in relation to electron transport processes. It is suggested that some of the effects of salinity on cell activity can be explained in terms of membrane structure. (See also W72-11755) (Knapp-USGS)
W72-11768

ECONOMIC AND SOCIAL ASPECTS OF SALINE WATER USE AND MANAGEMENT,
Gutteridge, Haskins and Davey, Melbourne (Australia).
B. J. Callinan, and R. G. Webster.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 227-242, 1971. 4 fig, 4 tab, 5 ref.

Descriptors: *Water use, *Salinity, *Social aspects, *Economics, *Australia, Legal aspects, Planning, Legislation, Regional development, Land management, Water management (Applied), Water resources development.

Salinity problems in Australia result from high salinities in streams and in shallow water tables. The major areas affected are the River Murray Valley and the southwestern parts of Western Australia and Victoria. The evaluation of the consequences of salinity problems must commence with knowledge of the economic and social bases upon which the region functions. Salinity-control measures are essentially long-term and their economic evaluation is best made with discount rates which are reduced for long-term costs and benefits. The social consequences must be given due weight in the light of conditions in cities. The effects of high salinities can be lessened in areas already affected, and avoided in areas about to be developed, by investigations, planning and control. Planning legislation can be used to exercise essential controls. (See also W72-11755) (Knapp-USGS)
W72-11769

ADMINISTRATIVE AND LEGAL ASPECTS OF SALINE WATER USE AND MANAGEMENT,
Melbourne Univ., Parkville (Australia).
S. D. Clark, and I. Meacham.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 243-254, 1971.

Descriptors: *Water use, *Salinity, *Social aspects, *Economics, *Australia, Legal aspects, Planning, Legislation, Regional development, Land management, Water management (Applied), Water resources development.

The Australian Senate Select Committee on Water Pollution reported in 1970 on the lack of effective control over water pollution throughout Australia. One form of administrative structure at the State level to combat these dangers is the central administration set up by the Environment Protection Act, passed by the Victorian Parliament in 1970, to cover all aspects of environmental pollution. At the inter-State and Commonwealth-State levels there are special legal and administrative problems to be faced. Control of salinity on the River Murray will depend on a practicable solution to these problems being found. A satisfactory administrative structure to operate at these levels could be built on the experience and advice of central pollution-control administrations, established within the separate States. (See also W72-11755) (Knapp-USGS)
W72-11770

IMPLICATIONS OF THE PRESENT STATE OF SCIENTIFIC KNOWLEDGE FOR TECHNICAL MANAGEMENT,
Water Conservation and Irrigation Commission, Sydney (Australia).
H. N. England.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 257-273, 1971. 9 ref.

Descriptors: *Water use, *Salinity, *Social aspects, *Economics, *Australia, Legal aspects, Planning, Legislation, Regional development, Land management, Water management (Applied), Water resources development.

Salinity, from a management viewpoint, is discussed under the headings of hydrology, use of saline waters, and control of soil and stream salinity, with incidental reference to other Symposium papers. The main theme is the conflict between control of soil salinity under irrigation and downstream river salinity, with the conclusion that the high quality of Australian surface waters should be preserved at the expense of minor loss of land to salt in the semi-arid floodplain environment, where most irrigation development and potential are situated. (See also W72-11755) (Knapp-USGS)
W72-11771

SALINITY AND WATER USE: FUTURE RESEARCH DIRECTIONS,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Soils.
A. E. Martin.
In: Salinity and Water Use, Proceedings of a National Symposium on Hydrology, sponsored by the Australian Academy of Science, Nov 2-4, 1971: Wiley-Interscience, Div. of John Wiley and Sons, Inc, New York, p 275-284, 1971. 20 ref.

Descriptors: *Salinity, *Water utilization, *Research and development, *Water resources development, Irrigation water, Municipal water, Desalination, Groundwater, Land reclamation, Land management, Water management (Applied), Geochemistry, Water quality, Australia.

Future research directions in salinity at the molecular level are already predetermined, and will probably concern the details of ion pumping in cell membranes, the development of new antibiotics, the emergence of salt-tolerant plants and the like. The real problems lie in the catchments and will need the application of terrestrial field research for their solution. A brief analysis of the status of field research is presented and some reasons for its unpopularity are suggested. New research should concentrate on the location of saline soils, sediments and groundwaters more intensively than hitherto, on the origin of terrestrial salt, on the factors responsible for secondary salinity in soils, water supplies and irrigation areas, and on the criteria for evaluating salt-affected soils and techniques for their reclamation. There is acute need for research on the social consequences of a contracting population in irrigation enterprises that ,uffer partial failure. (See also W72-11755) (Knapp-USGS)
W72-11772

SPECIFIC STRUCTURAL ALTERATIONS OF THE CHLOROPLASTS OF SPINACH LEAVES BY NEUTRAL SALTS,
California Univ., Davis. Dept. of Food Science and Technology.
V. J. Yao, C. Sterling, and C. R. Stocking.
Physiologia Plantarum, Vol 26, No 2, p 191-199, 1972. 21 fig, 26 ref.

Descriptors: *Membrane processes, *Salts, *Structural analysis, *Ions, *Water structure, Physicochemical properties, Potassium, Chlorides, Proteins, Lipids, Plant physiology.
Identifiers: *Chloroplasts, *Neutral salts.

The mechanism of salt action on biological structure is still not entirely clarified. It is generally felt that 2 broad categories of interaction exist: salts may alter the structural and chemical properties of the solvent or they may react directly with certain membrane electrostatic structures. Freshly isolated spinach chloroplasts were treated with neutral salt solutions at 1 and 2 M concentrations for ultrastructural study using high-resolution microscopy. The salts used were KCl, KSCN, KI and sodium trichloracetate. Each salt induced a unique pattern of structural disruption, and these are detailed. The structure of chloroplast membranes is characterized by highly polar faces and a strongly hydrophobic inner core. Consideration of the membrane protein-lipid structure suggests that electrostatic groups may be available for reaction with hydrated ions. (Casey-Arizona)
W72-12366

3D. Conservation in Domestic and Municipal Use

FUTURE PLANNING OF WATER RESOURCES AT THE REGIONAL WATER DISTRICT LEVEL,
Stanford Univ., Calif. Dept. of Civil Engineering.
R. Eliassen.
Journal of the American Water Works Association, Vol 59, No 4, p 433-439, April 1967. 2 tab, 3 ref.

Descriptors: *Cities, *Water resources development, *Water districts, *Water sources, Water supply, Economics, Water management, Drought, Payment, Unit costs, Water rates, Metropolitan Water District of Southern California, Northeast U. S..
Identifiers: Metropolitan New York.

Population increases of suburbs of metropolitan cities coupled with drought have resulted in severe local shortages of water. Regional water districts are suggested to solve this problem by expanding sources and increasing financial bases. Several such regional districts are cited. New sources need to be developed including groundwater exploitation and desalting of sea or brackish waters. Where regions extend beyond state lines Interstate Water Authorities should be provided through enabling legislation. Price of water should be set equal to marginal cost of service. Public education is needed to inform users of true costs of water supply and requirements for planning. (Flack-AWWARF)
W72-11884

MEETING FUTURE WATER REQUIREMENTS THROUGH REALLOCATION,
Colorado Univ., Boulder. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W72-11888

NORTHEAST WATER CRISIS AND ITS SOLUTION,
R. J. Faust.
Journal of the American Water Works Association, Vol 58, No 1, p 3-7, January 1966. 1 tab.

Descriptors: *Droughts, *Water supply, *Rainfall, *Water resources development, *Water shortage, *Water resources, *Water supply, *Northeast U. S., *Water storage, *Planning, *Political aspects, New York, Treatment facilities, Financing, New England, Water conservation, Water distribution (Applied), Rivers and Harbors Act.
Identifiers: Northern New Jersey, Philadelphia, Baltimore, Meters.

The Northeast is not running out of water - the shortages are in facilities not in water. Droughts can be planned for if management will take a conservative long-range approach. Contrary to Congressional statements ample supplies are available and federal intervention is not necessary. Baltimore and Philadelphia have excellent planning and management. Boston needs to pay more attention to future needs especially facilities. Northern New Jersey and New England have ample supplies and need improved facilities. New York, however, is beset with complex and politically difficult problems. The New York metropolitan area needs qualified management now. Eventually a metropolitan water authority including Conneticut, New York and New Jersey should be established. (Flack-AWWARF)
W72-11890

DUAL WATER SYSTEMS,
Black and Veatch, Kansas City, Mo.
P. D. Haney, and C. L. Hamann.
Journal of the American Water Works Association, Vol 57, No 9, p 1073-1098, September 1965. 16 tab, 46 ref.

Descriptors: *Dual system, *Water quality, *Potable supply, *Water source, *Desalination, *Demineralization, *Desalination processes, *Cost comparisons, *Distribution systems, *Water supply, *Cost analysis, *Water demand, Hardness (Water), Chemical analysis, Taste, Odor, Water softening, Domestic water, Water utilization.
Identifiers: Brackish water conversion, Mineral content, Bottled water, USPHS Drinking Water Standards, Culver City (Calif), Buckeye (Ariz), Coalinga (Calif), Webster (SD), University of Wisconsin, Cincinnati (Ohio), Wichita (Kans).

The feasibility was determined of two water supply systems, one to supply potable water for domestic use and the other to supply non-potable water for all other uses. Dual systems have been proposed as long ago as 1894 and are currently in use in Coalinga, California, Avalon on Catalina Island, the University of Wisconsin and Grand Canyon Village, Arizona. Based on cost comparisons developed in this study dual systems appear economically justified where source supplies are highly mineralized and/or have severe taste and odor problems. Most feasible are those locations which have a limited potable supply and an abundant mineralized non-potable source such as sea or brackish water. (Flack-AWWARF)
W72-11904

SELECTED DATA ON PUBLIC SUPPLIES OF THE 100 LARGEST CITIES IN THE UNITED STATES, 1962,
Geological Survey, Wash., D.C. Water Resources Div.
C. N. Durfor, and E. Becker.
Journal of the American Water Works Association, Vol 56, No 3, p 237-246, March 1964. 5 tab, 6 ref.

Descriptors: *Water supply, *Water treatment, *Population, *Radiochemical analysis, *Trace elements, Human population, Groundwater, Surface waters, Hardness (Water), Dissolved solids, Sodium, Water softening, Calcium, Magnesium, Hydrogen ion concentration, Spectroscopy.
Identifiers: *Finished water.

Public water supplies of the 100 large,t cities in the United States serve 60 million people, or 34 percent of the nation's population. The Geological Survey has recorded data on these cities and their water use. Included in this summary are data on population, supply, chemical, spectrographic and radiochemical analysis, and concentration of selected characteristics of finished water including hardness, dissolved solids and sodium. Population served by various forms of treatment for surface, ground and combined sources is given. Trace element data are presented along with pH measurements. (Flack-AWWARF)
W72-11905

WATER SUPPLY ECONOMICS, TECHNOLOGY AND POLICY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 06B.
W72-11913

USE OF WATER IN ALABAMA, 1970, WITH PROJECTIONS TO 2020,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06B.
W72-11979

USING LONG-RANGE STORM FORECASTS TO ASSIST THE OPERATION OF A FLOOD CONTROL AND CITY WATER SUPPLY RESERVOIR,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 04A.
W72-12030

HIGH RATE FILTRATION OF COMBINED SEWER OVERFLOWS,
Hydrotechnic Corp., New York.
For primary bibliographic entry see Field 05D.
W72-12191

THE URBAN SYSTEM,
Martin Marietta Co., Denver, Colo.
For primary bibliographic entry see Field 06A.
W72-12221

THE URBAN WATER SYSTEM--TECHNICAL ASPECTS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W72-12222

THE URBAN WATER SYSTEM--ECONOMIC ASPECTS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W72-12223

THE SYSTEMS APPROACH,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W72-12224

MANAGEMENT MODELS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 06A.
W72-12225

MATHEMATICAL MODELING,
Geological Survey, Fort Collins.
For primary bibliographic entry see Field 06A.
W72-12226

OPTIMIZATION TECHNIQUES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12227

THE MACRO APPROACH--URBAN WATER DEMAND MODELS,
Oklahoma Univ., Norman. School of Civil and Environmental Science.
For primary bibliographic entry see Field 06A.
W72-12228

THE MICRO APPROACH--COMPUTERIZED MODELS FOR MUNICIPAL WATER REQUIREMENTS,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 06A.
W72-12229

APPLICATIONS OF LINEAR PROGRAMMING, OR LINEAR POTPOURRI,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12230

LINEAR PROGRAMMING: GENERAL CONCEPTS AND METHODS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12231

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND SUPPLY,
Denver Board of Water Commissioners, Colo.
For primary bibliographic entry see Field 06A.
W72-12232

DYNAMIC PROGRAMMING CONCEPTS AND APPLICATIONS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12233

DYNAMIC PROGRAMMING APPLIED TO SEWER STUDIES,
Illinois University, Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12234

NONLINEAR PROGRAMMING AND SENSITIVITY ANALYSIS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12235

UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12236

CASE STUDY ON SENSITIVITY ANALYSIS AND NONLINEAR PROGRAMMING APPLICATIONS TO PROCESS ANALYSIS AND CONTROL,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12237

SOCIAL PROCESSES IN WATER MANAGEMENT SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Sociology.
For primary bibliographic entry see Field 06A.
W72-12238

3E. Conservation in Industry

USE OF WATER IN ALABAMA, 1970, WITH PROJECTIONS TO 2020,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06B.
W72-11979

WATERPOWER RESOURCES OF THE USSR,
For primary bibliographic entry see Field 06B.
W72-12024

EFFECTS OF GROUNDWATER PUMPING IN PARTS OF LIBERTY AND MCINTOSH COUNTIES, GEORGIA, 1966-70,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 04B.
W72-12384

3F. Conservation in Agriculture

KNOW YOUR SPRINKLER APPLICATION RATES,
Texas Agricultural Extension Service, College Station.
L. New.
Irrigation Age, Vol. 6, No. 6, p. 58-59, 62-63, 66-69, Jan 1972. 1 photo, 3 tab.

Descriptors: *Sprinkler irrigation, *Rates of application, On-site tests, Nozzles, Root zone, Irrigation water, Discharge measurement, Discharge (Water), Pressure, Pressure head, Irrigation practices, *Irrigation operation and maintenance, Irrigation.
Identifiers: *Water application rates, Spacing, Soil water storage, Soil-water relationship, Irrigation requirement.

Irrigation water must be applied in the quantities and at the times which best fill plant moisture needs. Application rates are the basis for determining the depth of irrigation water applied during a specified time. The rate also determines the time the system should set in one location to fill the soil's water-holding reservoir. The application rate is controlled by the line pressure, sprinkler nozzle size, and sprinkler spacing. A change in any of these components affects the application rate. A simple field method is given to determine the discharge from each nozzle. For a known discharge, the application rate and the time of set can be determined from the given tables. Application rates and times of set must be correlated with the holding capacity of the soil-root zone. The soil-root zone is the water reservoir for the day-by-day plant use. Soil water reservoirs are measured in inches of water per foot of soil depth. Typical sandy loam soils have water reservoirs of 1.0 to 1.5 in. of water per foot of soil depth. Assuming a 4-ft soil-root zone, the total water capacity of this soil is 4 to 6 in. A table shows water available to plant roots for various soil textures. (USBR)
W72-11786

EFFECTS OF THE USE OF AGRICULTURAL PESTICIDES ON WATER POLLUTION,
State Coll. of Agronomical Science, Gembloux (Belgium).
For primary bibliographic entry see Field 05C.
W72-11788

PREDICTION OF INCREASES IN SURFACE-IRRIGATION EFFICIENCY,
California Univ., Davis.
T. Strelkoff.
Paper, American Society of Civil Engineers National Water Resources Engineering Meeting, Atlanta, Ga. Jan 1972. 22 p, 8 fig, 11 ref.

Descriptors: *Surface irrigation, *Irrigation efficiency, *Hydraulics, *Flow duration, *Flow profiles, Furrow irrigation, Border irrigation, Infiltration, Infiltration rates, Flow, Soil surfaces, Computer models, Mathematical anlaysis, Return flow, Irrigation engineering.
Identifiers: Flow depth, Shape factor, Wetting front, Water application rates.

Vast quantities of water are used for surface irrigation, but 1/2 to 3/4 of the total water is not needed for crops and is lost. As the stream of water runs down the field, water infiltrates the ground at a rate governed primarily by the time elapsed since the passage of the wave front. The depth of infiltration at each point then depends on the time between passage of the leading and trailing edges of the surface stream. Generally, the infiltration time varies over the field; therefore, if every portion of the field is supplied with the required amount of water, some areas will be overirrigated. Four computer techniques are compared showing stream advance calculated by the volume-balance, kinematic-wave, zero-inertia and

complete hydrodynamic equations. Computer modeling helps determine the effects of these options on water application efficiency. Good results can be obtained with the volume-balance technique if ground slopes are relatively steep and moderately rough. The kinematic-wave method, which costs more to run than the volume-balance model, is not recommended. The zero-inertia model is less expensive to operate than solving the complete hydrodynamic equations, and yields equally accurate results under typical conditions. (USBR)
W72-11789

WEED CHEMICAL CONTROL IN MAIZE CROPS UNDER THE CONDITIONS OF THE LOW TERRACE LAND ALONG THE DANUBE RIVER,
Bulgarian Academy of Sciences, Kostinbrod. Inst of Plant Protection.
J. Lyubenov, M. Marinov, and R. Marinova.
Rastenievod Nauki. Vol 7 No 9 p 113-125. 1970. Illus. English summary.
Identifiers: *Chemcontrol, Cirsium arvense D, Control, Convolvulus arvensis D, Crops, Danube River, Land Maize-M, Terracing, Weed control.

The effects of atrazine and different tillage during the growing season on the dynamics of the soil moisture, the development and the yield of maize grown for grain were studied. Atrazine applied at a dose of 3 kg/ha 50% as wetted powder in years with normal rainfall may practically remove the competition of annual weeds. The introduction of atrazine in rows or dispersed over the whole plot created conditions for dropping off the hoeing in the rows and for growing maize with only one interrow cultivation during the growing season. Cultivation removed the perennial weeds resistant to atrazine, e.g. Cirsium arvense L., Convolvulus arvensis L. and others. In plots treated with atrazine and uncultivated during the growing season, especially during prolonged droughts,the soil is better water-supplied than in untreated and cultivated plots. The application of atrazine maximally reduced the harmful delayed hoeing of maize in the spring. At the same time a 12 day delay of hoeing of untreated plots reduces sharply the yield.--Copyright 1972, Biological Abstracts, Inc.
W72-11818

INFLUENCE OF FERTILIZER PRACTICES ON WATER AND THE QUALITY OF THE ENVIRONMENT,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-11880

EMERGENCE AND SURVIVAL OF COOL SEASON GRASSES UNDER DROUGHT STRESS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
G. M. Wood, and P. A. Kingsbury.
Agron J., Vol 63, No 6, p 949-951, 1971. Illus.
Identifiers: *Drought resistance, *Moisture stress, Dactylis glomerata M, Dormant, Droughts, Elymus junceus M, Emergence, Grasses M, Quiescent, Season, Seeds, Survival, Wildrye M.

Alternating moist and dry periods were used to evaluate 19 grasses, including 6 genera and several cultivars of some, in a growth chamber experiment. Two types of drought tolerance were demonstrated: drought tolerance of seedlings and presence of dormant or quiescent seeds that can survive alternate dry and moist period. A grass significantly higher in the first type of drought resistance was 'Sawki' Russian wildrye (Elymus junceus Fisch.). Pennlate orchardgress (Dactylis glomerata L.) showed a very high degree of drought tolerance of the second type.--Copyright (c) 1972, Biological Abstracts, Inc.
W72-11882

ON THE QUESTION OF COTTON INTERROWS,
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of COTTON.
P. Deshkova.
Rastnievod Nauki. Vol 8 No 4, p 81-89, 1971. Illus. (English summary).
Identifiers: Cotton D, *Interrows, Irrigation, Crop response, *Crop production.

The 60 cm interrow spacing has numberous advantages over wider (80 or 100 cm) interrow spacings from the point of view of agricultural technology and the existing techniques in cotton growing. Cotton growing at 80 cm interrow spacing delays ripening. With dry farming the yield from the first picking drops by 8.25% and under irrigation by 17.40% compared with the 60 cm row standard. Total yield is equal to that of 60 cm interrow spacing. Cotton, grown at 100 cm interrow, matures later and in comparison with 60 cm interrow spacing produces lower first picking yields both under farming (16.22%) and under irrigation (32.31%). Total yield under dry farming is equal to that of the standard while under irrigation it is 5.24% lower.--Copyright (c) 1972, Biological Abstracts, Inc.
W72-11887

THE EFFECT OF TECHNIQUES OF ROOT IMPROVEMENT OF SANDY SOIL ON WATER STATUS AND CROP YIELDS,
V. A. Tikavyi.
Dokl Mosk Sel'Skokhoz Akad Im K A Timiryazeva. 142. p 31-36. 1968.
Identifiers: *Crop production, Fertilizers, *Fertilizing, Moisture, Oats M, Plowing D, Roots, Rye M, Sands, Soils, Techniques, Vetch D, Winter.

In field experiments carried out in 1966-1967 by the All-Union Institute of Potato Growing on sandy-loamy soil, studies were made of the effect of farmyard manure and peat introduced to a depth of 45 cm in spring or 35 cm in autumn. The deep placement of organic fertilizers provided better conditions for accumulation of moisture and improved soil moisture capacity. WITH DEEPLY PLACED ORGANIC FERTILIZERS THE YIELDS OF WINTER RYE, POTATOES, OATS AND THE VETCH=OAT MIXTURE WERE NEARLY +.% TIMES HIGHER THAN IN USUAL PLOWING UNDER OF 60 TONS FARMYARD MANURE PER HECTARE TO A DEPTH OF 22 CM.==Copyright 1972, Biological Abstracts, Inc.
W72-11889

EFFECTS OF SOILS ON FORAGE UTILIZATION IN THE DESERT GRASSLAND,
Benson Union High School, Ariz.
J. L. Vandermark, E. M. Schmutz, and P. R. Ogden.
J Range Manage. Vol 24, No 6, p 431-434. 1971. Illus.
Identifiers: Bouteloua gracilis M, Cattle, Curlymesquite M, Desert, *Forages, Grama M, Grasslands, Hilaria belangeri M, *Soils.

This study was made in southeastern Arizona to determine some of the factors affecting utilization by cattle of 2 key species on 3 desert grassland soils. Macronutrient content of the soil and the plants, and corresponding utilization of blue grama (Bouteloua gracilis) and curlymesquite (Hilaria belangeri), were always significantly greater on the Pima bottomland soil than on the 2 upland soils, but they were not always significantly different between the 2 upland soils. No consistent relationships were found between forage utilization and micronutrient, sugar or starch content in the plants.--Copyright 1972, Biological Abstracts, Inc.
W72-11908

RESPONSE TO WHEAT VARIETIES TO DIFFERENT FERTILITY LEVELS UNDER RAINFED CONDITION,
Wheat Research Station, Pawarkhera (India).
S. P. Singh, K. P. Gupta, S. P. Kurchania, and S. C. Jethmalani.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 4 No 1/2 p 12-14. (1971).
Identifiers: *Crop production, *Fertilization, India, Nitrogen, Phosphate, Rainfed, Varieties, Wheat M.

A trial to study the response of wheat varieties to varying levels of fertility under rainfed conditions was conducted from 1964-65 to 1966-67. A dose of 33.5 kg N and 33.5 kg P2O5/ha increased the yield significantly over the control and 16.75 kg N + 16.75 kg P2O5/ha. 'Hy 65,' 'N.P. 839' and 'Hy 633' were superior to other cultivars tested.--Copyright 1972, Biological Abstracts, Inc.
W72-11927

THE EFFECT OF (2-CHLOROETHYL) TRIMETHYLAMMONIUM CHLORIDE (CCC) ON THE GROWTH AND YIELD OF WHEAT,
Adelaide Dept. of Agriculture (Australia).
J. E. Schultz.
Aust J Exp Agric Anim Husb. Vol 11, No 51, p 450-454. 1971. Illus.
Identifiers: Growth, Wheat M, Crop production, *Crop response, * (2-Chloroethyl) Trimethylammonium chloride.

The effect of CCC on the growth of wheat in South Australia was assessed in 3 yr, 1967-1969. A significant grain yield response was obtained only in the wet year, 1968, and was attributed to increased grain weight. The delay in heading and leaf senescence which occurred in CCC-treated plants perhaps allowed a greater assimilation of water and nutrients, thus producing the heavier grains. The lack of response in grain yield in 1967 and 1969 was probably due to moisture during grain filling. CCC reduced crop height significantly in 1968 and 1969, but not in the very dry year, 1967. Split applications might be more useful than the single applications used in these experiments. Although CCC can give small increases in yield under some conditions, it is unlikely to be of commercial importance for wheat-growing in South Australia.--Copyright 1972, Biological Abstracts, Inc.
W72-11953

CORRELATION BETWEEN YIELD AND YIELD COMPONENTS IN WHEAT (T. AESTIVUM) UNDER RAINFED CONDITION,
Wheat Research Station, Pawarkhera (India).
S. P. Singh, S. V. Velanker, and M. S. Srivastava.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 4, No 1/2, p 20-21. (1971).
Identifiers: *Crop production, Components, Date, Grains, India, *Rainfed, Tillers, Triticum aestivum M, Weight, Wheat M.

Correlation between heading date, tillers/plant, spikelets/ear, 1000-grain weight and yield/plant in wheat (Triticium aestivum) was studied under rainfed conditions. Grain yield was highly and positively correlated with number of grains/ear and 1000-grain weight. A significant positive correlation was noted between heading date and number of tillers/plant. Number of tillers/plant was negatively correlated with 1000-grain weight.--Copyright 1972, Biological Abstracts, Inc.
W72-11988

CONSUMPTIVE USE BY IRRIGATED HIGH MOUNTAIN MEADOWS IN SOUTHERN WYOMING,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 02D.
W72-12004

HYDROLOGY OF IRRIGATED LAND (GIDROLOGIYA OROSHAYEMYKH ZEMEL').
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 170, S. I. Kharchenko,editor, 1971. 128 p.

Descriptors: *Hydrology, *Hydrologic cycle, *Agriculture, *Irrigated land, Irrigation practices, Irrigation practices, Irrigation systems, Sprinkler irrigation, Irrigation water, Groundwater, Soil water, Soils, Crops, Meteorology, RaTION, Precipitation (Atmospheric), Evaporation, Lysimeters, Methodology, Analytical techniques, Equations.
Identifiers: *USSR, Kazakhstan, Rostov Oblast, Stavropol' Territory, Lysimetry, Soil monoliths, Thermoisopleths.

This collection of 6 papers provides information on water balance of agricultural lands and on methods for measuring and calculating various hydrometeorological elements. Specific topics discussed are: (1) tests of a hydrometeorological method to determine the irrigation regime of row crops in the Rostov Oblast in 1966-67; (2) groundwater recharge resulting from irrigation of a cotton field on the Arys'-Turkestanskiy tract in the Chimkent Oblast in Kazakhstan, 1967-69; (3) representativeness of lysimeter measurements of evaporation in the Stavropol' Territory in 1966-69; (4) techniques for calculating precipitation and irrigation water during lysimetry; (5) application of small sprinkers for investigation of soil uptake of atmospheric precipitation and irrigation water; and (6) methods for calculating total solar radiation for short periods of time. (Josefson-USGS)
W72-12019

RELATIONS BETWEEN FE IN IRRIGATION WATER AND LEAF QUALITY OF CIGAR WRAPPER TOBACCO,
Agricultural Research and Educational Center, Quincy, Fla.
F. M. Rhoads.
Agron J., Vol 63, No 6, p 938-940, 1971. Illus.
Identifiers: Algae, Cigars, *Iron, *Irrigation, *Crop production, Leaves, Manganese, Nicotiana tabacum D, Relations, Tensile strength, Tobacco D.

Damage, appearing to result from irrigation water, reduced the value of cigar wrapper tobacco (Nicotiana tabacum L.) in 1969. Dark leaf tips and dark spots over the entire leaf rendered damaged leaves unfit for wrapper use. Leaf analysis indicated that Fe and Mn were associated with the dark coloration. A study was made in 1970 to determine the effect of Fe in irrigation water on quality of cured wrapper tobacco leaves and to find a potential source of Fe contamination of irrigation ponds. Two forms of Fe were added to irrigation water applied to field plots, and Fe content of leaves, leaf quality, and leaf tensile strength were used to evaluate the effects. Soil and organic material were collected from a shallow area of a 'problem' pond, after it had been drained, for use in laboratory studies. Damaged tobacco, similar to that observed in commercial fields, was produced in field plots in 1970 when Fe was added to the irrigation water. Laboratory incubation studies showed that pond sediments were a potential source of Fe buildup in irrigation water. Leaf strength decreased with increasing content of Fe in the tissue. A visible coating was produced on green leaves in the greenhouse when 5 and 10 ppm Fe in water were sprayed on the plants.--Copyright 1972, Biological Abstracts, Inc.
W72-12028

ROOT GROWTH AND SOIL STRUCTURE UNDER DIFFERENT TILLAGE OPERATIONS AND UNIFORM APPLICATION OF FERTILIZER,
Indian Agricultural Research Inst., New Delhi.
D. Subbarami Reddy, and C. Dakshinamurti.
Indian J Agric Sci. Vol 41, No 5, p 413-422, 1971. Illus.
Identifiers: *Crop production, *Cultivation, Fertilizers, Grains, Growth, Maize M, Operations, Root development, Soils, Structure, Tillage, Triticum-aestivum M, Wheat M,Zea MAYS M.

Under uniform application of fertilizer on the rainfed soils the influence of different plowing treatments, deep plowing, moldboard plowing, discing, disc-harrowing and local (desi) plowing on the root-growth factors, soil structure in the rhizosphere and yield of maize (Zea mays L.) followed by wheat (Triticum aestivum L.) was studied. All the factors in both the crops were significantly higher with deep plowing, followed by the moldboard plowing. Root penetration was better because of improvement in the soil structure in the rhizosphere, and a significant correlation between root growth and soil structure was observed. Improved soil structure increased the grain yields in crops grown under different treatments, and there was a significant correlation between the 2 factors. Thus deep plowing, in sandy-loam soils under rainfed conditions, proved significantly superior to other plowing treatments studied.--Copyright 1972, Biological Abstracts, Inc.
W72-12038

NITRATE IN THE UNSATURATED ZONE UNDER AGRICULTURAL LANDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W72-12042

DIFFERENTIAL RESPONSE OF RAGI VARIETIES TO SEED HARDENING,
University of Agricultural Sciences, Bangalore (India).
B. G. Rajashekara, M. G. Rajappa, S. Ramarao, K. S. Krishna Sastry, and K. N. Mallanna.
Mysore J Agric Sci. Vol 5, No 2, p 187-192. 1971.
Identifiers: Grains, Hardening, Ragi M, Rainfall, *Seeds, Varieties, *Crop response, Crop production.

The responses of ragi cultivars to seed hardening under rainfed conditions were examined. 'Purna,' 'IE-817,' and 'H-22' responded consistently well to seed hardening and 'IE-267' did not respond at all. Other cultivars, 'IE-237,' 'ES-11,' 'IE-810' (white ragi) responded with slight increases in grain yield, only in years of low rainfall. The maximum response was in ear weight.--Copyright 1972, Biological Abstracts, Inc.
W72-12078

OBSERVATIONS ON THE BEHAVIOR OF THE SPECIES SORGHUM ALMUM PARODI UNDER THE ECOLOGICAL CONDITIONS OF CLUJ (BULGARIA),
Institutul Agronomic Dr. Petru Groza, Cluj (Rumania).
V. Popescu, and M. Albu.
Comun Bot. 12: p 533-538. 1971. Illus.
Identifiers: *Crop production, Behavior, Bulgaria, Cluj (Bulgaria), Corn-M, *Ecology, Sorghum almum M, Sorghum sudanense M, Sorghum vulgare M, Species.

Sorghum almum Parodi is appreciably influenced in its development by the quantity of precipitation in spite of ts thermophilous nature. For growth in length of 1 cm, the temperature varied from 4.6 to 12 C in 1966 and from 12.8 to 17.3 in 1967 during the different phases of growth. The precipitation for this growth ranged from 0.5-1.0 mm during the first yr and from 0.1-1-2 cm during the second yr of experimentation. The production of green mass in this plant was 23.3 tons/ha, which was practically equal to that of Sorghum vulgare and S. sudanense, but slightly lower than that of corn (27.5 t/ha).--Copyright 1972, Biological Abstracts, Inc.
W72-12080

WATER UPTAKE AND GROWTH OF SUGAR BEET, (IN FRENCH),
Institut National de la Recherche Agronomique, Clermont-Ferrand (France). Centre de Recherches Agronomiques du Massif-Central.
M. Robelin, and M. Mingeau.
I.I.R.B. Rev Inst Rech Betteravieres. Vol 5, No 2, p 71-86. 1970. Illus. English summary.
Identifiers: Beet D, Growth, Sugar, *Moisture uptake, *Crop production, Irrigation.

The maximum evapotranspiration (ETM) of a crop is its water uptake at field capacity under the climatic demand, when the soil supplies sufficient water to the plant. The potential evapotranspiration (ETP) may be determined and depends on climatic conditions. ETM is defined by ETP, leaf area and leaf activity and also by soil moisture when the soil is not completely covered with leaves. The relations between crop production indices and the water uptake index were examined with respect to dry matter, fresh root yield and sugar yield. The relation is linear in the first 2 cases and curvilinear in the last. During dry conditions, the decrease in photosynthesis first affects the elaboration of tissues resulting in less accumulation of metabolic products. Sugar content increases when water uptake diminishes from 100 to 75% of ETM. There is a sudden fall after this level. Under dry conditions, there is a decrease in growth but this may be compensated for by accelerated growth as soon as the water uptake becomes normal again. This phenomenon suggests the use of discontinuous irrigations. The experimental results were confirmed by a survey on the effects of the rainfall distribution on sugar beet yield.--Copyright 1972, Biological Abstracts, Inc.
W72-12086

THE EFFECT ON GROWTH AND YIELD IN RICE FLOODING, (IN KOREAN),
Chonnam Office tar Rural Development, Kwangju (Korea).
Y. S. Kim, and D. J. Yoo.
Res Rep Off Rural Dev (Crop) (Korea). 13, p 23-30. 1970. Illus. English summary.
Identifiers: *Flooding, Growth, *Rice-M, Crop production, Crop response.

The worst flooding damage occurred when the rice plants were completely submerged in water at the booting stage.--Copyright 1972, Biological Abstracts, Inc.
W72-12088

IRRIGATION OF SUGAR BEET ON LIGHT SAND SOIL,
P. N. Harvey, and L. W. Wellings.
Exp Husb. 19. p 1-12. 1970. Illus.
Identifiers: *Irrigation, Sands, Soils, Sugar beets, *Crop production, Crop response.

The average response to water in 11 yr was just over 1 ton of clean beet/acre in. of water applied. If the difference between the total rainfall in July, Aug. and Sept. and the calculated potential transpiration for these 3 mo. is 2 in. or less, there is little response to watering. If the deficiency rises to 4 in., good responses can be expected, and if to 6 in. very large responses are probable.--Copyright 1972, Biological Abstracts, Inc.
W72-12091

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, SAN MIGUEL COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, P. S. Derr, J. U. Anderson, and V. G. Link.
Available from the National Technical Information Service as PB-211 162, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 221, New Mexico State University, Las Cruces, New Mexico, 1972, 44 p, 9 fig, 7 tab, 8 ref. OWRR B-015-NMEX (19).

Descriptors: *New Mexico, *Irrigable land, *Soil classificatcn, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *San Miguel County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is presented on the suitability of soils in San Miguel County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The irrigation land classes were assigned primarily on the basis of the data available from the general soil map. Although such maps are often made by generalizing from large-scale detailed soil maps, detailed soil surveys were available only on approximately one-half of the land in San Miguel County. In those parts of the county not covered by detailed soil surveys, the general soil map was prepared on the basis of a field reconnaissance, together with interpretation of airphotos, topographic maps, geological maps, and other available information. The data were organized and presented on the basis of soil associations shown on the general soil map and on the irrigation land classification map. San Miguel County has about 3,050,900 acres, of which about 44 percent were considered suitable for irrigation. About 177,995 acres were in irrigation class 1; 419,084 acres in class 2; 305,680 acres in class 3; and 444,571 acres in class 4. The remaining 1,703,570 acres in the county were in land class 6, which was not considered suitable for irrigation. Information is provided on soil resources that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color are included. (Creel-New Mexico State)
W72-12098

ABSORPTION OF COPPER, ZINC, MANGANESE, BORON, COBALT AND MOLYBDENUM, BY CROPS IN THE TSELINOGRAD REGION,
P. G. Grabarov.
Tr Inst Pochvoved Akad Nauk Kaz SSR. 18: p 54-67. 1970.
Identifiers: *Absorption, Boron, Cereals, Cobalt, Copper, *Crops, Fodder, Legumes D, Manganese, Molybdenum, Pulse D, Tselinograd, USSR, Zinc, Trace elements.

Studies of the straw and kernels of grains, pulses and fodder crops for 6 yr revealed a greater accumulation of Zn, Cu and Mo in grain than in straw, but the opposite relationship was obtained in the case of Mn and B. The Co contents were approximately equal in straw and grain. The uptake of trace elements increased in wet years; it also increased with higher crop yields. Data are reported on the uptake of trace elements by cereals, pulse crops and legumes.--Copyright 1972, Biological Abstracts, Inc.
W72-12112

TOLERANCE AND SELF-TOLERANCE OF CEREALS UNDER IRRIGATION CONDITIONS,
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
G. Georgiev.
Rastenievod Nauki. Vol 7, No 9, p 13-24. 1970. English summary.
Identifiers: *Crop production, Barley M, Cereals, *Irrigation, Maize M, Oats M, Rye M, Sorghum M, Tolerance, Wheat M, Crop response, Resistance.

The tolerance and self-tolerance of 6 cereal crops: wheat, barley, rye, oats, sorghum and maize under irrigation conditions were studied from 1963-1966 on leached cinnamon forest soils. Two backgrounds of fertilization were applied: without fertilization (O) and intensive fertilization (T) with N200P160K120 (kg/ha). Marked self-intolerance was manifested by barley and somewhat by sorghum. Marked self-tolerance occurred in the rye and somewhat in maize. Wheat was better tolerant to the other cereals. Winter cereals show good tolerance to oats but not reciprocally. Oats manifests good tolerance to spring cereals but only under fertilization. The winter cereals are generally of equal significance as predecessors of the remaining cereal crops. Maize and sorghum are of equal biological significance to the remaining cereal crops, expressed in yield reduction without fertilization and better tolerance under mineral fertilization. Nutrition conditions change the self-tolerance and the tolerance of the different cereal crops. Thus maize manifests self-tolerance without fertilization. Sorghum manifests equal intolerance to maize and wheat without fertilization and better tolerance to wheat than to maize under fertilization.--Copyright 1972, Biological Abstracts, Inc.
W72-12113

THE GROWTH OF SUGAR-BEET ROOTS IN RELATION TO MOISTURE EXTRACTION FROM THE SOIL PROFILE,
Broom's Barn Experiment Station, Bury St. Edmonds (England).
A. P. Draycott.
I.I.R.B. Rev Inst Int Rech Betteravieres. Vol 5, No 2, p 65-70. 1970. Illus.
Identifiers: *Moisture uptake, *Crop production D, Extraction, Growth, Soil profiles, Roots, Soils, Sugar beets.

Periodic measurements of soil moisture were made in sugar beet crops in each of the years 1967-69. The quantity of water (g/cm3) was determined at 5, 10, 15 and 20 cm, and at 10 cm intervals down to 100 cm, using a neutron moderation meter. In all 3 yr moisture was lost from the surface 20 cm mainly by evaporation from bare soil during the period up to singling. During the latter half of May and in early June, sugar beet roots withdrew moisture down to 80 cm and by early July water was extracted down to 100 cm. In the 2 dry years, there was evidence that roots took out some moisture below 100 cm. By integrating the areas between sequential moisture profiles, soil moisture deficits were obtained. These were compared with deficits calculated from meteorological data and suggested that with deficits under sugar beets of less than 15 cm, the root system sustained the water requirement of the crop from soil reserves, except when the deficit increased rapidly in 1967.--Copyright 1972, Biological Abstracts, Inc.
W72-12117

EFFECTS OF VARIETY, SPACING AND SOIL FERTILITY ON ROOT DEVELOPMENT IN GROUNDNUT UNDER ARID CONDITIONS,
Central Arid-Zone Research Inst., Jodphur (India).
Suraj Bhan, and D. K. Misra.
Indian J Agric Sci. Vol 40, No 12, p 1050-1055. 1970.
Identifiers: Arachis hypogaea D, Arid climates, *Root development, Fertility, *Groundnut, Nitrogen, Nodules, Soils, Spacing, Varieties.

The erect cultivar 'AK 12-24' showed more primary and secondary roots and greater root weight, but was shallower in its penetration. It was inferior to 'PG 1' in nodulation and N content of the roots and nodules. Increased spacing between plants and balanced fertilization with N and P favored the development of roots and nodules and increased their N content. The amount of evapotranspiration and pod yield were positively correlated with root growth.--Copyright 1972, Biological Abstracts, Inc.
W72-12118

THE EFFECTIVENESS OF SHELTERBELTS IN THE FOREST-STEPPE AREAS,
L. T. Ustynovs'Ka.
Visn Sil'S'Kohospod Nauk. 9. p 82-85. 1969.
Identifiers: *Crop production, Oak D, Poplar D, *Shelterbelts, Wheat M, Winter.

Five-row strips with interrows of 1.5 m, with a height of 4 m and a length of 1 km resulted in an increase of yield of winter wheat of approximately 4 tons, and with the height of 6 m, 6-7 tons. These strips were stable. Strips of fast growing tree species (the poplar species producing no suckers) with 3-4 rows, 2.5 m interrows gave the best results.--Copyright 1972, Biological Abstracts, Inc.
W72-12125

PREDICTING RADIOCONTAMINATION OF PLANTS THROUGH RAIN (AND IRRIGATION WATER) (ESTIMATION DU TAUX DE TANSFERT DE LA RADIOCONTAMINATION DE LA PLUIE AUX VEGETAUX),
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleatres.
For primary bibliographic entry see Field 05B.
W72-12197

A MATHEMATICAL MODEL FOR EVALUATION OF RADIOACTIVE AND CONVENTIONAL POLLUTION OF SURFACE WATERS (MODELLO MATEMATICO PER LA VALUTAZIONE DI INQUINAMENTI RADIOATTIVI E CONVENZIONALI IN ACQUE SUPERFICIALI),
Comitato Nazionale per l'Energia Nucleare, Rome (Italy); and European Communities, Luxembourg. Commission.
For primary bibliographic entry see Field 05B.
W72-12198

EFFECT OF MULCHES ON WATER CONSERVATION, SOIL TEMPERATURE AND GROWTH OF MAIZE (ZEA MAYS L.) AND PEARL-MILLET (PENNISETUM TYPHOIDES (BURM. F.) STAPF. ET C. E. HUBB.),
Punjab Agricultural Univ., Hissar (India).
S. P. Bansal, P. R. Gajri, and S. S. Prihar.
Indian J Agric Sci. Vol 41, No 5, p 467-473. 1971. Illus.
Identifiers: *Crop production, *Mulching, Conservation, Plastics, Growth, India, Maize M, Mats, Millet M, Mulches, Pennisetum typhoides M, Soils, Straw, Temperature, Typha-M SP, Zea mays M.

The effect of mulches on the moisture conservation, soil temperature and growth of maize (Z. mays) and pearl-millet (P. typhoides) was studied in twin field experiments on the sandy-loam soil of Hissar in 1967. The mean integrated moisture content was highest under polyethylene mulch and lowest in the control. Straw, encap and cultivation were intermediate to polyethylene and the control. Straw mulch reduced, and polyethylene and encap increased, the maximum soil temperature at 10 cm. Straw mulch applied as 2-cm thick Typha mats increased the maize yield by 15 q (quintal)/ha or 35%, apparently because of its favorable effects on soil temperature. Post-planting shallow cultivation also increased maize yield by 30%. Encap sprayed at the rate of 1.5 l/m sq, or transparent polyethylene sheet spread between rows, increased the soil temperature considerably and did not affect maize yield. None of the mulches significantly affected the yield of pearl-millet.--Copyright 1972, Biological Abstracts, Inc.
W72-12253

EFFECTS OF WATER SOURCES AND FERTILIZERS ON PEANUT PLANTS IN THE GREENHOUSE,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
D. J. Banks, and B. G. Jordan.
Proc Okla Acad Sci. 51: p 47-50. 1971.
Identifiers: *Crop production, Fertilizers, Greenhouses, Peanut D, Plants, *Water types.

Experiments were conducted using different sources of water (tap, lake, distilled, acidified tap, and acidified distilled water) and different fertilizer treatments to seek the best method of growing peanut plants under greenhouse conditions. Distilled water proved to be best; acidification of tap water was beneficial. Use of acidifying soluble fertilizers (21-7-7 and 20-20-20) in combination with distilled water, sand, and plastic pots gave good results.--Copyright 1972, Biological Abstracts, Inc.
W72-12260

STUDIES OF THE FERTILITY OF GENETIC HORIZONS IN ADZHARIAN BUROZEMS AND RESTORATION PRACTICES FOR ERODED SOILS,
I. H. Beridze.
Subtrop Kul'T. 6. p 123-129. 1969.
Identifiers: *Fertilization Adzharian Burozems, Corn M, *Eroded soils, Fertility, Restoration, Soils, Soybean D, Tobacco D.

Pot experiments with soya demonstrated the high efficacy of mineral fertilizers on genetic horizons of forest burozems. The highest requirement of corn and tobacco for N fertilizers occurred on eroded burozems. The highest yields of corn and tobacco occurred in the NPK variant (crop increments of 629 and 526%, respectively). The NP variant produced respective crop increments of 561 and 413%, NK 465 and 367%, and N 141 and 329%.--Copyright 1972, Biological Abstracts, Inc.
W72-12315

EAST GREENACRES UNIT, PRAIRIE DIVISION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho.
For primary bibliographic entry see Field 08A.
W72-12336

LOANS TO BE MADE BY THE FARMERS HOME ADMINISTRATION TO RURAL WATER SYSTEM NO. 1, HOSPERS, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Farmers Home Administration, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12337

WAX FILAMENTS ON SORGHUM LEAVES AS SEEN WITH A SCANNING ELECTRON MICROSCOPE,
Duke Univ., Durham, N.C.
M. F. Sanchez-Diaz, J. D. Hesketh, and P. J. Kramer.
Journal of the Arizona Academy of Sciences, Vol. 7, No. 1, p 6-7, February 1972. 3 fig, 4 ref.

Descriptors: *Drought tolerance, *Plant morphology, *Electron microscopy, *Sorghum, *Corn (Field), Leaves, Water conservation, Stomata, Diffusion, Moisture stress.

In evaluating the causes for the differences in drought tolerance between sorghum and maize, the presence of a white, waxy bloom on the sorghum leaves and leaf sheaths is an obvious starting point. The waxy film can be seen as filaments under a light microscope, but with too little detail. Electron microscope photographs of these filaments at 125OX and 12,500X are presented. The wax filaments were 0.8 micron thick and never much longer than 110 microns. The filaments formed a meshwork of clusters on the leaf midribs and near some of the stomata. A picture of a stoma is presented for reference. The wax filaments will reflect some radiation, lowering the net radiation, and will thicken the boundary layer of air next to the leaf, thereby increasing resistances to diffusion of water, oxygen, and carbon dioxide in and out of the leaf. Thus drought tolerance should be increased. (Casey-Arizona)
W72-12343

STUDIES OF THE DRIP METHOD OF IRRIGATION,
Punjab Agricultural Univ., Hissar (India). Dept. of Soils.
I. P. Abrol, and S. P. Dixit.
Experimental Agriculture, Vol 8, No 2, p 171-175, 1972. 3 tab, 3 ref.

Descriptors: *Irrigation practices, *Crop response, *Onions, *Root systems, Soil strength, Soil water.
Identifiers: *Drip irrigation.

Drip irrigation is the lateral spread of water at slightly above atmospheric pressure, in soil near the root zone of the growing crop, through a system of perforated plastic pipes buried in the soil. A comparison was made of drip and conventional check basin irrigation methods, using onion (Allium cepa) and ladies finger (Hibiscus esculentum) as test crops. In both cases, drip irrigated plants showed significant superiority in yield and water use efficiency. This was because of greater soil moisture availability at lower tensions and reduced surface evaporation losses. Bulb or root crops may be at any advantage because the wetter soil presents less resistance to expansion. (Casey-Arizona)
W72-12347

COASTAL CALIFORNIA EVAPOTRANSPIRATION FREQUENCIES,
Agricultural Research Service, Weslo, Tex. Soil and Water Conservation Research Div.; Agricultural Research Service, Beltsville, Md.; and Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 02D.
W72-12352

PEAK WATER REQUIREMENTS OF CROPS IN SOUTHERN IDAHO,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 02D.
W72-12353

WATER DEFICITS--IRRIGATION DESIGN AND PROGRAMMING,
California Univ., Davis. Dept. of Water Science and Engineering.
R. M. Hagan, and J. I. Stewart.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 98, No. IR2, p 215-237, June 1972. 2 fig, 2 tab, 124 ref.

Descriptors: *Irrigation practices, *Evapotranspiration, *Planning, *Peak loads, *Irrigation programs, Soil moisture, Soil-water-plant relationships, Moisture tension, Moisture deficit, Productivity, Economic feasibility, Crop response.
Identifiers: *Water use efficiency, *Production functions, *Plant water potential.

Irrigation systems are created with the intention of providing water to crops to prevent the occurrence of crop water deficits that will lead to uneconomic yields. Design engineers must deal with the problem of matching the capacities of water distribution and water application to the peak use rates indicated by the peak evaporation rates. Water use efficiency is a prime goal because building increased capacity into distribution and application systems is very expensive. Economic information is needed on the expected effects of water deficits on crop yields, which is unfortunately scarce. Two approaches to irrigation programming and design of irrigation system peak capacities to meet delivery and application requirements are presented. The first is a comprehensive tabulation of available data on allowable soil water suction. This updates and adds to earlier information. Much of the data shows considerable scatter and it is obvious that plant water deficits would be better described by plant water potential rather than soil moisture. The conditions of evaporative demand complicate any interpretation of soil moisture in terms of plant moisture stress. The second approach is a continuing research program on preseason irrigation programming techniques and development of water production functions for principal crops, relating yield reductions to water deficits. These functions will vary with type of crop, soil depth and water holding capacity, evaporative demand of the area in question, and with the particular program adopted for times and depths of water applications. (Casey-Arizona)
W72-12354

AN AUTOMATED SURFACE IRRIGATION VALVE,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering; and Murphy (Frank W.) Manufacturers, Tulsa, Okla.
For primary bibliographic entry see Field 08C.
W72-12355

GENERAL STATEMENT OF PRINCIPLES TO BE INCLUDED IN STATE WATER RIGHTS LAWS.
American Society of Civil Engineers, New York. Committee on Water Laws.
For primary bibliographic entry see Field 06E.
W72-12361

SOIL PHYSICAL FACTORS AFFECTING PEANUT POD DEVELOPMENT,
Auburn Univ., Ala. Agricultural Experiment Station.
C. V. Underwood, H. M. Taylor, and C. S. Hoveland.
Agron J, Vol 63, No 6, p 953-954, 1971, Illus.
Identifiers: *Crop production, *Soil physical properties, Arachis hypogaea D, Development, Peanut-D, Pods, Soils.

Effects of crust strength and soil water potential on peg penetration and pod development in peanuts (Arachis hypogaea L.) were evaluated. When fully constrained, pegs developed as much as 13 bars pressure, but under simulated field conditions the pegs exerted only 3 or 4% of that pressure. In a field experiment the percentage of pegs that penetrated the upper 1.5 cm of pegging zone soil and the weight of pods that developed in the pegging zone decreased as penetrometer resistance increased. The rate at which individual pods increased in size was not reduced until soil water potential was reduced to below -15 bars.--Copyright 1972, Biological Abstracts, Inc.
W72-12363

ATTAINABLE IRRIGATION EFFICIENCIES,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. S. Willardson.
Journal of Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 239-246, June 1972. 1 fig, 2 tab, 15 ref.

Descriptors: *Irrigation efficiency, *Root zone, *Uniformity coefficient, *Irrigation systems, Economic feasibility, Political aspects, Infiltration rates, Soil water movement, Sprinkler irrigation.
Identifiers: *Trickle irrigation.

The general objective of irrigation is to provide a suitable moisture environment in the soil for plant growth. Since water supplies for irrigation in the arid and semiarid western U.S. have never been as plentiful as irrigators would like, the concept of irrigation efficiency has received much attention. Irrigation efficiency is considered equivalent to water application efficiency or the percentage of water applied that is actually stored in the root zone for use by the crops. Water application effi-

ciency is critically determined by uniformity of field water application in amounts that will not exceed root zone storage capacity. Such uniformity is difficult to attain in surface irrigation if light irrigations are required, if soil infiltration rates are high or if soil intake characteristics vary spatially. Physical, economic and political factors affecting water application efficiency are discussed. Application uniformities of different irrigation systems are discussed. The coefficient of uniformity of sprinkler systems vary widely depending on characteristics of the sprinkler system and the water distribution pattern. Trickle systems look promising but uniformity data are not yet available. (Casey-Arizona)
W72-12367

DISTRIBUTION CHANNELS WITH MULTIPLE OUTLETS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering; and Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
W. E. Hart, and J. Borrelli.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 267-274, June 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Semiarid climates, *Distribution systems, *Channels, *Irrigation systems, Spillways, Furrow irrigation, Ditches, Economic feasibility, *California, Outlets, Hydraulic structures, Slopes.

Land use improvements in California require agricultural intensification in some portion of the state's approximate 8 million acres of rolling dry foothills. An obvious first step would be irrigated pasturelands, but the economics of such land development dictate an irrigation system with low labor, capital and water requirements. The practical solution to these requirements is a graded supply ditch in which the water is checked at intervals to form bays. When a given bay is checked, the total supply flow is diverted through multiple, equally spaced outlets into field corrugations. The corrugation system is designed to allow simultaneous discharge from several identical outlets equally spaced along a graded open supply ditch. Design procedures for the bays and outlets under a wide set of field conditions are outlined. In order to insure approximately equal outflow from each of the several operating outlets, it is necessary that the head on all outlets be nearly equal. The required minimum head can be estimated using the gradually and rapidly varied flow equations. The design of zero-slope channels is also discussed. (Casey-Arizona)
W72-12370

BORDER IRRIGATION ADVANCE AND EPHEMERAL FLOOD WAVES,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02E.
W72-12371

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

HYDROLOGY OF SWELLING SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 03C.
W72-11761

STUDY OF HYDRAULIC FILTER LEVEL OFFSET (HYFLO) EQUIPMENT FOR AUTOMATIC DOWNSTREAM CONTROL OF CANALS,
Bureau of Reclamation, Denver, Color.
J. C. Schuster, and E. A. Serfozo.
Bureau of Reclamation Report REC-ERC-72-3, Jan 1972. 15 p, 13 fig, 2 tab, 3 ref.

Descriptors: *Control, *Automatic control, *Canals, Water levels, Downstream, Automation, Irrigation canals, Water level fluctuations, Hydraulics, Laboratory tests, Control systems, Analog computers, Simulation, Gates, Test results, Mathematical models, Control equipment, Model studies.
Identifiers: *Equipment design, Schematic diagrams, Corning Canal (Calif), Central Valley Project, Liquid level gages, Damping, Timing circuits, Offsets.

The Hydraulic Filter Level Offset (HyFLO) system for automatic downstream control of canals was mathematically modeled, designed, and constructed by the University of California, Berkeley, and the Bureau of Reclamation Office, Sacramento, Calif. The HyFLO system is a feedback control method for automatically adjusting the canal inflow from water level offsets caused by the canal outflow. Mechanical and electrical problems occurred in a field trial of the system, and the equipment was sent to the Engineering and Research Center, Denver, Colo, for testing and evaluating. The HyFLO equipment was installed in the laboratory to simulate one section of canal between 2 radial gates. After some equipment modification, the laboratory model satisfactorily simulated mathematical predictions of gate opening and water level changes in the canal section. Upon completion of the laboratory testing, the equipment was installed on one section of the Corning Canal near Red Bluff, Calif. The equipment is now controlling the flow satisfactorily. (USBR)
W72-11785

PARTNERSHIP IN COMPREHENSIVE RIVER BASIN PLANNING,
Water Resources Council, Washington, D.C.
H. P. Caulfield, Jr.
Journal of the American Water Works Association, Vol 59, No 10, p 1217-1222, October 1967.

Descriptors: *Planning, *River basin development, *Water resources development, *Project planning, *Water Resources Planning Act, Federal government, State government, Local government, River basin commissions, Water policy, Competing uses.
Identifiers: Comprehensive Planning, Local agencies planning.

The need for a partnership among federal, state and local levels of water resources planning and operations is emphasized. The federal role in encouraging the partnership, especially under the Water Resources Planning Act of 1965, is described. Six explicit reasons for comprehensive planning are given. The special needs and roles of local agencies are explored. The need for much improved methods of including local agencies in the federal-state partnership requires the help of the water utility industry. (Flack-AWWARF)
W72-11886

QUANTITATIVE ANALYSIS OF RESERVOIR AND STREAM YIELDS,
Illinois State Water Survey, Urbana.
H. F. Smith, J. B. Stall, and J. H. Dawes.
Journal of the American Water Works Association, Vol 58, No 9, p 1187-1196, September 1966. 6 fig, 2 tab, 8 ref.

Descriptors: *Surface runoff, *Runoff, *Safe yield, *Hydrology, *Reservoir yield, *Reservoir sites, *Reservoir storage, *Streamflow, *Low flow, Frequency analysis, Hydrologic cycle, Average flow, Impoundments, *Illinois.
Identifiers: *Low flow frequency curves, *Extending streamflow records, Reservoir capacity, Streamflow variability.

A number of hydrologic tools are available to provide useful answers to practical hydrologic streamflow problems. Methods are cited for computing impounding reservoir yield and stream yield and for extending streamflow records. Use of such methods is illustrated for Illinois. The time variability of runoff for Illinois is mapped. Potential reservoir sites and their net yields have been studied for Illinois. (Flack-AWWARF)
W72-11895

RADIATION AND HEAT BALANCE UNER THE CANOPY OF DRY AND FAIRLY MOIST OAK GROVES IN THE SOUTHERN FOREST-STEPPE OF THE UKRAINIAN SSR,
A. P. Fedoseev.
Lesovod Agrolesomelior Respub Mezhvedom Temat Nauch Sb. 15 p 19-29, 1968.

Descriptors: Canopy, Clouds, Dry, Foliage, *Forests, Groves, *Heat balance, Moist, Radiation, Rainfall, Southern Steppe, Ukrainian-SSR, Oak trees.

Observations were carried out in a fairly moist oak grove (FMG) on a 3 deg northern slope, in a dry oak grove on a water divide (DGW) and in another dry oak grove on a 12 deg southern slope (DGS). Plantings and soil moisture reserves are described for Aug.-Sept. Daily totals are given (for clear days, overcast days, and as an average) of short wave radiation and its absorption by the tree cover in the second half of summer and the first half of fall; intensity of radiation absorption as a function of the foliage of arboreal stands; the dependence of radiation absorption on sun elevation; elements of heat balance in the groves and in the field at different times during the day. The radiation balance under the canopy in FMG was 1/11 that of the radiation balance in the open; in DGW it was 1/9 and in DGS-1/7. Turbulent heat exchange under the tree crown is close to zero values (FMG) or is negative (DGW and DGS). Heat expenditure on evaporation from the soil surface and on transpiration by the herbaceous cover in FMG is 1/18 that in the field; in DGW and DGS it is 1/8. On cloudy days, the differences in the structure of the heat balance under the oak canopies are evened out. Rainfall causes a noticeable rearrangement in the heat balance structure in the forest, when both radiation balance and the heat expenditure on evaporation are reduced.--Copyright 1972, Biological Abstracts, Inc.
W72-11898

PRINCIPLES FOR DISTINGUISHING RIPARIAN VEGETATION TYPES IN THE FLOODPLAIN FORESTS OF EASTERN CISCAUCASIA,
O. V. Zelen'Ko.
Lesovedenie. 5. p 50-57, 1968. English summary.
Identifiers: Trees, Acer campestre D, Aeration, Ash D, Carpinus caucasica D, Ciscaucasia, Cornus D, Dogwood D, Elm D, Flooding, *Flood plains, Forests, Fraxinus excelsior D, Hedge, Hornbeam D, Maple D, Oak D, Pedunculate, Poplar D, Populus alba D, Principles, Quercus Robur D, *Riparian plants, Salix alba D, Soils, Types, USSR, Vegetation, Willow D.

A scale of resistance to flooding was composed for the most widespread tree species in floodplains of Eastern Ciscaucasia. For vegetation exposed to short flooding (SFV) the following species are characteristic: European ash (Fraxinus excelsior), Caucasian hornbeam (Carpinus caucasica), hedge maple (Acer campestre) and dogwood (Cornus). For the vegetation exposed to medium-duration flooding (MFV) the presence of pedunculate oak (Quercus robur) and of elm and the lack of ash, hornbeam, hedge maple and dogwood is characteristic. For vegetation exposed to prolonged flooding, the presence of white willow (Salix alba)

and of white poplar (Populus alba) is characteristic, together with the absence of species which are characteristic of SFV and MFV. The comparison of the 500 records available was carried out according to 'hygrotopes' (sites with a given moisture regime). Lists are given of plant indicators of riparian vegetation, separately for the fresh, the moist and the slightly moist 'hygrotopes.' Moisture-demanding species penetrate into the drier sites in MFV, whereas less-moisture demanding species penetrate into the wetter sites in the SFV. The comparison of soil morphology, which is closely connected with physical properties, and the vegetation types showed that the formation of riparian vegetation types depends on the mechanical composition, the stability and characteristics of texture, the compaction of the horizons, and on the stratification of the profile. On heavy soils, on soils with a weak texture, with compaction of the horizons, on soils with a stratified profile, vegetation typical of flooding of medium duration are more often formed. The negative effect of flooding on the vegetation is mainly due to the deterioration of aeration.--Copyright 1972, Biological Abstracts, Inc.
W72-11899

EFFECTS OF FOREST MANAGEMENT ON WATERSHEDS,
Virginia State Div. of Forestry, Charlottesville.
For primary bibliographic entry see Field 04C.
W72-11902

STATUS OF WATER RESOURCES USE, CONTROL AND PLANNING IN THE UNITED STATES,
John Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 06B.
W72-11914

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-11949

MAINTENANCE OF THE FLUSHING BAY AND CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-206 391D, $3.00 in paper copy, $0.95 in microfiche. January 17, 1972. 9 p, 1 map.

Descriptors: *New York, *Dredging, *Channel improvement, *Environmental effects, Spoil banks, Water pollution sources, Benthic fauna, Turbidity, Benthic flora, Landfills, Aquatic life, Marine fish, Bays, Navigation, Water quality.
Identifiers: *Environmental Impact Statements, *Flushing Bay (N.Y.).

The proposed project involves maintenance dredging of the existing federal project in Flushing Bay and Creek on the north shore of the Borough of Queens, New York City. Approximately 700,000 cubic yards of material will be removed during each maintenance action. There is no definite dredging schedule and dredging will be at infrequent intervals. Spoil will be deposited in approved ocean dumping grounds; however, upland disposal is permitted if a suitable site is found. Environmental impacts of the proposed action include turbidity within creek and bay waters, temporary loss of local marine life, disturbance of the marine food chain, disturbance of migratory bird refuges, lessened river traffic due to ships carrying heavier loads, and water quality impairment contributed to by spoil dumping. Adverse impacts include the temporary turbidity during dredging, damage to benthic life from dredging, and water quality impairment from dredging and dumping. Alternatives include cessation of harbor maintenance and alternative disposal sites, preferably on land. (Grant-Florida)
W72-11951

INFLUENCE OF FOREST DRAINING ON HYDROLOGY OF PEATLANDS (METSAOJITUKSEN VAIKUTUKSESTA SUON HYDROLOGIAAN),
Vesientutkimuslaitos, Vesihallitus, Helsinki (Finland).
S. E. Mustonen, and P. Seuna.
Vesientutkimuslaitoksen Julkaisuja, No 2, Vesihallitus, Helsinki, 1971. 63 p, 37 fig, 17 tab, 27 ref.

Descriptors: *Hydrology, *Land management, *Drainage, *Forests, *Peat, Bogs, Soil types, Ditches, Slopes, Drainage area, Watersheds (Basins), Runoff, Meteorology, Precipitation (Atmospheric), Antecedent precipitation, Rainfall-runoff relationships, Evapotranspiration, Seasonal Weirs, Correlation analysis.
Identifiers: *Finland.

Hydrological effects of forest draining were investigated in a drainage experiment carried out in 1935 at Ruokolahti in southeast Finland. The purpose of the experiment was to eliminate the effect of climatic factors on changes in runoff and to show the effects of ditching. The runoff quantities examined were annual runoff, monthly runoff, spring and summer maximum runoffs, and winter and summer 30-day minimum runoffs. Drainage increased annual mean runoff over a 9-year period (1961-69) by an average of 3.02 liter/sec/sq km or 95 mm. The increase in spring and summer maximum runoffs as a result of draining averaged 31% and 131%, respectively. The marked increase in minimum runoff values for both winter and summer was due largely to the year-round flow in ditches. (Josefson-USGS)
W72-12020

WATERPOWER RESOURCES OF THE USSR,
For primary bibliographic entry see Field 06B.
W72-12024

USING LONG-RANGE STORM FORECASTS TO ASSIST THE OPERATION OF A FLOOD CONTROL AND CITY WATER SUPPLY RESERVOIR,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
J. A. Cole.
North Carolina University Department of City and Regional Planning Research Report, July 1970. 9 p, 3 fig, 14 ref.

Descriptors: *Reservoir operation, *Reservoir releases, *Storms, *Flood forecasting, *Flood control, Water supply, Safe yield, Reservoir storage, Flow control, Rainfall, Weather data, Runoff.

The multiple use of a reservoir entails a balance of objectives. A balancing procedure is described which minimizes the sum of flood damages resulting from overspill of the reservoir after a severe rainstorm. Penalties are suggested for shortage caused by releasing water in anticipation of a storm which does not match up to the forecast severity. Storm forecasts at least five days in advance should permit the release of a substantial portion of the reservoir's contents by the time the storm arrives. Algorithms prescribe control rules for the timing and amount of such releases. (Woodard-USGS)
W72-12030

NATURAL AREAS,
For primary bibliographic entry see Field 06G.
W72-12039

CHANGES IN WATER QUALITY RESULTING FROM IMPOUNDMENT,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05G.
W72-12072

PLASTIC PIPELINES FOR LIVESTOCK WATER IN NORTHWEST NEBRASKA,
Soil Conservation Service, Rushville, Nebr.
W. Peden.
J Range Manage. Vol 24 No 6 p 473-476. 1971. Illus.
Identifiers: *Stock water, Livestock, Nebraska, *Pipelines, Plastics.

Polyvinyl-chloride (PVC) pipe has provided a method of piping good water. Five hundred forty five miles of PVC pipe have been installed, or are planned, on 108 ranches watering approximately 300,000 acres of rangeland. This productive grassland area can be grazed safely and efficiently with a stable, good quality water supply.--Copyright 1972, Biological Abstracts, Inc.
W72-12082

HOW TO BUILD AND SAVE BEACHES AND DUNES,
Rhode Island Univ., Kingston. Coll. of Resource Development.
J. A. Jagschitz, and R. C. Wakefield.
Available from the National Technical Information Service as COM-72 10150, $3.00 in paper copy, $0.95 in microfiche. University of Rhode Island Marine Leaflet Series Number 4, Agricultural Experiment Station Bulletin 408, October 1971. 12 p, 18 ref.

Descriptors: *Conservation, *Shore protection, *Beach erosion, *Dunes, *Vegetation establishment, *Grasses, Seeding (Planting), Fertilization, Maintenance.
Identifiers: *Fencing, *Beachgrass.

Protection of the ever-vulnerable sandy shoreline by beach and dune building is discussed. Building with brush and fences is illustrated, with emphasis on vegetation, primarily beachgrass. Instructions on obtaining, planting, fertilizing and maintaining beachgrass culms are given. (Ensign-PAI)
W72-12092

THE RIVER BASIN MODEL: ASSESSMENT DEPARTMENT.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU, $0.75; microfiche from NTIS as PB-211 143, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 83 p, 17 fig, 4 tab, 1 append. EPA Program 16110 FRU 12/71-6.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Real property, *Taxes, *Assessments, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Mathematical models, Human population, Land.
Identifiers: *Municipal government, *Governmental processes, *Public policy, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a

subsystem realistically interacting with all the other major subsystems, such as housing and transportation. A gaming format is employed; model users provide inputs to the computer programs on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. The Governmental Sector (provides public services) and the model required by its Assessment Department, and the computer printed output are described. The local Assessment Department is given the opportunity and responsibility for determining assessed values of property within the local dynamic system. The largest percentage of the revenues raised by local governments is from the real property tax. The value of real property in the model is determined by the normal workings of supply and demand. The Assessment Department may assess land and/or developments at any rate from zero to one hundred percent of their market value. (See also W72-10307) (Bell-Cornell)
W72-12122

THE RIVER BASIN MODEL: PLANNING AND ZONING DEPARTMENT.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-11, $0.75; microfiche from NTIS as PB-211 146, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 81 p, 17 fig, 5 tab, 1 append. EPA Program 16110 FRU 12/71-11.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Zoning, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Mathematical models, Human population, Public lands, Parks.
Identifiers: *Governmental processes, *Public policy, *Public services, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a subsystem realistically interacting with all the other major subsystems, such as transportation and housing. Using a gaming format, the model is a computer assisted decision-making tool; model users provide inputs to the programs, on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. The Governmental Sector and the model required by its Planning and Zoning Department, and the computer printed output are described. A principal function of the Governmental Sector is to provide public services, and its participants are elected and appointed public officials. The Planning and Zoning Department affects land use decisions through its power of zoning; it provides adequate parkland and public institutional land (developed parkland--museums, zoos, libraries, public golf courses, etc.) for the local jurisdiction population. (See also W72-10307) (Bell-Cornell)
W72-12123

THE RIVER BASIN MODEL: THE TRANSPORTATION SECTIOR.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-14, $1.00; microfiche from NTIS as PB-211 147, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December, 1971. 94 p, 18 fig, 7 tab, 2 append. EPA Program 16110 FRU 12/71-14.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Transportation, *Railroads, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Mathematical models, Human population, Public benefits.
Identifiers: *Governmental processes, *Public policy, *Public services, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a subsystem realistically interacting with all the other major subsystems, such as housing and transportation. A gaming format is employed; model users provide inputs to the computer programs, on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. The Governmental Sector (provides public services) and the model required by its bus and rail companies, and the computer printed output are described. The Governmental Sector establishes the amount of transit service, sets fares, and constructs rail lines and stations. Bus and rail companies provide the population in the simulated area with transportation service to be used for the trip to full-time work only; routes and modes of travel are assigned by the computer program. A social decision-maker assigns a dollar value for a time unit spent travelling to work by the people in his control. (See also W72-10307) (Bell-Cornell)
W72-12124

REPORT ON A SURVEY FOR DISEASES OF HYDRILLA VERTICILLATA AND OTHER AQUATIC WEEDS IN SOUTHERN INDIA,
Florida Univ., Gainsville. Water Resources Research Center.
R. Charudattan.
Typescript, n.d., 7 p (1972). OWRR B-011-FLA (1).

Descriptors: *Aquatic weed control, *Biocontrol, Weed control, Aquatic weeds, Water hyacinth, Pathogenic bacteria, Pathogenic fungi, Plant pathology, Florida.
Identifiers: Hydrilla verticillata, Water lettuce, Pathogens, Eichhornia spp., India, Salvinia spp., Pistia spp.

An investigation of the potential of plant pathogens as biological controls of aquatic weeds in Florida is considered. A preliminary search for pathogens of Hydrilla verticillata in India, near its center of origin, was undertaken, and pathogens were isolated and taken to Florida to be assessed for use as biological controls. Suggestions for a more intensive search are offered. (Svensson-Washington)
W72-12247

THE LAW OF DRAINAGE,
North Dakota Univ., Grand Forks. School of Law.
R. E. Beck.
In: Water and Water Rights, Vol. 5, secs. 450-459, 1972. p 475-648, 721 ref.

Descriptors: *Groundwater, *Drainage practices, *Legal aspects, *Repulsion (Legal aspects), Drainage districts, Drainage systems, Natural flow, Floodwater, Legislation, Federal government, State governments, Local governments, Municipal water, Grants, Damages, Reasonable use, Legal review, Drainage programs, Drainage water, Drainage, Irrigation.

The physical setting, policy considerations, and the basic legal questions of drainage law are discussed from the viewpoint of the landowner seeking to alter drainage. Substantive rights discussed include the common enemy rule; the natural flow rule; the reasonable use rule; drainage of groundwater, watercourses, sloughs and swamps, irrigation water, and floodwater; and drainage rights created by conduct of landowners. Remedies in relation to drainage are examined including injunctive relief in drainage cases, damages, self help, and public enforcement. The final section deals with municipal drains and drainage districts including discussion of multiple purpose districts and federal programs that might give impetus to local programs. Extensive coverage is given to the constitutionality of drainage legislation, formation of drainage districts, eminent domain powers of drainage districts, financing of drainage district operations, and dissolution of drainage districts. Pollution problems are not discussed nor is drainage related to watershed programs, flood control, or federal reclamation law. (Grant-Florida)
W72-12304

TULATIN PROJECT, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-12331

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-199 637D, $3.00 in paper copy, $0.95 in microfiche. May 26, 1971. 10 p, 3 illus, 1 dwg.

Descriptors: *Beach erosion, *Lake Erie, *Erosion control, *Environmental effects, *Pennsylvania, Erosion, Land management, Beaches, Sands, Recreation facilities, Administrative agencies, Reefs, Economic justification, Construction materials, Federal government, Project Planning, Lakes.
Identifiers: *Environmental Impact Statements, *Erie (Penn).

The proposed project would consist of constructing a 200 foot wide reef along a section of renourished beach located on the south shore of Lake Erie at Erie, Pennsylvania. Restoration of the beach will re-establish the bathing beach lost through erosive action of the lake. In addition to loss of beach, continued erosion will result in damage to a parking lot and bathhouse with resulting economic losses to nearby motels and restaurants. The project would result in no apparent adverse environmental effects. The use of coarse sand and gravel for beach fill will preclude the use of this material as concrete aggregate or for other commercial uses. Alternatives to the proposed project are no improvements, continue the present costly protection of beaches through replenishment by truck haul from upland sources, or pump sand from the terminal end of the peninsula. (Waldron-Florida)
W72-12332

CAMERON-CREOLE WATERSHED, LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-12334

LOANS TO BE MADE BY THE FARMERS HOME ADMINISTRATION TO RURAL WATER SYSTEM NO. 1, HOSPERS, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Farmers Home Administration, Washington, D.C.

Available from the National Technical Information Service as PB-202 790D, $3.00 in paper copy, $0.95 in microfiche. September 1971. 5 p.

Descriptors: *Environmental effects, *Area redevelopment, *Water supply, *Domestic water, Water supply development, Public health, Farm units, Iowa, Administrative agencies, Rural areas, Rural Sociology, Economic impact, Non-structural alternatives, Water quality control, Loans, Water quality, Water sources.
Identifiers: *Environmental Impact Statements, *Hospers (Iowa).

Insured loan funds in the amount of $1,900,000 have been authorized for use by the Rural Water System No. 1, Hospers, Iowa, to develop a rural water system to serve over 500 rural families in O'-Brien and Sioux Counties, Iowa. The project will alleviate health hazards and promote orderly growth of certain rural areas. The development of a water system will help to maintain family farm units, stop outmigration to urban areas, and promote rural industrial opportunities in the area. Construction of the project will not produce any adverse environmental effects. If the proposed water system is not developed, families could (1) use polluted water; (2) haul safe water from other sources; or (3) develop individual sources of safe water including adequate water treatment facilities, which in most cases is not economically feasible. The allocation of limited funds for this project will reduce the availability of such funds for similar projects in other areas. (Waldron-Florida)
W72-12337

CLAYTON LAKE, JACKFORK CREEK, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W72-12339

MUDDY CREEK RESERVOIR, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08D.
W72-12340

ROOTING CUTTINGS OF SALTBUSH (ATRIPLEX HALIMUS L.),
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy.
For primary bibliographic entry see Field 03B.
W72-12348

BITTERBRUSH SEEDLING ESTABLISHMENT AS INFLUENCED BY SOIL MOISTURE AND SOIL SURFACE TEMPERATURE,
Forest Service (*USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
R. B. Ferguson.
Journal of Range Management, Vol. 25, No. 1, p 47-49, January 1972. 2 tab, 12 ref.

Descriptors: *Vegetation establishment, *Shrubs, *Environmental effects, *Soil moisture, *Slopes, Topography, Soil temperature, Vegetation effects, Mode of action, Air temperature, Range management.
Identifiers: *Seedlings.

Bitterbrush (Pursnia tridentata) is one of the most valuable forage plants for use in revegetation efforts in the mountainous western U.S. It is known that only a very low percentage of planted seeds ultimately produces mature plants, but little is known of environmental effects on seedlings, except that seedling mortality is high. Findings are presented from several separate studies on bitterbrush seedling establishment. No evidence was found that high soil surface temperatures resulted in seedling mortality. Much evidence indicates that soil moisture has a significant effect on the vigor and growth of the seedlings. Even though southwestern slope exposures suffer dry conditions that eliminate all but the most vigorous of the seedlings, satisfactory seedling survival can be obtained if special care is taken to eliminate competing vegetation. Also scalps made with a bulldozer about 3 ft square are suggested. It would also be wise to utilize southeastern exposures as much as possible for seedling establishment. (Casey-Arizona)
W72-12357

TOPOGRAPHIC RELATIONS OF VEGETATION AND SOIL IN A SOUTHEASTERN ARIZONA GRASSLAND,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
E. F. Haase, and H. A. Schreiber.
Southwestern Naturalist, Vol 16, No 3-4, p 387-401, February 18, 1972. 5 fig, 2 tab, 24 ref.

Descriptors: *Ecological distribution, *Biological communities, *Arid lands, *Surveys, *Moisture content, Climatic data, Topography, Soil moisture, Soil types, Grasslands, Grasses, Grama grasses, Shrubs, Solar radiation, Slopes, Vegetation effects, On-site data collections, *Arizona.

Variations in plant species with aspect, slope position and edaphic factors were investigated in southeastern Arizona grasslands. The study region is near Tombstone, and the topography, soils, climate and vegetation are described. Vegetation was sampled on line intercepts in 2 soil series and 6 slope aspects (NW, N, NE, SE, S, SW). Soil samples were taken and laboratory determinations included moisture retention at 15-atm tension, nitrates, organic carbon, pH and texture. Vegetation presence data from 300 line intercepts were utilized to obtain a coefficient of interspecific association for each possible pairing of 11 species. Two communities were distinguished, the black grama (Bouteloua eriopods) found primarily on SW to SE aspects, and the Hilaria Berlangeri (curly mesquite) community, found primarily on NW to NE aspects. Each community could be correlated with type, texture, pH and moisture retention properties of the soils. The SW-SE aspects receive greater solar radiation, which causes drought conditions to occur earlier than on other aspects. (Casey-Arizona)
W72-12364

4B. Groundwater Management

AVAILABILITY OF GROUNDWATER FOR IRRIGATION FROM GLACIAL OUTWASH IN THE PERHAM AREA, OTTER TAIL COUNTY, MINNESOTA,
Geological Survey, Washington, D.C.
H. O. Reeder.
Available from GPO, Washington, D. C. 20402, Price $1.00. Geological Survey Water-Supply Paper 2003, 1972. 45 p, 16 fig, 3 plates, 3 tab, 20 ref.

Descriptors: *Hydrogeology, *Water yield, *Water resources development, *Minnesota, *Glacial drift, Water levels, Withdrawal, Irrigation water, Surface-groundwater relationships, Conjunctive use, Storage coefficient, Transmissivity.
Identifiers: *Otter Tail County (Minn).

The Perham area of Minnesota includes about 350 square miles of surficial deposits of glacial outwash. Transmissivity values range from nearly 0 along the perimeter of the area to more than 100,000 gallons per day per foot in the central parts of the area; storage coefficient values range from 0.1 to 0.2; and the saturated thickness of the upper outwash material ranges from nearly 0 to more than 100 feet. Most of the aquifer material is fairly well sorted and is in the particle-size range of fine to coarse sand. Wells penetrating the full thickness of the aquifer and developed to 100% efficiency can be expected to yield 1,200 gpm for 30 days and to have drawdowns of less than two-thirds the aquifer thickness in much of the area; however, well yields vary widely within short distances. The amount of streamflow leaving the area will not be depleted within the 10-year analysis period, if not more than 6 inches of water per year is used on all the irrigable land in the outwash area. If pumpage and its effects on the streams are assumed to be prorated proportionately along the full length of the streams within the area, then the levels of lakes along these streams generally will not be lowered appreciably. Lakes and ponds not connected to streams in the area are expected to be lowered considerably or to be dried up completely as pumping becomes more extensive. (Knapp-USGS)
W72-11752

ELECTRICAL-ANALOG ANALYSIS OF THE HYDROLOGIC SYSTEM, TUCSON BASIN, SOUTHEASTERN ARIZONA,
Geological Survey, Washington, D.C.
T. W. Anderson.
Available from GPO, Washington, D. C. 20402, Price $3.75. Geological Survey Water-Supply Paper 1939-C, 1972. 34 p, 8 fig, 6 plate, 1 tab, 16 ref.

Descriptors: *Groundwater resources, *Water resources development, *Model studies, *Projections, *Arizona, Analog models, Water wells, Aquifer characteristics, Water yield, Groundwater recharge, Hydrologic data, Withdrawal, Pumping, Transmissivity, Water level fluctuations, Water table, Hydrologic systems.
Identifiers: *Tucson (Ariz).

The water supply for the Tucson basin, Arizona, is derived entirely from groundwater. The average annual pumpage for 1962-64 was about 165,000 acre-feet and was greater than the natural rate of groundwater recharge. Water-level declines of as much as 70 feet occurred from spring 1940 to spring 1965 as a result of the overdraft. An electrical-analog model of the hydrologic system was constructed to determine the possible future effects of groundwater management schemes. Basic data required for the simulation of the hydrologic system included periodic water-level measurements, determinations of transmissibility, and pumpage and recharge values. The model was analyzed using steady-state and storage-depletion tehcniques. The steady-state analysis indicated that 97,000 acre-feet of water was entering and leaving the groundwater reservoir annually prior to extensive development. Model projections indicate a maximum water-level decline of 140 feet for the period 1940-84. (Woodard-USGS)
W72-11753

A SURVEY OF THE PRINCIPLES OF METALLIC CORROSION AND ITS CONTROL IN SALINE WATERS,
Commonwealth Scientific and Industrial Research Organization, Garden City (Australia). Div. of Mineral Chemistry.
For primary bibliographic entry see Field 03C.
W72-11759

BETTER TOOLS FOR WATER RESOURCES,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 03B.
W72-11891

ECONOMICS OF GROUNDWATER UTILIZATION,
L. Koenig.

Journal of the American Water Works Association, Vol 55, No 1, p 59-66, January 1963. 2 tab, 13 ref.

Descriptors: *Groundwater, *Groundwater mining, *Water sources, *Withdrawal, Groundwater basins, Overdraft, Safe yield, Aquifers, Coals, *Water utilization.
Identifiers: *Depletion, Reserves, *Groundwater utilization, Petroleum reserves, Coal reserves.

The current rate of depletion of the groundwater reserve is so many times less than most other natural resources that it is quite safe to increase greatly the use of groundwater. The present attitude of extreme conservatism toward groundwater is not based on facts. Groundwater reserves at an annual depletion rate of 6.1 million acre-ft have a life of 7,800 years. Groundwater is superior to surface water in many ways and the use of this resource should be greatly expanded. (Flack-AWWARF)
W72-11911

BALANCED UTILIZATION OF GROUNDWATER RESOURCES,
Layne-Western Co., Kansas City, Mo.
R. O. Joslyn.
Journal of the American Water Works Association, Vol 54, No 7, p 798-802, July 1962. 3 fig, 1 tab.

Descriptors: *Groundwater, Water resources development, Water sources, Water supply, *Water wells, *Water yield, Groundwater basins, *Groundwater recharge, Overdraft, Well spacing, Hydrogeology, Water table, Kansas, Missouri.
Identifiers: *Well fields, *Pumpage rates, Water table contours, Wichita (Kansas), Columbia (Missouri).

Groundwater must be used and water levels permitted to decline in order to provide storage space to receive recharge. The Wichita, Kansas and Columbia, Missouri well fields case histories are examples of how an aquifer may be developed. It has been determined that cities can obtain more water from groundwater sources by establishing a lower water level in the water-bearing formations, recharge is greatly increased and more effective utilization of the groundwater reservoir results. (Flack-AWWARF)
W72-11917

ARTIFICIAL RECHARGE IN THE UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. A. Moreland.
Geological Survey Open-file Report, April 6, 1972. 51 p, 11 fig, 13 tab, 19 ref.

Descriptors: *Artificial recharge, *California, Pit recharge, Water spreading, Infiltration, Water storage, Water management (Applied), Hydrogeology, Aquifer characteristics.
Identifiers: *Santa Ana Valley (Calif).

Artificial recharge has long been an integral part of water-supply management in the upper Santa Ana Valley, California. About 7,500 acres of unlined channels and 2,590 acres in 60 off-channel recharge facilities are available for water spreading. To estimate potential infiltration rates for the recharge facilities, 63 single-ring infiltrometer tests were conducted at 22 recharge facilities. Measured infiltration rates ranged from about 0.1 foot per day at Patton basin to 106 feet per day at Lynwood basin. Grain-size distribution was determined on 25 soil samples collected at infiltrometer test sites. Regression analysis showed a direct relation between the logarithm of the infiltration rate and the logarithm of the 20th percentile particle diameter, corresponding to 20 percent finer on the grain-size graph. Regression analysis also showed an inverse relation between the logarithm of the infiltration rate and the logarithm of the sorting coefficient. Slit clogging greatly affects infiltration rates. Some clogging was observed in nearly all facilities, and significant reduction of infiltration rates was measured in seven basins. Estimated recharge rates range from less than 1 foot per day in areas underlain by older alluvium to 4 feet per day in areas underlain by coarse-grained younger alluvium. (Knapp-USGS)
W72-11975

DISPERSION FROM RECHARGE WELL,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-11992

PUMPING AN ARTESIAN SOURCE FOR WATER TABLE CONTROL,
Agricultural Research Service, Mandan, N. Dak. Soil and Water Conservation Research Div.
E. J. Doering, and L. C. Benz.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers Vol 98, No IR2, Paper 8964, p 275-287, June 1972. 8 fig, 23 ref.

Descriptors: *Drainage programs, *Pumping, *Artesian aquifers, *Water levels, *North Dakota, Aquifer testing, Hydrogeology, Water table, Leaching, Confined water, Drawdown.
Identifiers: *Red River Valley (N Dak).

Pumping of an artesian aquifer in the Red River Valley of North Dakota can be used to control the water table in the overlying waterlogged and saline agricultural lands at an estimated pumping cost of $0.34 per acre per year. Because the fine-textured overburden is more than 100 ft thick and has a very low vertical hydraulic conductivity, continuous pumping will be necessary. By reducing the artesian pressure, the upward flow of saline water will be stopped, the water table in the leaky overburden will be reestablished at a greater depth, and salts can be leached from the root zone by precipitation. Even though the water pumped from the artesian aquifer is saline, the amount would be small enough that its discharge into the Red River of the North at low flow would not make the river water unsuitable for domestic use. (Knapp-USGS)
W72-11995

HYDROLOGY OF IRRIGATED LAND (GIDROLOGIYA OROSHAYEMYKH ZEMEL').
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 03F.
W72-12019

APPLICATION OF AERIAL METHODS IN GROUNDWATER STUDIES,
For primary bibliographic entry see Field 02F.
W72-12023

WATER-TRANSMITTING PROPERTIES OF AQUIFERS ON LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-12027

AN EVALUATION OF THE USE OF DRILLERS' LOGS IN LITHOLOGIC STUDIES OF THE OGALLALA FORMATION OF THE SOUTHERN HIGH PLAINS OF TEXAS,
Geological Survey, Austin, Tex.
C. A. Wilson, J. T. Smith, G. L. Thompson, and W. M. Sandeen.
Geological Survey Report, June 1972. 39 p, 16 fig, 3 tab, 1 ref.

Descriptors: *Drillers' logs, *Water wells, *Well data, *Artificial recharge, *Texas, Irrigation water, Reviews, Evaluation, Hydrologic data, Data collections, Aquifer characteristics, Computer programs, Water storage.
Identifiers: *Texas (Southern High Plains), Ogallala Formation.

Logs made by water-well drillers were analysed in conjunction with test-hole drilling and geophysical logging to evaluate usefulness of the driller's log in delineating areas that would be suitable for artificial recharge of the Ogallala Formation of the Southern High Plains of Texas. In 1969, there were about 59,000 irrigation wells in the area. A total of 309 logs was made in 222 wells and test holes during fiscal years 1970 and 1971. The number and types of logs made in the various counties of the study area are tabulated. Other data include well schedules, water-level measurements, drawdown-yield measurements, pumpage inventories, well-location maps, results of aquifer tests, and water-quality analyses. The commercial driller's log is more accurate for the intervals below the water table than for those above it. Greater accuracy below the water table probably reflects closer attention given to the drilling and logging procedures. The base of the Ogallala Formation is usually picked where the lithology changes from sand or sand and gravel to red clay or shale, blue clay or shale, or limestone. To determine the utility of computer analysis, data from drillers' logs of wells in Briscoe, Hale, and Swisher Counties were used as input. A sample of the initial computer printout with a tabulation of the data is shown. (Woodard-USGS)
W72-12031

HYDRAULIC TESTS IN HOLE UAE-1, AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W72-12037

DENSITY INDUCED MIXING IN CONFINED AQUIFERS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 05B.
W72-12041

RENOVATING SECONDARY SEWAGE BY GROUNDWATER RECHARGE WITH INFILTRATION BASINS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 05D.
W72-12071

EFFECT OF STORM RUNOFF DISPOSAL AND OTHER ARTIFICIAL RECHARGE TO HAWAIIAN GHYBEN-HERZBERG AQUIFERS,
Hawaii Univ., Honolulu. Water Resources Research Center.
F. L. Peterson, and D. R. Hargis.
Available from the National Technical Information Service as PB-211 155, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. 54, November 1971, 51 p, 16 fig, 3 tab, 27 ref. OWRR A-028-HI (1).

Descriptors: *Artificial recharge, *Groundwater, *Injection wells, *Storm runoff, Sewage effluents, Irrigation, Industrial wastes, *Hawaii, Aquifers, Water wells, Dissolved solids.
Identifiers: *Kahului (Maui).

In 1970 the Kahului Development Company began construction of a collecting basin and four deep injection wells for the disposal of storm runoff from a residential development in Kahului, Maui. This presented a unique opportunity to evaluate the suitability of the site for artificial recharge and to study the possible effects recharge of storm runoff

might have on the local ground-water body, both from a water quality and a hydraulic standpoint. The results of pumping and injection tests of one completed well and one test hole indicate that the finished injection wells should be able to inject at rates in excess of 5500 gallons per minute per well if significant clogging from sediment does not occur, and if hydraulic interference between the four wells operating simultaneously is not significant. The most serious potential water quality problem may be a reduction in injection efficiency owing to possible well clogging by heavy sediment loads. The general water quality effects of injecting storm runoff into the ground-water body will be to decrease the dissolved solids concentration of the ground water in the vicinity of the wells.
W72-12101

GROUNDWATER POLLUTION IN ARIZONA, CALIFORNIA, NEVADA, AND UTAH,
Fuhriman, Barton and Associates, Provo, Utah.
For primary bibliographic entry see Field 05B.
W72-12193

THE LAW OF DRAINAGE,
North Dakota Univ., Grand Forks. School of Law.
For primary bibliographic entry see Field 04A.
W72-12304

EAST GREENACRES UNIT, PRAIRIE DIVISION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho.
For primary bibliographic entry see Field 08A.
W72-12336

DISPOSAL OF PANTEX SEWAGE EFFLUENT HOLDING RESERVOIR PORTION OF AEC PANTEX ORDNANCE PLANT IN AMARILLO, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
General Services Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-12338

WELL LOSSES DUE TO REDUCED FORMATION PERMEABILITY,
Indiana Univ., Bloomington. Dept. of Geology.
J. Karanjac.
Ground Water, Vol 10, No 4, p 42-46, July-August 1972. 2 fig, 7 ref.

Descriptors: *Water wells, *Aquifer characteristics, *Permeability, *Groundwater movement, Laminar flow, Turbulent flow, Drawdown, Water yield, Hydraulic conductivity.
Identifiers: *Well loss, *Well efficiency.

Steady-state flow to a single well fully penetrating a confined isotropic aquifer is analyzed. The hydraulic conductivity of the aquifer changes exponentially from a minimum value at the well face to a constant value in the 'undamaged' aquifer. An equation is given for laminar flow well losses that are due to a decreased permeability in the vicinity of the well. The well loss depends upon the pattern in which permeability changes. The integral expressing the well loss may be evaluated numerically. The results are presented in a graph with nondimensional parameters and can be used for engineering evaluation of the laminar well loss. (Knapp-USGS)
W72-12377

PRACTICAL SOLUTIONS FOR PUMPING TESTS IN CARBONATE-ROCK AQUIFERS,
Ohio Dept. of Natural Resources, Columbus.
H. B. Eagon, Jr., and D. E. Johe.
Groundwater, Vol 10, No 4, p 6-13, July-August 1972. 12 fig, 8 ref.

Descriptors: *Aquifer testing, *Aquifer characteristics, *Water yield, Drawdown, Permeability, Transmissivity, Storage coefficient, Hydrogeology, Data collections, Hydrologic data.

Methods of aquifer test analysis used in consolidated-rock aquifers are evaluated. In the carbonate-rock aquifer in northwestern Ohio, 76 wells were drilled and tested. The data from each test were analyzed by the standard analytical methods. Step-test data were analyzed by three methods of which a graphical solution is preferred. Once dewatering occurs, the hydraulic response of a given well may change drastically and well-loss computations may give meaningless values. However, the analysis reveals the depth of major water-yielding zones. Step-test data can also be used to predict well yields when drawdown relationships are distorted by dewatering effects. Time-drawdown data are preferred for the determination of hydraulic properties of carbonate-rock aquifers. Data from the pumped well are valid for calculating aquifer transmissivity unless dewatering has occurred. Realistic values of transmissivity can be determined by using recovery data if distorted relationships caused by dewatering are minimized. Analysis of time-drawdown data from a fully penetrating observation well provides the most reliable values for aquifer transmissivity and storage coefficient. It is best to employ regional concepts where possible. (Knapp-USGS)
W72-12382

EFFECTS OF GROUNDWATER PUMPING IN PARTS OF LIBERTY AND MCINTOSH COUNTIES, GEORGIA, 1966-70,
Geological Survey, Atlanta, Ga.
R. E. Krause.
Georgia Geological Survey Information Circular 45, 1972. 15 p, 7 fig, 2 tab, 9 ref.

Descriptors: *Groundwater resources, *Water wells, *Withdrawal, *Water level fluctuations, *Georgia, Pumping, Aquifer characteristics, Drawdown, Hydrogeology, Water quality, Chemical analysis, Groundwater movement, Groundwater recharge.
Identifiers: *Liberty County (Ga), *McIntosh County (Ga).

Industrial pumping near Riceboro Ga., has lowered the groundwater level enough to cause many wells, including some at Harris Neck and Blackbeard Island National Wildlife Refuges, to stop flowing. During 1968, water levels declined more than 11 feet near the center of pumping at Riceboro, 2 feet at Blackbeard Island, and 4 feet at Harris Neck National Wildlife Refuge. About 80% to 90% of this additional decline is attributed to the industrial pumping near Riceboro, but it is superimposed on a regional water-level decline of as much as 45 feet in Liberty and McIntosh Counties caused by withdrawal of groundwater throughout the coastal area since 1880. (Woodard-USGS)
W72-12384

TECHNIQUE FOR PREDICTING GROUNDWATER INFLOW TO LARGE UNDERGROUND OPENINGS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W72-12388

4C. Effects on Water of Man's Non-Water Activities

A RAINFALL-RUNOFF SIMULATION MODEL FOR ESTIMATION OF FLOOD PEAKS FOR SMALL DRAINAGE BASINS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W72-11754

THE EFFECTS OF BURNING ON THE HEAT AND WATER REGIMES OF LICHEN--DOMINATED SUBARCTIC SURFACES,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02G.
W72-11885

EFFECTS OF FOREST MANAGEMENT ON WATERSHEDS,
Virginia State Div. of Forestry, Charlottesville.
C. J. Witter.
Journal of the American Water Works Association, Vol 57, No 4, p 448-452, April 1965. 1 fig, 2 tab.

Descriptors: *Forest management, *Water yield improvement, *Clear-cutting, *Hydrologic cycle, Water yield, Humus, Precipitation, Runoff, Transpiration.
Identifiers: *Commercial clear-cut, *Skid roads, *Forest cover, *Plant cover, Timber returns, Diameter limit, Extensive selection, Intensive selection, Timber cut, Litter, Fernow Experimental Forest, W. V., Coweeta Hydrologic Laboratory.

Forest management is the manipulation of the physical relationships among water, plants and soil. By changing the forest cover, the litter, and the upper soil layer, the runoff and evaporation can be influenced. Studies at Fernow Experimental Forest, West Virginia for four cutting practices show that water yields increase proportionally with cutting severity. Flood control can be aided during the summer and fall by forest management. These studies indicate how forest management can at the same time, permit economical timber production, increase water yield and provide clean usable water. (Flack-AWWARF)
W72-11902

FOREST CUTTING AND INCREASED WATER YIELD,
Forest Service (USDA), Elkins, W. Va. Elkins Research Center.
K. G. Reinhart, and G. R. Trimble, Jr.
Journal of the American Water Works Association, Vol 54, No 12, p 1464-1472, December 1962. 4 fig, 5 tab, 7 ref.

Descriptors: *Water yield improvement, *Forest management, *Clear-cutting, Watershed management, Land use, Gully erosion, Erosion control, Turbidity, Water quality, *West Virginia.
Identifiers: Commercial clear-cut, Diameter limit, Extensive selection, Intensive selection, Fernow Experimental Forest, Forest cutting.

Research on the Fernow Experimental Forest, West Virginia, has shown that forest cutting can result in increased water yield. Increase in flow was directly related to amount of timber cut and amounted to 4.4 inches on the commercial clear-cut watershed. Knowledge is not yet available to water managers to predict accurately the amount and timing of increased flow that can be expected from a given treatment. Results of this research should be used with caution until treatment effects can be predicted. (Flack-AWWARF)
W72-11916

SUBGRADE MOISTURE UNDER OKLAHOMA HIGHWAYS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
T. A. Haliburton, D. R. Snethen, L. K. Shaw, and B. D. Marks, III.
Transportation Engineering Journal, American Society of Civil Engineers Vol 98, No TE2, Paper 8870, p 325-339, May 1972. 6 fig, 25 ref.

Descriptors: *Expansive clays, *Foundations, *Highways, *Oklahoma, Soil mechanics, Soil moisture, Stability, Moisture content, Infiltration, Plasticity.

Data and conclusions from a 6-yr field study of subgrade moisture under existing Oklahoma highways are presented to show the effects of soil, climate, and highway design on subgrade moisture conditions. Effects of subgrade moisture conditions on expansive subgrade volume change and overall highway performance are also described. Subgrade moisture contents increased over a 2-yr interval from original conditions to an equilibrium value of 1.1 times to 1.3 times the subgrade plastic limit. This moisture increase caused lateral and vertical subgrade expansion, reduced subgrade soil support, and rendered the pavement system pervious to rainfall infiltration and evaporation with resulting rapid pavement deterioration. Suggestions are given for design of highways on expansive Oklahoma subgrades. (Knapp-USGS)
W72-11993

MILITARY FACILITIES AND ENVIRONMENTAL STRESSES IN COLD REGIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-12014

MEASUREMENT OF LATERAL EROSION AT PROPOSED RIVER CROSSING SITES OF THE ALASKA PIPELINE,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 02J.
W72-12040

WATER QUALITY OF SOME LOGGED AND UNLOGGED CALIFORNIA STREAMS,
California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
F. R. Kopperdahl, J. W. Burns, and G. E. Smith.
Administrative Report No 71-12, April 1971. 19 p, 8 tab, 23 ref.

Descriptors: *Water quality, *California, *Dissolved solids, *Turbidity, *Water temperature, Lumbering, Streams, Tidal streams, Road construction, Salmonids, Aquatic environment, Dissolved oxygen, Alkalinity, Hardness (Water), Chlorides, Phosphates, Sulfates, Nitrates, Hydrogen ion concentration, Water chemistry, Water pollution effects, Water pollution sources.
Identifiers: Lumbering effects, Coastal streams, Road construction effects.

Water quality surveys of four streams which had been logged or had road construction, and two undisturbed streams were conducted in 1968 and 1969. The effects were evaluated of logging on water quality and to predict capacities of the streams to rear salmonids. No abnormal concentrations of dissolved oxygen, alkalinity, hardness, dissolved solids, phosphates, chlorides, sulfate, nitrate, tannin, lignin, or pH were detected. Carbon dioxide was low in all streams except in South Fork Caspar Creek, in which 8 mg/l were observed during decomposition of logging debris. Turbidity was high when bulldozers were working in the stream. Alternating cut and uncut blocks on one stream, and retaining a buffer strip along another, kept temperatures low in the two streams. Temperatures increased after logging. (Katz-Washington)
W72-12248

4D. Watershed Protection

EFFECTS OF CONSERVATION TECHNIQUES ON YIELD,
For primary bibliographic entry see Field 03B.
W72-11909

FOREST CUTTING AND INCREASED WATER YIELD,
Forest Service (USDA), Elkins, W. Va. Elkins Research Center.
For primary bibliographic entry see Field 04C.
W72-11916

T OR C--WILLIAMSBURG ARROYOS WATERSHED, NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.
W72-11952

UNION CREEK WATERSHED PROJECT, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11958

SOIL EROSION AND EROSION CONTROL (EROZIYA POCHV I MERY BOR'BY S NEY),
P. S. Zakharov.
Izdatel'stvo 'Kolos', Moscow, 1971. 192 p.

Descriptors: *Erosion, *Soil erosion, *Erosion control, *Agriculture, *Soil conservation, Soil management, Land management, Farm management, Pasture management, Forest management, Shelterbelts, Windbreaks, Precipitation (Atmospheric), Topography, Vegetation, Soils, Slopes, Gullies, Mountains, Mudflows.
Identifiers: USSR, Eroded soils, Erosion classes, Erosion effects, Erosion hazard.

This three-part monograph is concerned with soil erosion types and with the effects of atmospheric precipitation, topography, soils, vegetation, and human activity on erosional processes. A classification of eroded soils is presented together with data on the damage caused by erosion to agriculture and crop production. Agricultural, silvicultural, hydraulic-engineering, and socio-economic conservation practices are reviewed, including contour tillage, terracing, introduction of improved crop rotations, application of intermediate crops, stripcropping, fertilization, pasture improvement, and planting of shelterbelts and windbreaks. Mudflows and methods of their prevention and control are examined in connection with erosion of soils in mountain areas. (Josefson-USGS)
W72-12017

DEVICE FOR CONTROL AND PREVENTION OF COAST EROSION,
Fyens Saekkekompagni A.S. (Denmark). (assignee).
For primary bibliographic entry see Field 08C.
W72-12156

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-12332

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-12342

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY,
National Inst. of Environmental Health Sciences, Research Triangle Park, N.C.
L. Fishbein.
Chromatographic Reviews, Vol. 15, No. 2-3, p 195-238, December 1971. 17 fig, 33 tab, 165 ref.

Descriptors: *Chemical analysis, *Pollutant identification, *Mercury, *Separation techniques, *Biological properties, Inorganic compounds, Water pollution effects, Metals, Cations, Anions, Solvents, Colorimetry, Absorption, Adsorption, Retention, Metabolism, Kinetics, Toxicity, *Chromatography, Gas chromatography, Ion exchange, Chromium, Electrophoresis, Alcohols, Aluminum, Copper, Cadmium, Lead, Sulfates, Chlorides, Nitrates, Uranium, Silver, Zinc, Cobalt, Nickel, Manganese, Iron, Gold, Molybdenum, Magnesium, Potassium, Sodium, Strontium, Heavy metals, Trace elements, Biochemistry, Color reactions, Laboratory equipment, Cesium, Genetics, Proteins.
Identifiers: *Mercury compounds, Excretion, Tissues, Thin layer chromatography, Paper chromatography, Ion exchange chromatography, Column chromatography, Bismuth, Acetate, Tin, Biotransformation, Arsenic, Inorganic mercury, Bioaccumulation, Diethyl mercury, Ethylmercury, Propylmercury, Butylmercury, Amylmercury, Octylmercury, Stearylmercury, Mercuric dithizonates, Alkyl mercuric dithizonates, Indium, Rhodium, Selenium, Thallium, Thorium, Tungsten, Vanadium, Yttrium, Blood, Urine, Feces, Barium, Gallium, Germanium, Lanthanum, Lithium, Palladium, Platinum, Antimony, Tellurium, Rubidium, Ruthenium, Zirconium, Biological magnification, Biological samples.

The objectives of this review are to: (1) focus on the chromatographic techniques utilized for analysis of inorganic forms of mercury in admixture with other metals and cations and from diverse biological and environmental sources, and (2) delineate major aspects of inorganic mercury compounds as to their adsorption, tissue distribution, biotransformation and transport, metabolism, retention, excretion, kinetics, and toxicity. Analytical techniques considered for the separation and identification of inorganic mercury from environmental and biological sources include salient paper, thin-layer, gas, column, and ion exchange chromatography. Biological considerations, in addition to toxicity, encompass genetic effects such as chromosome aberrations, and cytological and carcinogenic aspects of inorganic mercury and its compounds. (Mackan-Battelle)
W72-11797

MARINE ALGAE OF THE SMITHSONIAN--BREDIN EXPEDITION TO YUCATAN-1960,
Michigen Univ., Ann Arbor. Dept. of Botany.
W. R. Taylor.
Bulletin of Marine Science, Vol. 28, No. 1, p 34-44, March 1972. 19 ref.

Descriptors: *Systematics, *Marine algae, *Cyanophyta, *Chlorophyta, Phaeophyta, Rhodophyta, Cladophora.
Identifiers: *Yucatan, Lyngbya confervoides, Lyngbya majuscula, Gomontia polyrhiza, Ulva rigida, Cladophora fuliginosa, Batophora oerstedi, Acetabularia crenulata, Valonia ventricosa, Valonia ocellata, Ernodesmis verticillata, Dictyosphaeria vanbosseae, Dictyosphaeria caver-

nosa, Cladophoropsis membranacea, Boodlea composita, Anadyomene stellata, Bryopsis pennata, Caulerpa species, Avrainvilla species, Cladocephalus luteofuscus, Udotea flabellum, Penicillus species, Halimeda species, Dilophus species, Dictyota species, Pocockiella variegata, Stypodium zonale, Padina sanctae-crucis, Sargassum filipendula, Turbinaria turbinata, Galaxaura lapidescens, Fosliella farinosa, Goniolithon strictum, Amphiroa fragilissima, Amphiroa brasiliana, Corallina cubensis, Corallina subulata, Jania capillacea, Jania adherens, Hypnea cervicornis, Hypnea musciformis, Cryptarachne planifrons, Wrangelia penicillata, Griffithsia schousboei, Ceramium byssoideum, Centroceras clavulatum, Spyridia filamentosa, Spyridia aculeata, Heterosiphonia wurdemanni, Heterosiphonia gibbesii, Polysiphonia subtilissima, Bryothamnion triquetrum, Digenia simplex, Lophocladia trichoclados, Wrightiella tumanowiczii, Bostrychia montagnei, Herposiphonia tenella, Acanthophora muscoides, Acanthophora spicifera, Laurencia species.

Over 80 species of marine algae that were collected by the Fourth Smithsonian-Bredin Expedition of 1960 came from the territory of Quintanna Roo on the east side of the peninsula of Yucatan, Mexico, and substanially add to the records of Mexican marine algae. The principal set of specimens has been deposited in the U. S. National Herbarium. (Holoman-Battelle)
W72-11800

SIMULTANEOUS MICRODETERMINATION OF IODINE AND CHLORINE OR IODINE AND BROMINE IN ORGANIC COMPOUNDS,
Ain Shams Univ., Cairo (Egypt). Microanalytical Research Labs.
S. S. M. Hassan, and M. B. Elsayes.
Mikrochimica Acta, No. 1, p 115-121, 1972. 5 tab, 11 ref.

Descriptors: *Iodine, *Chlorine, *Bromine, *Separation techniques, *Aqueous solutions, *Organic compounds, Chemical analysis, Sodium compounds, Chlorides, Bromides, Ions, Solvent extractions.
Identifiers: *Microdetermination, Combustion, Carbon tetrachloride, Sodium nitrate, Iodate, Chemical recovery.

A simple, simultaneous micro-method for determining iodine and chlorine or iodine and bromine in organic compounds involves combustion of the organic sample in an 02-filled separatory funnel containing sodium nitrate and nitric acid. The combustion solution contains elemental iodine and chloride or bromide ions. Iodine is separated by carbon tetrachloride and oxidized with bromide water to iodate. The carbon tetrachloride and excess bromine are evaporated and the iodate determined iodometrically. The chloride and bromide ions remaining in the aqueous combustion solution are determined mercurimetrically after the excess nitrite is removed with hydrogen peroxide. Average recoveries of 98.7, 100.7, and 100.6 percent, respectively, were obtained for iodine, chlorine, and bromine in mixtures of their organically bound compounds. The microdetermination of iodine in the presence of other halogens is possible by using sodium nitrite as the absorbing agent and Leipert's method. (Mackan-Battelle)
W72-11801

ANALYSIS OF LOW LEVEL TRITIUM CONCENTRATIONS BY ELECTROLYTIC ENRICHMENT AND LIQUID SCINTILLATION COUNTING,
International Atomic Energy Agency, Vienna (Austria).
G. Sauzay, and W. R. Schell.
Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 25-33, January 1972. 3 fig, 4 tab, 3 ref.

Descriptors: *Tritium, *Water analysis, *Electrolysis, Chemical analysis, Evaluation, Statistics, Theoretical analysis, Methodology, Distillation, Pollutant identification, Radioisotopes, Measurement, Estimating, Variability, Calibration, Equations.
Identifiers: *Liquid scintillation, Scintillation counting, Enrichment, Detection limits, Sensitivity.

A method is presented for estimating the standard deviations in measurement of low-level tritium concentrations in water samples. The enrichment is performed by electrolysis in a battery of 20 cells, giving an enrichment factor of about 18, and the final samples after distillation are counted in a liquid scintillation counter. A statistical evaluation of the cell battery shows that there is a significant spread of the cells which is included together with the error on the distillation in an overall variance corresponding to 3 percent of the initial concentration. A new liquid scintillation counter was used to compare different vials using a newly prepared scintillant cocktail Instagel. Different calibration equations were determined, and the accuracy of measurements was derived theoretically and applied to hypothetical routine measurements. From these data a proposal was made for establishing routine runs with a sensitivity limit of 5 plus or minus 1.2 TU (standard deviation) for 20 samples per week. The proposed approach was applied routinely, and the results of several runs are given. Optimization of the system, i.e., decrease of the sensitivity limit, is discussed, as well as the fitting of the calibration line to the range of measured values. (Holoman-Battelle)
W72-11802

ADSORPTION-FREE MEASUREMENTS ON STREAMING RADIOACTIVE SOLUTIONS,
Chalmers Univ. of Technology, Goteborg (Sweden). Div. of Nuclear Chemistry.
H. Ottertun.
Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 13-15, January 1972. 2 fig, 3 ref.

Descriptors: *Solvent extractions, *Aqueous solutions, *Radioisotopes, *Radiochemical analysis, *Flow, Raidoactivity techniques, Equipment, Measurement, Laboratory equipment, Liquids, Zinc, Sodium compounds, Methodology, Adsorption, Flow systems.
Identifiers: Benzene, Samarium, Sodium perchlorate, Acetylacetone, AKUFVE-system, Organic solvents.

A new technique for adsorption-free measurements of radioactivity of flowing solutions creates a free liquid jet centered in a vertical tube whereby contact between the liquid phase and the internal well of the detection cell is avoided. The flow cells, one for each liquid phase, are connected to the 1 liquid circulation system of an AKUFVE apparatus, and the sample is delivered into the dectector tube through a teflon nozzle. The performance of the technique has been tested in solvent extraction studies with the extraction systems Sm-acetylacetone-1M NaCLO4-C6H6 and Zn-acetylacetone-1M NaClO4-C6H6. Experiments were carried out with the equipment in continuous operation for more than 20 hr, with no problems arising from contamination of cell walls. Experimental results indicate a good reliability for the free-jet technique. (Mackan-Battelle)
W72-11803

CHARACTERISTICS OF MILKING CENTER WASTE EFFLUENT FROM NEW YORK STATE DAIRY FARMS,
Cornell Univ., Ithaca, N. Y. Dept. of Food Science.
For primary bibliographic entry see Field 05B.
W72-11805

GEOGRAPHIC DISTRIBUTION AND RELATIVE ABUNDANCE OF SALPIDAE OFF THE OREGON COAST,
Oregon State Univ., Corvallis. Dept. of Oceanography.
L. T. Hubbard, Jr., and W. G. Pearcy.
Journal of Fisheries Research Board of Canada, Vol. 28, No. 12, p 1831-1836, December 1971. 2 fig, 2 tab, 21 ref.

Descriptors: *Distribution patterns, Invertebrates, Marine animals, *Oregon, *Coasts, Columbia River, Sampling, Equipment, Bioindicators, Plankton nets, Trawling, Seasonal, Spatial distribution, Temporal distribution.
Identifiers: *Salps, *Tunicates, *Salpa fusiformis, Iasis zonaria, Pegea confoederata, Thetys vagina, Thalia democratica, Helicosalpa virgula, Newport River, Coos Bay, Brooklings River, Pelagic animals.

Salps were collected along with other pelagic animals from selected sites off the Oregon coast from 1961-64 using a 6 ft Isaacs-Kidd midwater trawl and 1-m plankton nets at monthly and bimonthly intervals. The purpose of these collections was to determine the seasonal and geographical occurrence of salps off Oregon, to relate their occurrence to environmental condition, and to determine if some species may be indicators of warmwater advection. Six species of salps were identified from 434 midwater trawl and 200 meter net samples: Helicosalpa virgula, Iasis zonaria, Salpa fusiformis, Pegea confoederata, Thalia democratica, and Thetys vagina. Relative abundance of the species varied in time and space and few distributional patterns were evident; none of the specimens were collected below 150 m. Salpa fusiformis and I. zonaria, the most common species, were found during all seasons of the year, the highest numbers usually during the summer, the upwelling season. Thalia democratica, H. virgula and T. vagina were found only during 1963, and P. confoederata was most common during 1963. This was an abnormally warm year and the presence of these species off Oregon may have been related to advection from the south or west and the lack of upwelling. (Holoman-Battelle)
W72-11806

POLLUTION MONITORING: SOME INSTRUMENTS AND TECHNIQUES,
P. H. Curran.
Instrument Practice, Vol. 26, No. 2, p 76-78, February 1972. 3 tab.

Descriptors: *Analytical techniques, *Monitoring, Pollutant identification, Air pollution, Water pollution, *Mercury, Foods, Instrumentation, Salmon, Heavy metals.
Identifiers: Spectrophotometry, Chemical recovery, Tuna, Biological samples.

A description is presented of the most popular analytical techniques used for monitoring atmospheric pollution (infrared spectrophotometry and gas chromatography), water pollution (infrared spectrophotometry, gas chromatography, and atomic absorption spectroscopy), food pollution (gas, thin-layer and gas-liquid chromatography, ultraviolet spectroscopy, colorimetric and fluorimetric scanning), and mercury pollution (atomic absorption spectrophotometry and a new Hg cold vapor analyzer). No actual procedures are described in detail, but best possible detection limits are included in some instances. (Mackan-Battelle)
W72-11808

METALS AND OTHER ELEMENTS: DETERMINATION OF MERCURY IN FISH BY FLAMELESS ATOMIC ABSORPTION: A COLLABORATIVE STUDY,
Food and Drug Administration, Denver, Colo.
R. K. Munns, and D. C. Holland.

Journal of the Association of Analytical Chemists, Vol. 54, No. 1, p 202-205, 1971. 2 fig, 2 tab, 18 ref.

Descriptors: *Mercury, *Spectrophotometry, *Fish, Pollutant identification, Acids, Evaluation, Performance, Reduction (Chemical), *Heavy metals.
Identifiers: Flameless atomic absorption spectrophotometry, *Atomic absorption spectrophotometry, Biological samples, Interlaboratory studies, Muscle, Tissue, Method evaluation, Performance evaluation, Standard methods, Sample preparation, Collaborative testing, Precision, Chemical recovery.

A collaborative study among nine laboratories has resulted in the recommendation that the flameless atomic absorption spectrophotometry method for analysis of total mercury be adopted by the Association of Official Analytical Chemists. The method used to analyze total mercury in fish is based on the measurement of volatilized mercury vapor. Fish muscle is digested with nitric-sulfuric perchloric acids and stannous chloride-hydroxylanine is used to reduce the mercury (II), which is then volatilized at room temperature in a stream of air. The mercury vapor is measured in a gas cell by atomic absorption at 253.7 nm. Collaborative results showed an overall mercury recovery of 83.5 percent and a standard deviation of 0.066. Similar samples analyzed by the official AOAC method showed erratic results with an overall recovery of 46 percent and a range of 0 to 106 percent. (Mortland-Battelle)
W72-11810

DETERMINATION OF MERCURY IN FOOD PRODUCTS AND BIOLOGICAL FLUIDS BY AERATION AND FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Michigan Dept. of Agriculture, Lansing.
V. A. Thorpe.
Journal of the Association of Analytical Chemists, Vol. 54, No. 1, p 206-210, 1971. 3 fig, 4 tab, 4 ref.

Descriptors: *Mercury, *Pollutant identification, Foods, Fish, Chemical analysis, Acids, Chemical reactions, Oxidation, Feeds, Milk, Poultry, Reduction (Chemical), Calibrations, *Aeration.
Identifiers: *Biological samples, Potassium permanganate, Stannous chloride, Sulfuric acid, Reagents, Blood, Urine, Meat, Eggs, *Atomic absorption spectrophotometry, Precision, Sample preparation, Chemical recovery.

A modification of a method developed at the Fisheries Research Board of Canada has been used for determining mercury in fish, water, other food products, and biological fluids such as meat, poultry, eggs, milk, urine, blood, and animal feeds. Samples were wet digested at 50 C with sulfuric acid, oxidized with strong potassium permaganate solution, and reduced with stannous chloride. Flameless atomic absorption spectrophotometry was used to measure vapor, and to compare sample results with prepared standards and standard curves. Replication of analyses on different days showed good precision, and in testing samples spiked with known amounts of mercury results showed adequate recovery. (Mackan-Battelle)
W72-11811

MICROANALYSES OF 14 CHLOROHYDROCARBONS IN WASTEWATER BY THIN LAYER AND GAS CHROMATOGRAPHY,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Pollution Surveillance.
F. K. Kawahara, R. L. Moore, and R. W. Gorman.
Journal of Gas Chromatography, Vol. 6, p 24-27, January 1968. 4 tab, 8 ref.

Descriptors: *Pollutant identification, *Waste water (Pollution), *Chlorinated hydrocarbon pesticides, Chemical analysis, Methodology, Heptahlor, Aldrin, Endrin, Dieldrin, Water analysis, Separation techniques, Halogenated pesticides.
Identifiers: *Thin layer chromatography, *Chlorohydrocarbons, *Electron capture gas chromatography, *Microcoulometric titrimetric gas chromatography, Hexachlorocyclopentadiene, Hexachlorobicycloheptadiene, Heptadiloronorbornene, Chlordene, Isodrin, l-Hydroxychlordene, Heptachlor epoxide, Gamma chlordane, Nonachlor, Rearrangement, Retention times, Electron capture detectors, Sample preparation, Eluates, Microanalysis, Recovery, Precision.

An analytical procedure has been developed which provides for rapid determination of 14 chlorinated hydrocarbons from water grab sample, even though two pairs of compounds with identical or similar retention times are involved. The process involves extraction and concentration of samples and analysis by thin layer chromatography (TLC). TLC was used to resolve the coemerging pairs, to facilitate GC analysis, and for confirmation. Good recoveries were obtained in the analysis of the chlorohydrocarbon compounds which are epoxidized, hydroxylated, or hyperchlorinated. However, it was observed that the low melting or liquid chlorohydrocarbons which are more volatile exhibit more then usual losses, probably incurred during concentration operations. Relative TLC R sub f values, GC relative retention data, and percent recovery data are tabulated for comparison. (Mackan-Battelle)
W72-11812

MONITORING INDUSTRIAL EFFLUENTS,
Dow Chemical Co., Freeport, Tex. Waste Control Dept.
K. D. Ripley.
Chemical Engineering, Vol 79, No 10, p 119-122, May 8, 1972. 2 fig, 2 tab, 2 ref.

Descriptors: *Monitoring, *Biological properties, *Industrial wastes, *Water quality control, *Physicochemical properties, Pollutant identification, Waste water (Pollution), Dissolved oxygen, Odor, Phenols, Biochemical oxygen demand, Oxygen demand, Water pollution sources, Pesticides, Flow rates, Temperatures, Suspended solids, Sampling, Coliforms, Alkalinity, Hydrogen ion concentration, Metals, Nitrogen, Phosphorus, Sulfur, Salinity, Oils, Inorganic compounds, Organic compounds.
Identifiers: Data interpretation, Dissolved solids, Total organic carbon.

A guide to the general aspects of monitoring industrial wastes covers the following areas: (1) the general approaches to monitoring - centralized and decentralized; (2) parameters to be monitored; and (3) where and how to sample. No methodology is described but examples are given to illustrate the importance of sampling frequency, selecting the best method, and data interpretation. (Mackan-Battelle)
W72-11819

THE DETERMINATION OF ORGANIC BASES IN CARBONISATION EFFLUENTS,
Salford Univ. (England).
L. S. Bark, R. L. Cooper, and K. C. Wheatstone.
Water Research, Vol 6, No 1, p 117-126, January 1972. 6 fig, 3 tab, 5 ref.

Descriptors: *Organic compounds, *Industrial wastes, *Organic wastes, *Pollutant identification, *Alkalis (Bases), Phenols, Waste water (Pollution), Aromatic compounds, Sewage effluents, Chemical wastes, Solvent extractions, Aqueous solutions.
Identifiers: *Flame ionization gas chromatography, Pyridine, Quinoline, Amines, Aniline, Gas liquid chromatography, Column chromatography, Sample preparation, Detection limits.

Pyridine and quinoline bases and aromatic amines present in carbonization effluents were determined by flame ionization gas chromatography. Samples were acidified, made alkaline, extracted into diethyl ether, and injected into the gas chromatograph. Good separation and determination were achieved within 30 min using dual stainless steel columns packed with Chromosorb W (AW-DCMS) coated with 15 percent Carbowax 20M and by linear temperature-programming from 123 degrees to 185 degrees at 3 C/min. From one sample, 39 peaks were resolved, of which 33 were found to correspond to 42 organic bases analyzed under identical conditions; the remaining 6 peaks have not been positively identified. Concentrations down to 0.1 mg/l of each organic base in the original sample were determined. (Snyder-Battelle)
W72-11820

STANDARD ERROR OF LC 50 AND SAMPLE SIZE IN FISH BIOASSAYS,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Research and Development.
A. L. Jensen.
Water Research, Vol 6, No 1, p 85-89, January 1972. 1 fig, 3 ref.

Descriptors: *Fish, *Bioassay, *Reliability, *Lethal limit, Statistical methods, Theoretical analysis, Water temperature, Thermal pollution, Water pollution effects.
Identifiers: *Sample size, Pimephales promelas, Standard error, Probit analysis, Accuracy, Errors, Fathead minnow.

Pimephales promelas, weighing from 1.25 to 2.50 g, was used in a study of the relationship between the relative error of the LC sub 50 and sample size in fish bioassays. An instant increase in temperature was used as the lethal agent. Six separate experiments were performed, two of which defined the LC sub 50 range for fathead minnows acclimated to 6 C to be between 26 and 28 C. Separate probit analyses, using percent mortality in 12 hr, were used to determine LC sub 50 values for samples sizes ranging from 10-120 minnows. The standard error for each LC sub 50 was calculated and relative errors determined for different sample sizes. It was shown that if the mean concentration tested is near the estimated LC sub 50 and the same sample size is used at each test level, the dependence of relative error on sample size is predictable. The standard error of the estimated LC sub 50 is significantly reduced as sample size is increased until the sample size reaches about 30 fish. (Snyder-Battelle)
W72-11821

THE IDENTIFICATION OF PETROLEUM PRODUCTS IN THE MARINE ENVIRONMENT BY ABSORPTION SPECTROPHOTOMETRY,
Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
E. M. Levy.
Water Research, Vol 6, No 1, p 57-69, January 1972. 8 fig, 8 tab, 5 ref.

Descriptors: Oil, *Pollutant identification, Water pollution, *Oil wastes, Oil spills, *Spectrophotometry, Canada, Sea water, Oil pollution, Ultraviolet radiation.
Identifiers: *Oil characterization, *Absorption spectrophotometry, Fingerprinting, Sable Island, Magdolen Islands, Bunker C oil, Chedabucto Bay, Absorbance, Fuel oil, Magdalen Islands, Petroleum products.

Absorption spectrophotometry is shown to provide a convenient method for the identification of the source of petroleum products in the marine environment. Absorbance at 228 nm relative to that at 256 nm distinguishes different members of similar types of oils sensitively and reliably. The

technique was applied to a variety of standard samples of common petroleum products and to environmental samples taken from beaches on islands off eastern Canada. The UV absorption spectra for the fuel oils were characterized by strong absorption maxima at approximately 228 nm and comparatively less prominent peaks at 256 nm. The spectra for the lubricating oils indicated very weak absorption at 256 nm and no clearly defined peak at 228 nm. The ratio of the absorbances at 228 and 256 nm varied from 1.23 for the residual to 7.41 for the distillate fuel oils. No change in this ration was detected for a sample of Bunker C oil that experienced almost a year's exposure to weathering processes. The origin of oils in the environmental samples was identified. Weathering of samples as above had not significantly altered those compounds responsible for UV absorption characteristics and the origin or source could still be identified. (Mortland-Battelle)
W72-11823

CAPILLARY CELL FOR PHOSPHORIMETRY OF ORGANIC MOLECULES IN AQUEOUS SOLVENTS AT 77 DEGREE K,
Florida Univ., Gainesville. Dept. of Chemistry.
R. J. Lukasiewicz, P. A. Rozynes, L. B. Sanders, and J. D. Winefordner.
Analytical Chemistry, Vol 44, No 2, p 237-240, February 1972. 3 fig, 1 tab, 19 ref.

Descriptors: *Organic compounds, Solvents, *Aqueous solutions, Sulfur compounds, Phenols, Quartz, Chemical analysis, Application methods, Laboratory equipment.
Identifiers: *Phosphorimetry, *Organic molecules, *Phosphorescence, Luminescence, Nitrophenol, Sulfamethazine, Thiouracil, Methanol, Detection limits, Capillary cells, Organic solvents, Sample preparation, Biological samples.

Phosphorimetric analysis of polar organic molecules in predominately aqueous solutions at 77 K has been achieved using an open quartz capillary tube for the sample cell. Limits of detection (between 0.1 and 0.1 ng) and analytical curves (linear over a 10,000 fold concentration range) for p-nitrophenol, sulfamethazine, and 2-thiouracil were measured and found to compare favorably with the best previously reported values using nonaqueous solvents and larger sample cells. The measurement of phosphorescence of molecules in biological systems (sample size required is only about 20 microliter) is now possible because of the use of a 90 percent water-10 percent methanol solvent, which has a very small phosphorescence background of the quartz capillary cells, was minimized by the use of an excitation polarizer oriented perpendicularly to the sample cell length. (Mackan-Battelle)
W72-11824

EVALUATION OF THE AUXOTAB ENTERIC 1 SYSTEM FOR IDENTIFICATION OF ENTEROBACTERIACEAE,
Mayo Clinic, Rochester, Minn.; and Mayo Foundation, Rochester, Minn.
J. A. Washington, II, P. K. W. Yu, and W. J. Martin.
Applied Microbiology, Vol 23, No 2, p 298-300, February 1972. 3 tab, 8 ref.

Descriptors: *Evaluation, *Pollutant identification, Analytical techniques, Cultures, Microbiology, Salmonella, Shigella, E. coli, *Enteric bacteria, Coliforms, Aerobic bacteria, Methodology, Water pollution, Pathogenic bacteria.
Identifiers: *Auxotab Enteric I System, *Enterobacteriaceae, Edwardsiella tarda, Citrobacter freundii, Arizona hinshawii, Klebsiella pneumoniae, Enterobacter aerogenes, Enterobacter cloacae, Enterobacter liquefaciens, Enterobacter hafniae, Serratia marcesens, Proteus mirabilis, Proteus vulgaris, Proteus morganii, Proteus rettgeri, Providencia.

An evaluation of the accuracy and convenience of the Auxotab Enteric 1 System for identification of Enterobacteriaceae was performed with 160 bacteria. The system consists of a card with 10 capillary units containing selected reagents. The capillaries are inoculated with an aqueous concentrated bacterial suspension, and the card incubated at 35 C for 3 hr in a special chamber. Identification at the species level was correct in 134 (83.8 percent) instances and at the generic level in 144 (90 percent) instances. Sixty strains failed to achieve the minimal concentration of organisms required to complete the identification process within 7 hr. The system was judged to be laborious and to present a potential hazard to those working with it. (Snyder-Battelle)
W72-11825

INTERFERENCES IN THE DETERMINATION OF TITANIUM, ZIRCONIUM, AND HAFNIUM BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Varian Techtron Ltd., Spring Vale (Australia).
V. K. Panday.
Analytica Chimica Acta, Vol 57, No 1, p 31-43, November 1971. 3 fig, 13 ref.

Descriptors: *Titanium, Boron, Metals, Sodium, Potassium, Cesium, Beryllium, Magnesium, Calcium, Strontium, Copper, Cadmium, Iron, Lead, Alkali metals, Alkaline earth metals, Zinc, Nickel, Mercury, Chromium, Molybdenum, Cobalt, Manganese, Aluminum, Cations, Anions, Ammonia.
Identifiers: *Zirconium, *Hafnium, *Ion interference, *Chemical interference, *Atomic absorption spectrophotometry, Absorbance, Rubidium, Barium, Silicon, Lithium, Lanthanum, Tin, Vanadium, Tungsten, Bismuth, Antimony, Tantalum, Niobium, Yttrium, Hydrochloric acid, Nitric acid, Sulfuric acid, Acetic acid, Hydrogen peroxide, Atomic absorption.

The various interferences (metallic ions, inorganic and organic acids, ammonia, hydrogen peroxide) with the absorption on titanium, zirconium, and hafnium in nitrous oxide-acetylene flames during atomic absorption spectrophotometric determinations were investigated using a Techtron AA-4 atomic absorption spectrometer with a nitrous oxide-acetylene flame. Gas flow rates were adjusted for the maximum absorption signal for each element. Solutions of titanium, zirconium , and hafnium were prepared by dissolving the metal in a few drops of hydrofluoric acid and 2 ml of nitric acid with final solutions containing 0.1 percent of each acid. The effects of various ions and compounds appeared to be periodic in nature, with the smallest ion causing the largest effect. Absorption of titanium was increased by adding extraneous ions, except with boron; however, the absorption of zirconium and hafnium was generally depressed, except with lanthanum, silicon, tantalum, cadmium and copper, where an enhancement was observed. (Snyder-Battelle)
W72-11826

FLOC-FORMING BACTERIA ISOLATED FROM ACTIVATED SLUDGE,
Tohoku Univ., Sendai (Japan). Faculty of Agriculture.
A. Kato, K. Izaki, and H. Takahashi.
Journal of General and Applied Microbiology, Vol 17, No 6, p 439-456, December, 1971. 10 fig, 7 tab, 22 ref.

Descriptors: *Sewage bacteria, *Flocculation, *Activated sludge, *Pollutant identification, Corynebacterium, Enzymes, Electron microscopy, Colorimetry, Pseudomonas, Organic compounds, Aerobic bacteria, Water pollution sources.
Identifiers: Corynebacterium fascians, Bacillus cereus, Zoogloea, Flavobacterium dormitator, Infrared spectroscopy, Cellulase, Protease, Pectinase, Deflocculation, Sample preparation, Biochemical tests, Culture media, Enzymatic inhibitors, Exocellular polymer.

Microorganisms isolated from phenol-adapted activated sludge were identified and characterized as to their floc-forming ability. Bacteria were isolated by plating-out dilutions of sludge extract, and identified by a series of biochemical tests. Floc formation by a bacterium was determined by the unaided eye or microscopically from samples which had been shaken for 150 hours at 37 C. The flocs were described as a capsular matrix of extracellular fibrils surrounding the cells, and were susceptible to deflocculation by cellulase, pectinase, or protease. This suggested that flocs were exopolymer compounds of cellulose, pectin, or protein. Further analysis, however, showed that the cellulose-type floc did not consist of a homopolymer of cellulose but of 9 heteropolymer of glucose and an unknown carbohydrate. The cellulase-susceptible floc-former was identified as Bacillus cereus, and the protease-susceptible microorganism as Flavobacterium dormitator. Corynebacterium fascians was identified as a new floc-former. (Long-Battelle)
W72-11827

SOME OBSERVATIONS ON THE TOLERANCE OF OCEANIC PLANKTON TO HIGH HYDROSTATIC PRESSURE,
Aberdeen Univ., (Scotland). Dept. of Physiology.
A. G. Macdonald, I. Gilchrist, and J. M. Teal.
Journal of the Marine Biological Association of the United Kingdom, Vol 52, No 1, p 213-223, February 1972. 5 fig, 4 tab, 21 ref.

Descriptors: *Crustaceans, *Hydrostatic pressure, *Resistance, *Zooplankton, Marine animals, Amphipoda, Copepods, Respiration, Oceans, Distribution patterns, Stress, Deep water, *High pressure, Shallow water.
Identifiers: Macroinvertebrates, Ostracods, Decapods, Euphausiids, Vertical distribution, Gigantocypris mulleri, Conchoecia hyalophyllum, Conchoecia macrocheira, Conchoecia rhynchena, Parathemisto, Megacalanus longicornis, Euaugaptilus magna, Pareuchaeta gracilis, Pleuromamma robusta, Euphausia krohni, Acanthephyra pelagica, Amalopeus elegans, Anomalocera patersoni.

The effect of varied hydrostatic presssures (up to 500 atm) upon the activity of certain planktonic animals was studied by researchers on the R. R. S. 'John Murray' in August 1970 and May 1971. Plankton hauls were made with an open 2-m net paid out on a maximum of 4500 m of wire. The collected animals were kept cold and experimented on within 12 hr. In the standard pressure experiment the animals were confined in a small perspex vessel mounted inside the pressure vessel and held at a selected temperature for 1 hr, after which the pressure was raised to 500 atm in 1 min, held for 15 min and then released to 1 atm over a further 1 min period. After decompression the animals were observed for an hour in the vessel and their recovery assessed. The temperature, regulated by a water jacket around the pressure vessel, was selected to correspond to 3 depths in the sea: 13 C for shallow water; 7-8 C for 1200-1400 m; 3-2.5 C for depths greater than 2700 m. After each experiment the animals were fixed and identified. Respiration of Gigantocypris and Systellaspis debilis was measured at 250 and 500 atm for periods of 20 min at each pressure. Respiration decreased with increased pressure in Gigantocypris, and in S. debilis, respiration increased with pressure increases and vice versa. That Gigantocypris proved more pressure tolerant than the other ostracods and Anomalocera more sensitive than other copepods was consistent with normal vertical distributions. Moderate pressures generally increased locomotor activity with the exception of deeper water forms, notably Gigantocypris. (Mackan-Battelle)
W72-11828

THE PRODUCTION OF SURFACE-ACTIVE MATERIAL BY MARINE PHYTOPLANKTON CULTURES,
Galveston Marine Lab., Tex.

For primary bibliographic entry see Field 05B.
W72-11829

RAPID SEPARATION AND ESTIMATION OF GASES PRODUCED OR UTILIZED BY MICRO--ORGANISMS,
Edinburgh Univ. (Scotland). Dept. of Microbiology.
R. A. Herbert, and A. J. Holding.
Journal of Chromatographic Science, Vol 10, No 3, p 174-175, March 1972. 1 fig, 1 tab, 8 ref.

Descriptors: *Gas chromatography, *Microorganisms, *Separation techniques, *Gases, Carbon dioxide, Chemical analysis, Methane, Thermal conductivity, *Organic compounds, *Inorganic compounds, Oxygen, Nitrogen, Sediments, Nitrates, Nitrogen fixation, Fermentation, Laboratory equipment.
Identifiers: Quantitative analysis, Ethylene, Acetylene, Nitrous oxide, Thermal conductivity detector, Detection limits, Ethane, Substrate utilization, Acetylene reduction.

A gas chromatographic system can be used to separate and quantitatively determine inorganic and simple hydrocarbon gases (O2, N2, NO/CO, CO2, N2O, CH4, C2N2, C2H4, C2H6) evolved or utilized by microorganisms. The system consists of a gas chromatograph fitted with a thermal conductivity detector which functions alternately as a reference or a sensor. A Vitatron recorder with an electronic integrator and a dual column arrangement (Molecular sieve 5A and Silica gel) operated at 30 C are also utilized. Tabulated minimum detection limits verify that this method allows for an effective resolution of mixtures of simple hydrocarbon and inorganic gases. It also allows for rapid, accurate analyses of several gases without having to change columns. The described method has been used to routinely determine the nitrogenous gases resulting from the microbial dissimilation of nitrate in lake sediments as well as other gases released from the sediment. It could be used to monitor utilization/production of methane and ethane in microbial fermentation systems, or to determine nitrogen fixation rates by measuring ethylene formation from acetylene. (Snyder-Battelle)
W72-11831

KINETICS OF GROWTH ON AQUEOUS-OIL AND AQUEOUS-SOLID DISPERSED SYSTEMS,
Pennsylvania Univ. Philadelphia. School of Chemical Engineering.
For primary bibliographic entry see Field 05C.
W72-11832

THE FLOCCULATION OF ALGAE WITH SYNTHETIC POLYMERIC FLOCCULANTS,
Connecticut Univ., Hartford. School of Medicine.
For primary bibliographic entry see Field 05D.
W72-11833

LIQUID X-RAY DIFFRACTION TECHNIQUES FOR OVERVIEWED SAMPLES,
Ball State Univ., Muncie, Ind. Dept. of Chemistry.
R. M. Lawrence, J. R. Relford, and S. C. Habegger.
The Review of Scientific Instruments, Vol 43, No 1, p 40-42, January 1972. 4 fig, 1 tab, 10 ref.

Descriptors: *Methodology, Radiation, Absorption, Light intensity, Crystallography, *X-ray diffraction, Chemical analysis, Water analysis, Aqueous solutions, Irradiation, Optical properties, *Analytical techniques.
Identifiers: *Overviewed samples, *Liquid x-ray diffraction, Diffractometers.

Overviewing techniques are used in achieving agreement between the forms of the relative and absolute intensity curves in liquid x-ray diffraction studies. To view the entire scattering volume of an irradiated sample, diffractometer slit combinations are selected on the basis of intensity vs sample height curves. Elimination of the sample absorption correction and the associated optical restrictions yields scattering patterns that have the same form as their corresponding absolute intensity curves over the entire range in scattering angle. A theta-theta diffractometer, specially constructed for obtaining diffraction patterns of liquids, in conjunction with a solid state detector system (comprised of photomultiplier, high voltage supply, preamplifier, linear amplifier, pulse height analyzer, scales, timer, and printer) was used in these studies. Sample and room temperatures were maintained within one degree C. In order to obtain a diffraction pattern of a system, a minimum of 2 runs was made over the entire angular range. Sufficient counts were obtained at each angle to give a probable error of 0.6 percent or less. The intensities for any set of runs over a sample differed by less than 2 percent over several degrees of scattering angle, and were corrected for polarization and background, at approximately 6 cycles/min. These overviewing techniques have been used to study the structures of more than 20 systems. A good fit of the relative intensity curve to the corresponding absolute intensity curve was achieved in each case over the entire range in S. (Mackan-Battelle)
W72-11834

A SIMPLE ASSEMBLY FOR FREEZE-DRYING OF TISSUE SAMPLES,
Michigan Univ., Ann Arbor. Upjohn Research Center for Clinical Pharmacology.
For primary bibliographic entry see Field 07B.
W72-11835

ISOLATION OF INFECTIOUS PANCREATIC NECROSIS VIRUS FROM WHITE SUCKERS (CATASTOMUS COMMERSONI),
Guelph Univ. (Ontario). Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-11837

POTENTIAL SOURCES OF ERROR IN THE MEASUREMENT OF LOW RATES OF PLANKTONIC PHOTOSYNTHESIS AND EXCRETION,
Southampton Univ., (England). Dept. of Oceanography.
P. J. LeBWilliams, T. Berman, and O. Holm-Hansen.
Nature New Biology, Vol 236, No 64, p 91-92, March 22, 1972. 1 tab, 8 ref.

Descriptors: *Radioactivity techniques, *Measurement, *Primary productivity, *Phytoplankton, Carbon radioisotopes, Irradiation, Ultraviolet radiation, Photosynthesis, Sodium compounds, Seston, Filters, Organic matter, Bicarbonates, Rates, Adsorption, Chemical reactions.
Identifiers: *Errors, *Excretion, C-14, Sodium bicarbonate, Radioactive impurities, Chemical interference, Photooxidation.

Potential sources of interference in widely used C-14 productivity or photosynthesis measuring techniques were found to involve: (1) retention of C-14-labeled sodium bicarbonate by filters; (2) passive adsorption of radioactivity by filters and/or seston; and (3) soluble and insoluble radioactive impurities in commercially available C-14-labeled sodium bicarbonate. It was recommended that, since washings only decrease but do not eliminate residual radioactivity on filters, the excess labeled bicarbonate be removed by fuming in HCl vapor as suggested by Steemann-Nielsen. In studies of soluble extracellular products contaminated by soluble radioactive organic material, it was shown that irradiation of the C-14-labeled bicarbonate in solution with ultraviolet light effectively photo-oxidizes the contaminant to CO2 and reduces the impurity to less than 0.0001 percent. Care must be taken to maintain the pH of the solution between 8.0 and 8.5. (Mackan-Battelle)
W72-11838

EVALUATION OF PYRITIC OXIDATION BY MOSSBAUER SPECTROMETRY,
Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Inst. of Science.
For primary bibliographic entry see Field 05B.
W72-11839

ECOLOGICAL STUDIES OF MERCIERELLA ENIGMATICA FAUVEL (ANNELIDA: POLYCHAETA) IN THE BRISBANE RIVER,
Queensland Univ., Brisbane (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-11840

MERCURY IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL APPRAISAL,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 05C.
W72-11842

A BASKET FOR WASHING BENTHOLOGICAL SAMPLES,
Fish and Wildlife Service Ashland, Wis.
For primary bibliographic entry see Field 07B.
W72-11859

NATIONAL WATER DATA PROGRAM,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07A.
W72-11892

A QUANTITATIVE STUDY OF FACTORS AFFECTING ALGAL DIVISION SYNCHRONY MEASUREMENTS,
Saint Louis Univ., Mo. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-11920

MONITORING FOR EFFECTIVE ENVIRONMENTAL MANAGEMENT,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
N. L. Drobny.
Preprint 1626, American Society of Civil Engineers, National Water Resources Engineering Meeting, January 24-28, 1972, Atlanta, Georgia, 28 p. 5 fig, 2 tab, 15 ref.

Descriptors: *Water quality control, *Environmental control, *Montoring, Physicochemical properties, Ecology, Mathematical studies, Statistics, Aerial photography, Infrared radiation, Remote sensing, Data collections, Measurement, Data processing, Data storage and retrieval, Data transmission, Pollutant identification, Quality control, Water quality, Aircraft, Satellites (Artificial).

Systems for data measurement, management and utilization are discussed in reference to an effective water quality monitoring network. In treating the water quality measurement function, explicit consideration was given to three questions: (1) what parameters should be measured; (2) what techniques or equipment should be used in collecting the required data; and (3) how much data should be collected. The range of physical/chemical data collection alternatives were structured into three broad categories: (1) manual sample collection, (2) electronic monitoring equipment, and (3) noncontact techniques such as aerial photography and infrared sensing using airplanes or satellites. In order that environmental quality measurements reach decision makers in a timely and useful manner, an effective data management system was needed to provide for coordinated transmis-

sion, processing, storage, and retrieval of the data. Environmental quality indices are now being developed to assess the success of the various programs, procedures, and policies. (Byrd-Battelle)
W72-11921

POLYCHLORINATED TERPHENYLS IN THE ENVIRONMENT,
Fisheries Research Board of Canada, St. Andrews, (New Brunswick). Biological Station.
V. Zitko, O. Hutzinger, W. D. Jamieson, and P. M. K. Choi.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 4, p 200-201, April 1972. 1 fig, 5 ref.

Descriptors: *Gulls, *Bird eggs, *Gas chromatography, *Pollutant identification, Canada, Polychlorinated biphenyls, Water birds, Bioassay, Separation techniques, Pesticide residues, Pesticides, Absorption.
Identifiers: *Eggs, *Polychlorinated terphenyls, *Cormorants, Larus argentatus, Phalacrocorax auritus, Bay of Fundy, Aroclor 5460, Biological samples, Gas liquid chromatography, Herring gulls, Fat tissue.

The presence of polychlorinated terphenyls (PCT) in the eggs and fatty tissue of herring gulls (Larus argentatus) from the Bay of Fundy, Canada, was determined by gas-liquid chromatography on a 6 ft by 4 mm glass column containing 3 percent OV-210 on Chromosorb WAW 60/80, and operated at 200 C. PCT residues were confirmed by chlorination with antimony pentachloride in sealed glass tubes for 4 hr at 170-180 C. The level of PCT in subcutaneous fat and eggs of herring gulls was 1.4 and 0.1 micrograms, respectively when expressed as Aroclor 5460 on wet weight basis. PCT's were not detected in eggs and fatty tissue of double crested cormorants (Phalacrocorax auritus) from the same area indicating that PCT's are not as widely distributed in the environment as polychlorinated biphenyls. (Snyder-Battelle)
W72-11923

INTERFERING GLC PEAKS FROM MATERIALS AND CHEMICALS IN PESTICIDE RESIDUE ANALYSIS,
Canadian Grain Commission, Winnipeg (Manitoba). Grain Research Lab.
I. Levi, and T. W. Nowicki.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 4, p 193-199, April 1972. 6 fig, 5 ref.

Descriptors: *Pesticide residues, *Pollutant identification, *Gas chromatography, Chemical analysis, *Chlorinated hydrocarbon pesticides, Organic pesticides, Cereal crops, Chemicals, Organic compounds.
Identifiers: *Chemical interference, Electron capture gas chromatography, Sodium sulfate, Filter paper, Talcum powder, Gas liquid chromatography, Precision.

The following materials and chemicals have been found to contribute contaminants which interfere with glc-ecd analysis of cereal grains for organochlorine pesticide residues: (1) anhydrous sodium sulfate analyzed reagent; (2) filter paper, unwashed and double-acid washed; (3) wash bottles, unitized and all glass assembly; (4) soiled (used) teflon gaskets; (5) silane-treated glass wool; (6) Blender and Omni mixers; (7) rubber gloves; and (8) talcum powder. Some suggestions offered for eliminating spurious peaks or minimizing them to an acceptable working level include (1) removing volatile organic impurities in sodium sulfate by heating at 600 C for 2 hr. or washing with a solvent system; (2) soaking filter paper in a solvent system overnight; and (3) heating glass wool at 600 C for 2 hr. (Holoman-Battelle)
W72-11924

EYES BENEATH THE WAVES,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-11925

MEASUREMENT OF MICROSAMPLES IN ATOMIC EMISSION AND ATOMIC FLUORESCENCE FLAME SPECTROMETRY,
Florida Univ., Gainesville. Dept. of Chemistry.
J. R. Starbeck, P. A. St. John, and J. D. Winefordner.
Mikrochimica Acta, No. 1, p 55-64, 1972. 4 fig, 2 tab, 11 ref.

Descriptors: Metals, Heavy metals, *Potassium, *Calcium, *Lead, *Cadmium, *Nickel, Chemical analysis, Sampling, Methodology, *Spectrophotometry.
Identifiers: *Atomic emission flame spectrometry, *Atomic fluorescence flame spectrometry, Detection limits, *Microanalysis, Chemical interference, Biological samples.

A simple, rapid, and sensitive analytical technique, based upon the combination of liquid-feed sampling with a total consumption nebulizer burner, and a microsample injection system, is described for the analysis of discrete microliter samples by atomic emission and atomic fluorescence flame spectrometry. Three elements were studied by atomic emission flame spectrometry: K 766.5 nm; Ca 422.7 nm; and Pb 405.8 nm; and three by atomic fluorescence flame spectrometry: Pb 405.8 nm; Cd 228.8 nm; and Ni 232.0 nm. The standard solutions were prepared in deionized water which also served as the liquid carrier. For each measurement, the nonochromator was adjusted to the analytical wavelength using continuous introduction of a solution of analyte to the flame. The detection limit of each element was determined by injecting constant volumes of different concentrations of the analyte using both the microsampling and the conventional continuous sampling methods with the same instrumental system. Concentrational detection limits were higher than those determined by conventional methods by about 10-100 times. The atomic emission analytical curves prepared for K and Ca were linear over the respective ranges of 0-0.10 and 0-0.5 micrograms. The atomic fluorescence analytical curves for Cd and Ni were slightly curved toward the abscissa for 0-2 and 0-5 micrograms, respectively. Initial studies involving the use of the microsampling method for K and Ca analysis in blood serum indicate that no interferences result. (Mackan-Battelle)
W72-11928

A VERSATILE SOLVENT SYSTEM FOR THE PAPER CHROMATOGRAPHY OF INORGANIC CATIONS,
Vikram Univ., Ujjain (India). School of Studies in Chemistry.
N. S. Poonia, V. Bhagwat, and H. S. Singh.
Mikrochimica Acta, No. 1, p 36-41, 1972. 2 fig, 2 tab, 15 ref.

Descriptors: *Cations, *Chromatography, *Metals, Alcohols, Ions, Gold, Cobalt, Nickel, Iron, Manganese, Zinc, Chromium, Aluminum, Copper, Cadmium, Mercury, Lead, Strontium, Molybdenum, Titanium, Magnesium, Calcium, *Heavy metals, *Trace elements.
Identifiers: *Paper chromatography, *Solvent system, Chloroform, Iso-amyl alcohol, Acetones, Iso-pentanol, Platinum, Silver, Palladium, Ruthenium, Rhodium, Iridium, Bismuth, Arsenic, Antimony, Tin, Thallium, Selenium, Tellurium, Tungsten, Uranium, Vanadium, Zirconium, Thorium, Cerium, Lanthanum, Gallium, Indium, Scandium, Beryllium, Barium, Yttrium, Rubeanic acid, Dithizone, Potassium ferrocyanide, Potassium ferricyanide, Rhodizonic acid, Aluminon, Thornol, Potassium iodide, Stannous chloride, Sodium peroxide, Organic solvents, Inorganic solvents.

The paper chromatographic resolution potentiality of the solvent system chlorogorm-acetone-iso-amyl-alcohol-ll N HCl (1:1:1:0.5 v/v) for metal cations was tested. A fine glass capillary tube was used to place about a 5-mm diameter spot at the center of a paper disc. After drying, the paper was put in the solvent for development using a wick narrow enough for feeding the solvent such that development takes about 3 hours for individual elements or 6 hours for mixtures. The paper is then removed, the solvent front marked, dried, and subjected to the appropriate detection reagent. R sub f values and reagents for both individual elements and mixtures are given. The solvent system does not resolve the rare-earth, alkali, or alkaline earth metals due to presence of lipophilic iso-amyl alcohol. (Mortland-Battelle)
W72-11929

NOTE ON THE SIGNIFICANT DIFFERENCE IN GAS-LIQUID CHROMATOGRAPHIC RESPONSES TO INSECTICIDES INJECTED AT FAST AND SLOW RATES,
Food and Drug Directorate, Ottawa (Ontario).
C. E. Mendoza.
Journal of Chromatographic Science, Vol. 9, No. 12, p 753-754, December 1971. 2 tab, 6 ref.

Descriptors: *Insecticides, *Chlorinated hydrocarbon pesticides, Aldrin, *Pollutant identification, Halogenated pesticides, *Chromatograph.
Identifiers: *Gas liquid chromatography, *Injection rates, Dyrene, Malathion, Parathion, Electron capture detector, p p' DDT.

The effects of injection rate on the response of a gas-liquid chromatograph to insecticides was studied using three electron capture detector foils. Significantly higher responses were obtained when Dyrene, aldrin, p,p'-DDT, malathion, and parathion were injected at a slow rate than when they were injected at a fast rate. This difference may be attributable to the width of the pesticide band moving through the column since this band may stretch at a slower rate and expose more ions to the detector surface. This assumption was supported by a decreased current during injection at a slow rate. Thus, injection rate is apparently a critical factor in obtaining maximum efficiency of the detector. It is suggested that an automatic injector should permit a consistent injection rate and assure a consistent response. (Mortland-Battelle)
W72-11931

A NEW COMPUTING INTEGRATOR FOR CHROMATOGRAPHY,
Vidar Corp., Mountain View, Calif.
For primary bibliographic entry see Field 07B.
W72-11932

TRACE ELEMENTS IN SEWAGE SLUDGES,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 05B.
W72-11933

DEVICE FOR FIELD DETERMINATION OF SELECTED HEAVY METALS IN NATURAL WATERS,
Ball State Univ., Muncie, Ind. Dept. of Chemistry.
D. M. Coleman, R. E. Van Atta, and L. N. Klatt.
Environmental Science and Technology, Vol. 6, No. 5, p 452-455, May 1972. 3 tab, 7 ref.

Descriptors: *Heavy metals, *Water analysis, *Polarographic analysis, Lead, Cadmium, Zinc, Iron, Instrumentation, Electrodes, Electrolytes, On-site investigations, Equipment.
Identifiers: Trisodium citrate, Ion selective electrodes, *Electrochemical methods.

A relatively simple and inexpensive self-contained portable device, designed as a three-electrode polarograph for in situ determination of lead, cadmium, zinc, and iron in natural waters has been developed and tested. The system uses a dropping mercury-indicating electrode, a platinum-counter electrode, and a saturated electrode. Trisodium citrate is used as the electrolyte. The calomel precise sampling method is based on the specific application and must be determined by the analyst. The analyses for these four metals may be completed in less than an hour, with results accurate to within plus or minus 0.1 ppm. Capability for application of the instrument to the determination of other metals is built-in. Among the advantages of the instrument are: the device is readily portable; it is capable of yielding analytical results in the field for some metal ions which are relatively difficult to determine by other techniques under similar conditions; it is relatively easy to operate; suitable for use by nontechnical personnel; the chemical operations required are extremely simple; and it is designed for relatively simple maintenance, requiring only occasional replacement of propane, Freon-12, and batteries. (Mortland-Battelle)
W72-11934

HYDROGEN PEROXIDE CONTENT OF RIVER WATER AND A METHOD FOR DETERMINING IT,
Nauk SSSR, Moscow. Institut Biologii Akademiya Vnutrennykh Vod.
V. Ye. Sinel'nikov.
Hydrobiological Journal, Vol 7, No 1, p 96-100, 1971. 2 fig, 1 tab, 12 ref. (Originally published in Gidrobiologicheskiy Zhurnal, Vol 7, No 1, 1971.).

Descriptors: *Water chemistry, *Chemical analysis, *Analytical techniques, *Chemical reactions, Oxidation, Oxygen, Catalysts, Enzymes, Iodine, Iodides, Organic matter, Sampling.
Identifiers: *USSR, *Volga River, *Hydrogen peroxide, *Luminescence, *Chemiluminescence, Luminol, Oxidases, Catalases, Iodometry.

Investigations of possible application of chemiluminescence activated by luminol to detect the presence of hydrogen peroxide and other oxidizing agents in river water, and of possible use of chemiluminescence to study decomposition of organic matter in bodies of water were based on determinations of H2O2 content in water samples collected from the Volga River between Rybinsk Reservoir and Astrakhan in July 1969. Chemiluminescence exhibited by water upon addition of luminol can be used to calculate its total oxidizing activity, while changes in chemiluminescence intensity are an indicator of hydrogen peroxide content. Compared to the total content of oxidizing agents, including oxygen, the hydrogen peroxide concentration is very low. It is assumed that hydrogen peroxide functions as a catalyst and supplements the activity of oxidases. (Josefson-USGS)
W72-12016

USE OF ATOMIC ABSORPTION SPECTROSCOPY IN THE DETERMINATION OF MICRO G/ LITER CONCENTRATIONS OF NA+, K+, CA2+, AND MG2+,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02K.
W72-12025

ENVIRONMENTAL STUDIES OF MERCURY AND OTHER ELEMENTS IN COAL AND LAKE SEDIMENTS AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS,
Illinois State Geological Survey, Urbana.
E. J. Kennedy, R. R. Ruch, H. J. Gluskoter, and N. F. Shimp.
Reprint, from Nuclear Methods in Environmental Research, Proc of American Nuclear Society Topical Meeting August 23-24, 1971, Columbia, Mo: University of Missouri, Columbia, Office of Conferences and Short Courses, p 205-215, 1971. 8 fig, 8 ref.

Descriptors: *Mercury, *Lake sediments, *Elements (chemical), *Chemical analysis, *Coals, Analytical techniques, Sediments, Cores, Laboratory tests, Lake Michigan, Radiochemical analysis.

Radiochemical separation techniques for determining mercury in coal and fresh water sediments were developed. The procedures involve hot-tube combustion or volatilization followed by chemical entrapment. The range of mercury for coals currently being mined in Illinois is 0.04 to 0.49 ppm, with an average of 0.18 ppm. Coals from most other states fall within this range. Washability studies indicate that the mercury is primarily, but not totally, associated with the pyrite-rich fractions. Some 132 samples of southern Lake Michigan unconsolidated bottom sediments from 31 sampling stations were assayed for mercury. A base level of 0.03 to 0.06 ppm was found in the deeper portions of the cores, whereas up to 0.38 ppm was detected in the top sediment intervals in various parts of the lake. Mercury concentrations are highest in fine-grained lake bottom surficial sediments off major river mouths and correlate with the organic carbon and total sulfur concentrations of the samples. These results are consistent with data for other elements (arsenic, bromine, chromium, lead, and zinc) determined on the same samples by neutron activation analysis and other techniques. (Woodard-USGS)
W72-12033

COUNTING AND RECORDING EQUIPMENT FOR COASTAL AND ESTUARINE POLLUTION STUDIES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-12057

SUBMERSIBLE WATER QUALITY MONITORING EQUIPMENT,
Water Pollution Research Lab., Stevenage (England).
R. Briggs, K. Melbourne, and G. Williams.
Institution of Electronic and Radio Engineers, Conference on Electronic Engineering in Ocean Technology, Proceedings No. 19, September 21-24, 1970, (Water Pollution Research Laboratory Reprint No. 609), 13 p, 7 fig, 12 ref.

Descriptors: *Water management, *Water quality, *Monitoring, Temperature, Dissolved oxygen, Hydrogen ion concentration, Turbidity, Ammonia, *Pollutant identification.
Identifiers: Suspended solids, Suspended organic matter, Oxidized nitrogen.

River management requires accurate information of river flows, water quality and climatological conditions. The WPRL has developed a single relatively inexpensive, twin channel, battery operated monitor capable of measuring water quality parameters at depths down to 25 m. Temperature, dissolved oxygen, pH, turbidity and conductivity can be measured with the sensors now available. Data are recorded in 10 bit binary form on 1/2 in magnetic tape. Future developments point to sensors for measuring suspended matter, organic matter, ammonia, and oxidized nitrogen. Alternative means of data recording and the possibility of transmission by UHF are discussed. (Goessling-Texas)
W72-12058

DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE,
Engineering-Science, Inc., Oakland, Calif.
For primary bibliographic entry see Field 05D.
W72-12062

FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE'.
Los Angeles County, Calif.
For primary bibliographic entry see Field 05D.
W72-12063

FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE,'
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05D.
W72-12064

CONTAMINATION OF THE SEAS AND OCEANS BY ARTIFICIAL RADIOACTIVITY,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W72-12084

CONCENTRATION AND DISTRIBUTION OF OIL POLLUTANTS IN HALIFAX HARBOUR, 10 JUNE TO 20 AUGUST 1971,
Bedford Inst., Darmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05B.
W72-12089

THE STRUCTURE AND PROPERTIES OF WATER SOLUTIONS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 01B.
W72-12099

DETERMINATION OF NITRILOTRIACETIC ACID (NTA) WITH ION-SELECTIVE ELECTRODES,
State Univ. of New York, Buffalo. Dept. of Chemistry.
G. A. Rechnitz, and N. C. Kenny.
Analytical Letters, Vol. 3, No. 10, p 509-514, 1970. 3 fig, 4 ref. EPA Project 16020 FTB.

Descriptors: *Chemical analysis, *Ion exchange, *Electrodes, Copper, Volumetric analysis, Detergents, Pollutant identification, Electrochemistry.
Identifiers: *Nitrilotriacetic acid, *NTA.

A solid membrane copper ion selective electrode was used for the determination of NTA via complexometric titration with copper (II). Interferences, of the type commonly found in detergents, were investigated.
W72-12110

MECHANISTIC STUDIES ON THE VALINOMYCIN-BASED POTASSIUM ELECTRODE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
E. Eyal, and G. A. Rechnitz.
Analytical Chemistry, Vol. 43, No. 8, p 1090-1093, July 1971. 2 fig, 5 tab, 15 ref. EPA Project 16020 FTB.

Descriptors: *Chemical analysis, *Cation exchange, *Electrodes, Ion transport, *Potassium, Electrochemistry, Pollutant identification.
Identifiers: *Valinomycin.

The potentiometric selectivity of the valinomycin electrode is shown to arise from the relative complexing ability of valinomycin with univalent cations, so that the electrochemical selectivity ratio for cation pairs is given by the quotient of the equilibrium formation constants of the respective complexes. It is also shown, on the basis of experiments on 'frozen' electrodes, that the transport mechanism is of the mobile site type in which valinomycin acts as a carrier molecule or transport catalyst.
W72-12111

ABSORPTION OF COPPER, ZINC, MANGANESE, BORON, COBALT AND MOLYBDENUM, BY CROPS IN THE TSELINOGRAD REGION,
For primary bibliographic entry see Field 03F.
W72-12112

ION-ELECTRODE STUDY OF THE CALCIUM--ADENOSINE TRIPHOSPHATE SYSTEM,
State Univ. of New York, Buffalo. Dept. of Chemistry.
M. S. Mohan, and G. A. Rechnitz.
Journal of the American Chemical Society, Vol. 94, No. 5, p 1714-1716, March 8, 1972. 2 tab, 23 ref. EPA Project 16020 FTB.

Descriptors: Biochemistry, *Physicochemical properties, *Calcium compounds, *Ion exchange, *Electrode, Membranes, Electrochemistry, Pollutant identification.
Identifiers: Adenosine triphosphate.

Association constants of the complexes CaATP2- and Ca2ATP have been measured by direct potentiometry using a calcium ion selective membrane electrode.
W72-12114

SULFATE ION-SELECTIVE MEMBRANE ELECTRODE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
G. A. Rechnitz, G. H. Fricke, and M. S. Mohan.
Analytical Chemistry, Vol. 44, No. 6, p 1098-1099, May 1972. 1 fig, 6 ref. EPA Project 16020 FTB.

Descriptors: *Chemical analysis, *Sulfates, *Ion exchange, *Electrodes, Membranes, Pollutant identification, Electrochemistry.
Identifiers: Mixed crystal membrane.

A mixed-crystal membrane composed of 5 mole-percent Cu2S and equal mole fractions of Ag2S, PbS, and PbSO4 gave Nernstian response to sulfate and showed good selectivity with respect to univalent anions. (Hoover-EPA)
W72-12115

ISOLATION OF LYTIC AGENTS RELATED TO SPHAEROTILUS,
Randolph-Macon Coll., Lynchburg, Va.
D. J. Geason.
Available from the National Technical Information Service as PB-211 186, $3.00 in paper copy, $0.95 in microfiche.Mimeo, September 1970. 21 p, 4 fig, 16 ref. FWPCA 17050 DHI 09/70.

Descriptors: *Sphaerotilus, *Myxobacteria, Bacteriophage, Aquatic bacteria, Sewage, Waste water (Pollution), Aerobic bacteria, Pathogenic bacteria, Microorganisms.
Identifiers: *Bdellovibrio, *Spheroplasts, *Microcysts, *Enrichment cultures, Syris.

This study has been undertaken to isolate and identify those agents found in nature which are capable of lysing Sphaerotilus and thus abate the nuisance associated with its occurance in flowing streams and raw sewage. Enrichment culture of river water or raw sewage and either a locally isolated strain or ATCC 13338 has resulted in the isolation of four bacteria capable of destroying the cells but not the sheath of Sphaerotilus. Specific bacteriophage could not be demonstrated. Bdellovibrio bacteriovorus first appeared as small motile rods causing spheroplasting and lysis of the host. After subsequent passages through the host it increased in numbers, size, and avidity or attack. Two other isolates were gram-negative rods which formed microcysts but not fruiting bodies, and produced non-diffusible yellow or red pigments. These have been tentatively identified as myxobacters of the genus Sporocytophaga. The fourth isolate is also a gram-negative rod. It forms extremely mucoid colonies and is being further studied. (EPA abstract)
W72-12120

SELECTIVE DETECTION OF ENTEROCOCCI IN MARINE WATERS,
Connecticut Univ., Noank. Marine Research Lab.
J. D. Buck.
American Journal of Public Health, Vol. 62, No. 3, p 419-421, March 1972. 3 tab, 11 ref.

Descriptors: *Marine microorganisms, *Pollutant identification, *Marine bacteria, *Sea water, Streptococcus, Water pollution sources, Microscopy, Turbidity, Enteric bacteria, Inhibition.
Identifiers: *Enterococci, *Selective media, Phase microscopy, Most probable number test, Culture media.

Selective detection of entrococci in marine waters has been accomplished by culturing representative samples on 3 types of presumptive media: AD broth, S.E. broth, and AD broth with 0.1 percent sodium azide. All positive tube cultures were examined using phase microscopy for the presence of streptococci. Apparent (turbidity and real (microscopic) most probable number (MPN) values were also obtained. Results indicated that false-positive reactions occurred frequently in azide dextrose broth and that increased azide content was inhibitory to streptococci. Pfizer S.E. broth produced average MPN values similar (85 percent) to those observed in azide dextrose broth. The azide dextrose broth with 0.1 percent azide added was considered to be more selective and more expedient for the MPN determination of enterococci in the samples tested. (Byrd-Battelle)
W72-12161

NUMERICAL TAXONOMY ON CORYNEFORM BACTERIA ISOLATED FROM POND-REARED SHRIMP (PENAEUS AZTECUS) AND POND WATER,
Texas A and M Univ., College Station. Dept. of Animal Science.
C. Vanderzant, P. W. Judkins, R. Nickelson, and H. A. Fitzhugh, Jr.
Applied Microbiology, Vol. 23, No. 1, p 38-45, January 1972. 6 fig, 4 tab, 7 ref.

Descriptors: *Systematics, *Pathogenic bacteria, Aquatic bacteria, Numerical analysis, Soil bacteria, Biological properties, *Shrimp, Ponds, Computers, Water pollution sources, Water temperature, Cultures, Anaerobic bacteria, Aerobic bacteria, Shellfish, Amino acids, Water pollution effects, Turbidity, Pollutant identification, Carbohydrates, Vitamins.
Identifiers: *Corynebacteria, *Penaeus aztecus, *Numerical taxonomy, Culture media, Substrate utilization, Biochemical tests, Paper disc method, Corynebacterium aquaticum, Corynebacterium bovis, Corynebacterium equi, Corynebacterium lilium, Corynebacterium michiganense, Corynebacterium pseudodiphtheriticum, Corynebacterium pseudotuberculosis, Corynebacterium pyogenes, Corynebacterium renale, Corynebacterium rubrum, Corynebacterium tritici, Corynebacterium hoffmanni, Arthrobacter atrocyaneus, Arthrobacter flavescens, Arthrobacter globiformis, Arthrobacter tumescens, Microbacterium flavum, Microbacterium lacticum, Propionibacterium arabinosum, Propionibacterium rubrum, Brevibacterium linens, Brevibacterium divaricatum.

Sixty-six bacterial test cultures were isolated from representative samples of pond-reared shrimp (Penaeus aztecus) and pond water. These gram-positive, catalase-positive, non-spore forming, pleomorphic and rod-like bacteria were then compared with type cultures of the Corynebacteriaceae. Stock culture medium (SCM) was used to determine the time to maximum turbidity, growth at different temperatures and pH values, and sensitivity to antiibiotics (paper disc method). Vitamin assay media were used to determine vitamin requirements, and acid production from carbohydrates (1 percent) was tested in a medium which contained 0.1 percent peptone, 1.7 percent NaCl, 0.5 percent yeast extract and 0.0025 percent bromothymol blue. Cellular characteristics were determined on gram-stained cells. In addition, pond isolates were placed in two major groups based on colony pigmentation and in five subgroups based on cell morphology. Classification of the type cultures based on 66 cell and colony characters proved comparable to one based on 163 morphological, biochemical, and physiological characters; this similarity was not observed with pond isolates. With the aid of numerical analysis, pond isolates were placed into six major groups based on certain biochemical and physiological tests. Coryneform bacteria isolated from shrimp and pond water exhibited little similarity to the type cultures. (Byrd-Battelle)
W72-12162

MICROBIAL FLORA OF PACIFIC OYSTERS (CRASSOSTREA GIGAS) SUBJECTED TO ULTRAVIOLET-IRRADIATED SEAWATER,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 05B.
W72-12164

CHEMICAL CHARACTERISTICS OF HUMIC COMPOUNDS ISOLATED FROM SOME DECOMPOSED MARINE ALGAE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05B.
W72-12166

IODINE CONTENT IN MILK AND WATER IN WROCLAW VOIVODESHIP,
Instytut Zootechniki, Krakow (Poland).
For primary bibliographic entry see Field 02K.
W72-12167

INHERENT ERRORS IN PERPENDICULAR ALLOCATION OF OVERLAPPING CHROMATOGRAPHIC PEAKS,
Osaka Univ. (Japan). Dept. of Applied Chemistry.
For primary bibliographic entry see Field 02K.
W72-12168

A FLOUOROMETRIC METHOD FOR DETERMINING CHLOROPHYLLS A, B, AND C,
Johns Hopkins Univ., Baltimore, Md.
M. E. Loftus, and J. H. Carpenter.
Journal of Marine Research, Vol. 29, No. 3, p 319-338, September 15, 1971. 7 fig, 4 tab, 28 ref.

Descriptors: *Fluorometry, *Spectrophotometry, Fluorescence, Water pollution, Plant pigments, Phytoplankton, Plant physiology, Photosynthesis, Measurement, Separation techniques, Solvent extractions, Biomass, Primary productivity, Methodology.
Identifiers: *Chlorophyll a, *Chlorophyll b, *Chlorophyll c, Pheophytin a, Absorbance, Errors, Fluorometers, Pheopigments.

A fluorometric method is presented for determining chloraphylls a, b, and c. The effects of accessory carotenoids and chlorophyll derivatives on the accuracy of this method are analyzed. The chlorophylls were isolated from various plant specimens using either the chromatographic or the n-hexane-90 percent-acetone phase separation technique. The purity and concentration of the isolated chlorophylls were determined by spectrophotometric methods. Conditional molecular fluorescence coefficients were determined by using a specially equipped Turner III fluorometer and monitoring the fluorescence through three combination Corning-glass filters. Measurements obtained with the various sensitivity settings on the fluorometer were converted to equivalent units on the most sensitive scale and the coefficients were expressed in those units. Good agreement between the results derived with this technique and those derived with the spectrophotometric method has been demonstrated in the absence of pheopigments in 90 percent-acetone extracts. An inherent error in the current fluorometric methods for the determination of chlorophyll a and pheophytin a was demonstrated, and a method for improving the estimation of pheophytin a is given. (Byrd-Battelle)
W72-12169

ESTER SYNTHESIS BY ZOOGLOEA RAMIGERA 115 GROWN IN THE PRESENCE OF ETHANOL,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W72-12171

USEFULNESS OF CULTURES IN THE TAXONOMY OF BLUE-GREEN ALGAE, (BENUTZUNG VON KULTUREN IN DER BLAUALGEN-TAXONOMIE),
Ceskoslovenska Akademie Ved, Trebon. Botanicky Ustav.
For primary bibliographic entry see Field 05C.
W72-12172

NEW PSEUDOMONAD UTILIZING METHANOL FOR GROWTH,
Hadassah Medical School, Jerusalem (Israel). Lab. of Applied Microbiology.
Y. Chalfan, and R. I. Mateles.
Applied Microbiology, Vol. 23, No. 1, p 135-140, January 1972. 2 fig, 5 tab, 17 ref.

Descriptors: *Pseudomonas, *Systematics, Cultures, Electron microscopy, Alcohols, Amino acids, Temperature, Hydrogen ion concentration, Phosphates, Growth rates, Size, Proteins, Biological properties, *Pollutant identification.
Identifiers: *Substrate utilization, Culture media, Pseudomonad C, Methanol, Pseudomonas aeruginosa, Pseudomonas fluorescens, *Pseudomonads.

During studies of methanol utilization as a sole carbon source for microbial growth, a contaminant organism appeared which rapidly used the alcohol as its energy source. This new bacterium, classified as pseudomonad C, was isolated using a modified minimal salts medium agar containing methanol (MSM-M). The production of pigments, oxidation of gluconate to 2-ketogluconate, and gelatin liquifaction were among tests used to classify the microbe. The purpose was to identify the bacterium in order to compare it to other methanol/methane-using bacteria, to gain understanding of its nutritional requirements, and to check its suitability as a source of single-cell protein. Some of its characteristics include: (1) a growth doubling time of about 100 min at 32-37 C; (2) good growth at methanol concentrations up to 2 percent with cell yields of about 31 percent based on the methanol consumed; (3) sensitivity to phosphate; (4) pH-controlled cell densities; (5) a rod shape with single polar flagellum, pink color, 0.5-0.7 by 1.5-2.0 millimicrons in size; and (6) growth temperature range of 28-40 C. The amino acid pattern of the microbial protein indicated that the bacterium holds promise as a source of single-cell protein. (Mackan-Battelle)
W72-12173

NUMERICAL DIAGNOSTIC KEY FOR THE IDENTIFICATION OF ENTEROBACTERIACE,
Florida Univ., Gainesville. Coll. of Medicine.
H. Baer, and L. Washington.
Applied Microbiology, Vol. 23, No. 1, p 108-112, January 1972. 2 tab, 9 ref.

Descriptors: *Systematics, *Enteric bacteria, *Pollutant identification, Pathogenic bacteria, Anaerobic bacteria, Aerobic bacteria, Testing, Fermentation Gases, E. coli, Shigella, Salmonella, Biochemistry.
Identifiers: *Enterobacteriaceae, Biochemical tests, Aeromonas, Numerical taxonomy, Accuracy, Salmonella typhi, Klebsiella ozaenae, Shigella boydii, Enterobacter liquefaciens, Shigella sonnei, Shigella flexneri, Klebsiella pneumoniae, Arizona hinshawii, Edwardsiella tarda, Enterobacter hafniae, Providencia alcalifaciens, Providencia stuartii, Citrobacter freundii, Serratia marcescens, Enterobacter cloacae, Enterobacter aerogenes, Proteus mirabilis, Proteus vulgaris, Proteus morganii, Proteus rettgeri.

A numerical diagnostic key for enteric organisms is described which permits the identification of typical strains and of biochemical variants with high accuracy. Unknown strains are inoculated into a basic set of five media which permit the testing of eight biochemical reactions. The positive reactions are assigned points, and the score of a strain is added up, after which the identification of the strain is obtained from a table. In many instances, the final identification is obtained with this set of biochemical tests; and, in other instances, a small number of additional tests are required to distinguish between organisms giving the same score in the basic set of biochemical tests. The key permits an accurate, rapid, and economical differentiation of the typical and the more common atypical biotypes of enteric organisms in the clinical laboratory. (Mackan-Battelle)
W72-12175

ENTEROVIRUS CONCENTRATION OF CELLULOSE MEMBRANES,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
C. Wallis, M. Henderson, and J. L. Melnick.
Applied Microbiology, Vol. 23, No. 3, p 476-480, March 1972. 1 fig, 5 tab, 12 ref.

Descriptors: *Separation techniques, *Adsorption, *Retention, *Viruses, Aquatic microbiology, Biocontrol, Bioassay, Membrane processes, Water quality control, Water purification, Salts, Aluminum, Hydrogen ion concentration, Isolation, Pollutant identification.
Identifiers: *Cellulose membrane, *Enterovirus, Poliovirus, Aluminum chloride.

The in situ concentration of viruses from large volumes of water has been made possible by the use of aluminum salts for the adsorption of viruses on cellulose membranes. Five gallons of 0.05 M aluminum chloride in 0.5 M HCl were placed in a 5 gal pressure vessel and mixed by nitrogen pressure with tap water to give a final concentration of 0.5 mM aluminum chloride at a pH of 3.0. A second vessel containing poliovirus, sodium thiosulfate, and a pH indicator were diluted with water to give concentrations of 250, 2,500 and 25,000 cells/500 gal solution. Recoveries of 94, 88 and 94 percent, respectively, were achieved for 3 experiments which involved passing the 500 gallons as above across the 293 mm cellulose membrane (0.45 millimicrons pore size), followed by elution with a pH 11.5 protein free buffer and reconcentration on a 25 mm membrane. Viruses were then removed from the smaller membrane into a final eluate of 1-5 ml, which provided for convenient assay. (Mackan-Battelle)
W72-12176

UNUSUAL ORGANISM WHICH GIVES A POSITIVE ELEVATED TEMPERATURE TEST FOR FECAL COLIFORMS,
Wyoming Univ., Laramie. Div. of Microbiology and Veterinary Medicine.
J. C. Adams.
Applied Microbiology, Vol. 23, No. 1, p 172-173, January 1972. 2 tab, 5 ref.

Descriptors: *Coliforms, *Pollutant identification, *Environmental effects, *Hot springs, *Sulfur, Testing, Enteric bacteria, Sewage bacteria, Water temperature, Thermal springs, Water quality control, Cultures.
Identifiers: *Elevated temperature test, Enterobacter aerogenes, Mutation.

The elevated-temperature test is commonly used as the basis distinguishing between fecal and non-fecal coliforms. Fecal coliforms produce gas from lactose within 24 hr at 44.5 C while non-fecal or soil coliforms do not give positive reactions (gas) under these conditions. A non-fecal organism has been found in a sulfur hot spring which gives a positive elevated-temperature test. In addition to the elevated-temperature test, all standard tests were run with the conclusion that the organism represents an intermediate coliform type. It was also found that non-fecal Enterobacter aerogenes, collected from the hot springs, gives a positive reaction to the elevated-temperature test. These data suggest some environmental effect upon the organisms causing the unusual test results. (Mackan-Battelle)
W72-12177

RAPID RECOVERY OF ESCHERICHIA COLI FROM ESTUARINE WATER,
Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit.
For primary bibliographic entry see Field 05B.
W72-12178

CHARACTERIZATION OF INDOLE-POSITIVE PROTEUS MIRABILIS,
Minnesota Univ., Minneapolis. Dept. of Lab. Medicine; and Minnesota Univ., Mineapolis. Dept. of Pediatrics.
J. M. Matsen, D. J. Blazevic, J. A. Ryan, and W. H. Ewing.
Applied Microbiology, Vol 23, No 3, p 592-594, March 1972. 3 tab, 4 ref.

Descriptors: *Pathogenic bacteria, *Antibiotics (Pesticides), *Enteric bacteria, *Pollutant identification, Biological properties, Water pollution sources, Biochemistry, Laboratory tests, Aerobic bacteria, Resistance.
Identifiers: *Proteus mirabilis, Proteus vulgaris, Proteus rettgeri, Penicillin, Proteus morganii, Biochemical tests, Klebsiella, Cephalosporin, Indole, Ornithine decarboxylase.

Thirteen indole-producing, swarming strains of Proteus were identified by additional biochemical testing to be Proteus mirabilis. These strains were characterized by 40 biochemical tests and by susceptibility testing to 11 antibiotics. All produced ornithine decarboxylase and were susceptible to members of the penicillin-cephalosporin groups of antibiotics. Indole-positive strains showed similar biochemical properties to indole-negative P. mirabilis but these strains were distinctly different from P. vulgaris. In order to distinguish P. mirabilis from P. vulgaris an indole and an ornithine decarboxylase test were performed. P. mirabilis showed a positive ornithine decarboxylase test while P. vulgaris was negative.

Distinguishing between these two Proteus species has an important laboratory significance in that their sensitivity to the penicillin-cephalosporin group of antibiotics differs greatly. (Long-Battelle)
W72-12179

PROCEDURE FOR ISOLATION AND ENUMERATION OF VIBRO PARAHAEMOLYTICUS,
Texas A and M Univ., College Station. Dept. of Animal Science.
C. Vanderzant, and R. Nickelson.
Applied Microbiology, Vol 23, No 1, p 26-33, January 1972. 4 tab, 15 ref.

Descriptors: *Pollutant identification, *Aerobic bacteria, Food processing industry, Systematics, Cultures, Enteric bacteria, Aerobic bacteria, *Isolation, Separation techniques, Methodology.
Identifiers: *Vibrio parahaemolyticus, Fluorescent-antibody techniques, Pseudomonads, Culture media, Enrichment, *Enumeration.

A new procedure employing a direct plating technique, with or without prior enrichment, is described for the isolation and enumeration of Vibrio parahaemolyticus. A plating medium consisting of 2.0 percent peptone, 0.2 percent yeast extract, 1.0 percent corn starch, 7 percent NaCl, and 1.5 percent agar at pH 8.0 was used for growth purposes and TSB with 7 percent NaCl for an enrichment broth. Food homogenates, suspected as being infected, were diluted and either spread directly on plates or inoculated into enrichment broth and then incubated at 42C for 18 hr. A loopful of the TSB tube culture was then streaked onto the direct plating medium and incubated at 42C for 24-48 hr. The resulting cultures were smooth, white to creamy, circular and amylase positive. A fluorescent-antibody technique confirmed the gram-negative, fermentative, oxidase-positive, pleomorphic rods which were sensitive to pteridine 0/129 as V. parahaemolyticus. Using this technique, a quantitative recovery of the microbe was made from inoculated oysters, clams, shrimp, squid, crab, and swordfish meat. (Mackan-Battelle)
W72-12180

PRELIMINARY OBSERVATIONS ON THE UPTAKE OF POLIOVIRUS BY WEST COAST SHORE CRABS,
Notre Dame Coll., Belmont, Calif. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W72-12182

USE OF AROMATIC COMPOUNDS FOR GROWTH AND ISOLATION OF ZOOGLOEA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W72-12186

NOTE ON THE DISTRIBUTION OF CESIUM 137 IN THE LIGURO-PROVENCAL BASIN (NOTE SUR LA DISTRIBUTION DU CESIUM 137 DANS LE BASSIN LIGURO-PROVENCAL),
Laboratoire de Chimie Nucleaire d'Orsay (France).
For primary bibliographic entry see Field 05B.
W72-12187

OCEANOGRAPHY OF THE NEARSHORE COASTAL WATERS OF THE PACIFIC NORTHWEST RELATING TO POSSIBLE POLLUTION.
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-12190

TRITIUM CONTAMINATION OF THE ENVIRONMENT (UBER DIE TRITIUMKONTAMINATION DER UMWELT),
Kernforschungszentrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 07C.
W72-12195

APPLICATION OF EXPERIENCE IN MONITORING RADIOACTIVE WASTES TO INDUSTRIAL WASTES (ERFAHRUNGEN MIT RADIOAKTIVEN ABWASSERN ALS MODELL FUR EINE VERBESSERUNG DER UBERWACHUNG VON INDUSTRIEABWASSERN),
Bundesgesundheiteant, Berlin (West Germany). Institut fuer Wasser-, Bodes-, und Lufthygiene.
For primary bibliographic entry see Field 05B.
W72-12196

HAZARD POTENTIAL OF RADIOACTIVE WASTE,
Comitato Nazionale per l'Energia Nucleaire, Rome (Italy); and Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W72-12199

PROBLEMS IN THE EVALUATION OF THE RADIOLOGIC RECEPTOR CAPACITY OF THE ENVIRONMENT - GENERAL METHOD OF APPROACH (PROBLEMES POSES PAR L'EVALUATION DE LA CAPACITE RADIOLOGIQUE LIMITE D'UN MILIEU RECEPTEUR - PRINCIPES GENERAUX D'APPROCHE),
Commissariat a l'Energic Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleatres.
For primary bibliographic entry see Field 05B.
W72-12201

RADIOECOLOGY AS AN AID TO THE GENERAL ENVIRONMENTAL POLLUTION PROBLEM,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Environmental Sanitation Sector.
For primary bibliographic entry see Field 05B.
W72-12202

A CUMULATIVE EXPOSURE INDEX (CUEX) FOR ASSESSING ENVIRONMENTAL RELEASES OF RADIOACTIVITY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W72-12205

RADIOACTIVE CONTAMINATION OF THE VENICE LAGOON FROM 1964 TO 1969 (L'INQUINAMENTO RADIOATTIVO DELLA LAGUNA DI VENEZIA DAL 1964 AL 1969),
Padua Univ. (Italy). Instituto di Igiene.
For primary bibliographic entry see Field 05B.
W72-12206

CHALK RIVER NUCLEAR LABORATORIES PROGRESS REPORT, OCT. 1 TO DEC. 31, 1971; BIOLOGY AND HEALTH PHYSICS DIVISION; ENVIRONMENTAL RESEARCH BRANCH,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 05B.
W72-12207

RADIONUCLIDE DISTRIBUTION IN COLUMBIA RIVER AND ADJACENT PACIFIC SHELF SEDIMENTS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-12209

NON-BIOLOGICAL UPTAKE OF ZINC-65 FROM A MARINE ALGAL NUTRIENT MEDIUM,
Oregon State Univ., Corvallis.
R. D. Tomlinson.
Available from NTIS, Springfield, Va. as RLO-1750-83, $3.00 paper copy; $0.95 microfiche. RLO-1750-83, Sept. 1970, 73 p.

Descriptors: *Assay, *Zinc, *Adsorption, *Surfaces, Laboratory equipment, *Laboratory tests, *Measurement, *Marine algae tracers, Chemical precipitation, Hydrogen ion concentration.
Identifiers: Non-biological uptake.

Both qualitative and quantitative evaluation were made of the non-biological adsorption of zinc in a laboratory system designed to measure zinc uptake by a marine alga. Carrier-free 65Zn was used as a zinc radiotracer. Four general areas of investigation received special emphasis. These were: (1) the physiochemical nature of the nutrient medium precipitate, (2) adsorption of 65Zn by the nutrient medium precipitate, (3) adsorption of 65Zn by laboratory glassware, and, as a factor potentially influencing adsorption, (4) pH levels in algal culture conditions. (Houser-ORNL)
W72-12210

VERTICAL DISTRIBUTION OF RADIOACTIVITY IN THE COLUMBIA RIVER ESTUARY,
Oregon State Univ., Corvallis. Oregon.
For primary bibliographic entry see Field 05B.
W72-12211

SEASONAL CHANGES IN PARTICLE SIZE DISTRIBUTION COMPOSITION, AND STRONTIUM EXCHANGE CAPACITY OF PARTICULATE MATTER SUSPENDED IN THE COLUMBIA RIVER,
Battell Pacific Northwest Labs., Richland. Wash.
For primary bibliographic entry see Field 05B.
W72-12212

HORIZONTAL AND VERTICAL DISTRIBUTIONS OF RADIONUCLIDES IN THE NORTH PACIFIC OCEAN,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-12213

CONCENTRATION OF IRON-55 IN COMMERCIAL FISH SPECIES FROM THE NORTH ATLANTIC,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W72-12214

EXCESS-RADON AND TEMPERATURE PROFILES FROM THE EASTERN EQUATORIAL PACIFIC,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W72-12215

ROTATORY-FLOW TECHNIQUE AS A MEANS OF DETECTING SUBLETHAL POISONING IN FISH POPULATIONS,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
P. E. Lindahl, and E. Schwanbom.
OIKOS, Vol 22, p 354-357, 1971. 1 fig, 2 tab, 8 ref.

Descriptors: *Mercury, Water pollution effects, Metals, Heavy metals, Toxicity, Fish populations, Water pollution, Lakes, Fish behavior, Bioassay, Bioindicators, Analytical techniques, Methodology.
Identifiers: *Rotatory-flow technique, *Sublethal poisoning, Sublethal effects, Roach, Leuciscus spp., Methyl mercuric hydroxide.

The rotatory-flow technique has been applied to roach (Leuciscus rutilus L.) from the mercury-contaminated Lake Ovre Hillen and from Lake Snosjon, which, as it chiefly receives spring water, is supposed to contain water that is comparatively pure. A highly significant difference in the mean critical rate of rotation (in r.p.m.) was found between the two samples of fish, which also differed with respect to the amount of methylmercury hydroxide found in their muscles. For the combined samples of fish, the critical rate of rotation showed a highly significant negative correlation to the amount of mercurial per unit muscle. The appearance of the same relationship for the fish from Lake Snosjon indicates that also in 'pure' natural waters the coordination of a proportion of the fish is significantly decreased by the presence of methylmercury hydroxide in their bodies. (Svensson-Washington)
W72-12249

A LABORATORY APPARATUS FOR MAINTAINING UNIFORM SUSPENSIONS OF FINE--GRAINED SEDIMENT,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 05C.
W72-12266

DETECTION AND MEASUREMENT OF C-14 LABELLED INSECTICIDE METABOLITES IN FRESHWATER OSTRACODS USING THIN LAYER CHROMATOGRAPHY AND LIQUID SCINTILLATION SPECTROPHOTOMETRY,
South Dakota Univ., Vermillion.
J. A. Kawatski, and J. C. Schmulbach.
Proceedings of the South Dakota Academy of Science, Vol 49, 1970. 6 p, 3 tab, 2 ref. OWRR A-015-SDAK (5).

Descriptors: *Aldrin, *Dieldrin, *Pesticide residues, *Chromatography, *Spectrophotometry, *Radioisotopes, *Tracers, *Tracking techniques, *Methodology, Pesticides, Insecticides, Crustaceans, Aquatic animals, Chlorinated hydrocarbon pesticides, Analytical techniques, Carbon radioisotopes, Water chemistry, Water analysis, Metabolism, Path of pollutants, Pesticide kinetics, Absorption.
Identifiers: *Thin layer chromatography, *Liquid scintillation spectrophotometry, Sublethal effects, Ostracods, Chlamydotheca spp., Biological accumulation, Accumulation of insecticide, Insecticide metabolites.

A method which has been used successfully to rapidly detect and measure trace amounts of C-14-aldrin, C-14-dieldrin, and possible C-14-metabolites of these insecticides extracted from water and small freshwater crustaceans, ostracods, is presented. This procedure provided a means of determining with relative ease, whether metabolism or alteration of insecticide had occurred. Furthermore, it allowed a rapid quantitation of separated residues with a sensitivity far in excess of that achieved by conventiona. TLC and considerably greater than that of gas-liquid chromatography. As little as 0.2 nanograms of C-14-aldrin, C-14-dieldrin, or equivalent C-14-metabolite per ostracod (ca. 0.5 mg) could be detected and measured. (Svensson-Washington)
W72-12270

WATER BUDGET AND QUALITY OF WATER STUDIES OF HUBBARD CREEK RESERVOIR, TEXAS, 1963-67 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02H.
W72-12385

5B. Sources of Pollution

POLLUTION STUDIES FOR INTERSTATE SANITATION COMMISSION, NEW YORK HARBOR MODEL,
Army Engineer, Vicksburg, Miss. Waterways Experiment Station.
H. B. Simmons, and W. H. Bobb.
Available from the National Technical Information Service as AD-733 746, $3.00 in paper copy, $0.95 in microfiche. Miscellaneous Paper No. 2-588, February 1963. 30 plate, 15 tab.

Descriptors: *Hydraulic models, *Path of pollutants, *Harbors, *New York, *Sewage effluents, Data collections, Hudson River, Water pollution sources, Dye releases, Streamflow, Regulated flow, Flow rates, Tracking techniques, Dye concentrations.
Identifiers: *New York Harbor, Raritan River, East River.

Data from hydrologic model studies include the dispersion characteristics of effluents discharged from several of the major sewage treatment plants contributing to pollution in New York Harbor. The model is of the fixed-bed type constructed to linear scale ratios, model to prototype, of 1:000 horizontally and 1:100 vertically. Tides and tidal currents were reproduced in the model by means of a primary tide generator, located at the Lower New York Bay model limit, and by separate but synchronized, secondary, two-way flow-control devices located at the model limits of the Hudson River and Long Island Sound. The salinity of the model ocean was maintained at the same salinity as the prototype, and the freshwater discharges of the Hudson and Raritan Rivers were introduced at Hyde Park, New York, and Fieldville, New Jersey. The high discharges in the Hudson and Raritan Rivers were 24,000 and 3,530 cfs, respectively, and the low discharges were 4,500 and 665 cfs, respectively. The use of two fluorescent dyes made it possible to test the effluents from two treatment plants simultaneously. The two dyes, brilliant pink and uranine, were used because the light generated by these dyes is visible at opposite ends of the spectrum. (Woodard-USGS)
W72-11740

THE DETERMINATION OF DISPERSION COEFFICIENTS IN NON-HOMOGENEOUS MEDIA IN PROBLEMS OF SALT WATER CONTAMINATION OF FRESH GROUND WATER,
Societe Centrale pour l'Equipment du Territoire-International, Puteaux (France).
A. Bonnier, and A. Korganoff.
Journal of Hydrology, Vol 16, No 1, p 39-47, May 1972. 20 ref.

Descriptors: *Saline water intrusion, *Diffusion, *Mixing, *Path of pollutants, *Mathematical studies, Diffusivity, Dispersion, Equations, Groundwater movement, Mathematical models.
Identifiers: *Coastal aquifers.

Salt-water contamination of fresh groundwater is one of the major problems facing the population of coastal areas. The use of a mathematical model taking into consideration diffusion phenomena requires a knowledge of dispersion parameters which vary from one point to another in a non-homogeneous medium. A mathematical method for overcoming these difficulties is given. (Knapp-USGS)
W72-11743

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA: I. LINEAR PROBLEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. A. Wooding.
Journal of Hydrology, Vol 16, No 1, p 1-15, May 1972. 4 fig, 26 ref.

Descriptors: *Groundwater movement, *Path of pollutants, *Numerical analysis, *Ion transport, Porous media, Mixing, Diffusion, Leaching, Translocation, Ion exchange, Water chemistry, Saline water-freshwater interfaces.

The technique of matched asymptotic expansions is applied to solute transport in steady one-dimensional flow systems in porous slabs, membranes or columns, assuming linear exchange equilibrium and constant diffusivity. These special cases are studied as a preliminary to the examination of more difficult non-linear systems. The governing dimensionless parameter is the macroscopic Peclet number. Three cases are treated to illustrate features of the perturbation technique. With a fluctuating diffusion ('back-mixing') layer at the outlet when the input concentration is a fairly slowly-varying, arbitrary function of time, the outer problem is hyperbolic and is easily solved, while the inner problem reduces to the solution of a set of ordinary differential equations. With a thickening diffusion layer at a discontinuity between two fairly slowly-varying concentration functions, the solution obtained is qualitatively different from that of the nonlinear case. With the arrival of a diffusion zone (initially a concentration step) at the outlet, the solution possesses features of a fluctuating and thickening diffusion layer. This is a special example with analogies to a 'boundary layer within a boundary layer', and illustrates, in particular, a type of concentration distribution which can be encountered in classic breakthrough experiments. (Knapp-USGS)
W72-11745

SALINITY AND THE HYDROLOGIC CYCLE,
Flinders Univ., Bedford Park (Australia). School of Physical Sciences.
For primary bibliographic entry see Field 03C.
W72-11757

THE TRANSPORT OF SALT IN RIVERS AND ESTUARIES,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 03C.
W72-11764

NATURAL CONTAMINATION OF SNOW COVER IN THE BASIN OF THE ABRAMOVA GLACIER (O YESTESTVENNOY ZAGRYAZNENNOSTI SNEZHNOGO POKROVA V BASSEYNE LEDNIKA ABRAMOVA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W72-11778

A STUDY OF THE STATISTICAL DISTRIBUTION OF CERIUM-144 IN THE ORGANS AND TISSUES OF AQUATIC ORGANISMS,
V. V. Chugunov, A. M. Podgurskii, G. A. Cherenkova, and E. N. Lyapin.
Radiobiologiya. Vol. 11, No. 2, p 298-301. 1971. Illus.
Identifiers: Aquarium, *Aquatic life, Carassius carassius, Cerium-144, Distribution, Organisms, Organs, Salvinia P, Statistics, Tissues, *Cerium.

Under aquarium conditions, studies were made of the probable statistical patterns in the distribution of Ce144 in the organs and tissues of freshwater fish (Carassius carassius), Salvinia, a floating fern, organic material, (polyvinylchloride) and the water of the aquarium. The types of functions of the distribution differ and depend on the specific biological features of the objects under study. In the case of the organs and tissues of the fish there are logarithmically normal laws of the spread of the concentration of Ce144. In the case of Salvinia the spread of the specific activity of Ce144 conforms to the normal law of distribution. In the case of

polyvinylchloride the spread for the concentration of Ce144 approximates normal distribution (Charles distribution). The spread of the particles of this isotope in the water of the aquarium conforms to the law of uniform density.--Copyright 1972, Biological Abstracts, Inc.
W72-11794

CHARACTERISTICS OF MILKING CENTER WASTE EFFLUENT FROM NEW YORK STATE DAIRY FARMS,
Cornell Univ., Ithaca, N. Y. Dept. of Food Science.
R. R. Zall.
Journal of Milk Food Technology, Vol. 35, No. 1, p 53-55, 1972. 1 fig, 6 tab, 3 ref.

Descriptors: *Sewage effluents, *Waste identification, *Dairy industry, *Cattle, Effluents, Farm wastes, Biochemical oxygen demand, Water pollution sources, Nutrients, Nitrates, Nitrites.

Waste profile studies of milking center (milkhouse and milking parlor) wastes from twenty-four New York State dairy farms in 20 different countries were conducted to determine the characteristics and amounts of wastes. Composite samples were collected in small plastic swimming pools, and two-quart portions transported to the laboratory where biological and chemical analyses were performed. Waste volumes were physically measured at the farms. Sixty percent of the experimental sites sampled showed a sewage load of less than 10 lb. of BOD per day farm with approximately 4 gal of waste per cow per day from milking center operations. The amounts of nitrates and nitrites were no greater than the levels from sewage treatment plant effluents. Also, there were relatively small differences in soluble N and P compounds when compared with animals/farm or with pounds of BOD produced in milking centers. The principal solids in the wastes were manure, feed, bedding, and hood dirt. (Snyder-Battelle)
W72-11805

VARIATION OF MANGANESE, DISSOLVED OXYGEN AND RELATED CHEMICAL PARAMETERS IN THE BOTTOM WATERS OF LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Water Chemistry Lab.
J. J. Delfino, and G. F. Lee.
Water Research, Vol. 5, p 1207-1217, December 1971. 11 fig, 18 ref.

Descriptors: *Dissolved oxygen, *Chemical properties, *Manganese, Water quality, Pollutant identification, Sediment-water interfaces, Carbonates, *Wisconsin, Water analysis, Sampling, Iron, Aquatic life, Sediments, Hydrogen ion concentration, Depths, Sulfides, Reduction (Chemical), Alkalinity, Laboratory tests, On-site investigations, Water temperature, Physiochemical properties, Desorption.
Identifiers: *Hypolimnion, *Lake Mendota, Desorption.

The increase of Mn concentration and the simultaneous depletion of dissolved oxygen in the bottom waters (hypolimnion) of Lake Mendota, Wisconsin were studied in situ. In situ water samples were collected 3-4 times weekly from 21-23 m depths, 1 m above the sediment-water interface using a Van Dorn lucite sampler and analyzed for Mn, Fe, sulfide, alkalinity, and dissolved oxygen. Temperature was measured in situ and pH readings were made in the laboratory. Considerably higher Mn concentrations were found in the hypolimnion compared to Fe, despite a sedimentary Fe/Mn weight ratio of 19:1. Laboratory equilibration studies under anoxic conditions indicated that pH was an important parameter involved in the release of Mn from the sediments. This was also implied by the Mn and pH data measured in situ. Possible mechanisms involved in the release of Mn from the sediments, including desorption of Mn from oxide substrates, reduction of Mn oxides, and dissolution of carbonates and sulfides, are discussed. (Mackan-Battelle)
W72-11809

THE NUMBER OF SAPROPHYTIC BACTERIA AND THE CONTENT OF ORGANIC MATTER IN THE WATER OF PONDS OF KARAMET--NIYAZ AND THE KARAKUM CANAL,
O. I. Bogdanovich.
Biol Vnutr Vod Inf Byull. 8. p 25-29. 1970.
Identifiers: *Bacteria, *Karakum Canal, *Karamet-Niyaz, *Organic matter, Ponds, USSR.

The maximum content of saprophytic bacteria were found in 8 ponds of Karamet Niyaz and the Karakum Canal at the end of spring; there was a considerable decrease in summer, with some increase again in the fall. Fluctuations in the number of saprophytic bacteria in the ponds were very great: from 45 to 77,800 cells/ml. In the Karakum Canal the number of saprophytic bacteria was low and varied from 5 to 200 cells/ml. Fertilizing the ponds with mineral and organic components sharply increased the content of saprophytic bacteria in the water. A good correlation was observed between the number of saprophytic bacteria and the permanganate oxidizability of the water. The content of organic matter and saprophytic bacteria in the water of rearing ponds increased in parallel with the increase in the measures to intensify growth in the ponds.--Copyright 1972, Biological Abstracts, Inc.
W72-11814

MONITORING INDUSTRIAL EFFLUENTS,
Dow Chemical Co., Freeport, Tex. Waste Control Dept.
For primary bibliographic entry see Field 05A.
W72-11819

THE DETERMINATION OF ORGANIC BASES IN CARBONISATION EFFLUENTS,
Salford Univ. (England).
For primary bibliographic entry see Field 05A.
W72-11820

THE TEMPERATURE DEPENDENCY OF BIOLOGICAL DENITRIFICATION,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05C.
W72-11822

THE PRODUCTION OF SURFACE-ACTIVE MATERIAL BY MARINE PHYTOPLANKTON CULTURES,
Galveston Marine Lab., Tex.
W. B. Wilson, and A. Collier.
Journal of Marine Research, Vol 30, No 1, p 15-26, January 15, 1972. 7 fig, 1 tab, 22 ref.

Descriptors: *Surfactants, *Phytoplankton, Foaming, Cultures, *Diatoms, Aquatic life, Pyrrophyta, Dinoflagellates, Sea water, Duration curves, Rating curves, Films, Organic compounds, *Texas, *Gulf of Mexico, Surface tension, Chrysophyta.
Identifiers: Decay rate, Cyclotella nana, Cyclotella caspia, Chaetoceros galvestonensis, Glenodinium, Coccolithus huxleyi.

The production of surface-active materials (surfactants) by axenic cultures of five marine diatoms, a dinoflagellate, and a coccolithophorid (all grown in uniform culture conditions) was determined by measuring the volume and stability of the foam produced by shaking them in their culture medium. Although a diatom, Cyclotella nana, produced the most stable surfactant, and a coccolithophorid, Coccolithus huxleyi, the least stable surfactant, differences in the stability of the surfactant between the species of diatoms employed were considerable. Cyclotella nana produced more surfactants than did Cyclotella caspia or Glenodinium sp. where as other diatoms (Chaetoceros II and Cyclotella galvestonensis) did not. In addition, Chaetoceros I produced more stable foams than did the other Chaetoceros species. These results indicate an innate tendency to synthesize surfactants. Differences were not related to variations in cell numbers or biomass, but they may be related to innate characteristics of a particular species. Surfactants were not identified but were suspected to be lipids and/or long fatty acid chains. (Mackan-Battelle)
W72-11829

RELATION BETWEEN THE DEGRADATION OF DDT AND THE IRON REDOX SYSTEM IN SOILS,
Agricultural Research Service, Beltsville, Md. Soils Lab.; and Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
B. L. Glass.
Journal of Agricultural and Food Chemistry, Vol 20, No 2, p 324-327, March/April 1972. 4 fig, 4 tab, 18 ref.

Descriptors: *Chemical degradation, *DDT, *Oxidation-reduction potential, *Soils, *Iron, Degradation (Decomposition), Colorimetry, DDD, Pesticide kinetics, Path of pollutants, Chemical reactions, Chemical properties, Ions, Metals, Enzymes, Submergence, Assay, Aquatic soils, Anerobic conditions, Soils chemistry, Soil analysis, *Reduction (chemical).
Identifiers: Urease.

In order to test the relationship between DDT degradation and the iron redox system in soils, an experiment was conducted on soil samples collected from four agricultural areas in different regions of the U.S. Four 150g soil samples were treated with DDT (30 mg), which yielded a concentration of 200 ppm, passed through a riffle, and divided into 10-12 g subsamples in 4 oz serum bottles. These samples were then amended with aliquots of urease in solution sufficient to submerge the soils, and the waterlogged soils were incubated at 35 C from 3-28 days. Unamended water-logged soils were run simultaneously as controls. All redox potentials were measured on a pH meter and ferrous iron determinations made by colorimetric analysis on a spectrophotometer at 510 millimicrons. The rates of degradation of DDT were related to the rates of formation of ferrous iron in the amended soils. A relation was also obtained between the redox potential and the DDT degradation in the soils. With an in vitro iron redox system, 20 percent of the original DDT was converted to DDD after 7 days. It was concluded that DDT underwent an irreversible redox type of reaction. A mechanism is proposed for the degradation of DDT whereby electrons furnished by the reduced organic substrate are transferred to the DDT molecules via the ferrous ions thus initiating a free radical reaction in the absence of oxygen. (Mackan-Battelle)
W72-11830

POTENTIAL SOURCES OF ERROR IN THE MEASUREMENT OF LOW RATES OF PLANKTONIC PHOTOSYNTHESIS AND EXCRETION,
Southampton Univ., (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W72-11838

EVALUATION OF PYRITIC OXIDATION BY MOSSBAUER SPECTROMETRY,
Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Inst. of Science.
R. A. Baker.
Water Research, Vol 6, No 1, p 9-17, January 1972. 6 fig, 3 tab, 3 ref.

Descriptors: *Pyrite, *Oxidation, *Monitoring, *Mine wastes, Water analysis, *Spectroscopy, Mineralogy, Radioactivity techniques, Automation, Instrumentation, Computers, Iron bacteria, Iron oxides, Mine drainage, Acid mine water, Aqueous solutions, Radiation, Gamma rays, Iron, Ions, Pollutant identification, Evaluation Ferrobacillus, Iron compounds, Sulfur bacteria, Kinetics, Spectrometers.
Identifiers: *Mossbauer spectroscopy, Ferrobacillus ferrooxidans, Ferrobacillus sulfooxidans, Thiobacillus thiooxidans, Backscattering detector, Co-57, Chemical interference.

Both unreacted and oxidized pyritic minerals were differentiated in water using Mossbauer effect spectroscopy together with a backscattering mode detection of 14.4 KeV gamma rays and using 100 mCi Co-57 in the form of cobaltous oxide as the radiation. Samples were mounted as close as possible to the detector window beneath a vertically oriented Mossbauer unit and radiation counts were measured over specific time intervals. The counts were transferred to tape and printed format and analyzed by an IBM 360 computer and final absorption spectra were prepared on a Calcomp Plotter. Spectra were successfully obtained of mineral surfaces submerged under 2 mm water. Oxidation reaction rates were sufficiently slow to allow scans over 24-hr periods making the detection of minor concentrations of reaction product more likely. Since ions in aqueous solutions do not absorb radiation, the results suggest a means of examining pyritic surface reactions without interference from concurrent reactions in the aqueous phase. (Mortland-Battelle)
W72-11839

MERCURY IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL APPRAISAL,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 05C.
W72-11842

THE ESTIMATION OF CELL NUMBERS OF FLAGELLATE AND COCCOID CHLOROPHYTA IN NATURAL POPULATIONS,
University Coll. of North Wales, Bangor.
Christine M. Happey.
Br Phycol J. 5 (1): 71-78, Illus, 1970.
Identifiers: *Chlorophyta, *Coccoid, *Flagellate, *Cell numbers, Populations, Ultrasonication.

Methods for the quantitative estimation of the small coccoid and flagellate Chlorophyta in natural algal communities are outlined. Experiments to demonstrate the precision of these methods are discussed and the components of variance are calculated for several experimental procedures, both for phytoplanktonic and benthic associations. The smallest overall variance for phytoplankton estimations is 27% where a large number of samples were collected and bulked to reduce the sampling error. The precision in counting epipelic algae by this method is only 12%. This result suggests that the inclusion of a short period of ultrasonication may reduce the overall variance in estimation by randomizing the distribution of the algae prior to plate inoculation. Close agreement exists between direct counts and plate counts. It is realized that the cultural approach has limitations, but comparison with results obtained from other methods indicates the advantages of cultural techniques, particularly when estimating small or motile algae.--Copyright 1972, Biological Abstracts, Inc.
W72-11858

DISTRIBUTION OF IRON, MANGANESE, COPPER, ZINC, AND SILVER IN OYSTERS ALONG THE GEORGIA COAST,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05C.
W72-11865

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 02E.
W72-11866

EFFECT OF PESTICIDE RESIDUES AND OTHER ORGANOTOXICANTS ON THE QUALITY OF SURFACE AND GROUND WATER RESOURCES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W72-11867

ARTIFICIAL SURFACES AS A METHOD OF STUDYING POPULATIONS OF BENTHIC MICRO-ALGAE IN FRESHWATER,
Glasgow Univ. (Scotland). Dept. of Zoology.
R. Tippett.
Br Phycol J., Vol 5, No 2, p 187-199, 1970. Illus.
Identifiers: *Algae, Artificial surfaces, Benthos, Diatoms, *Methodology, Populations, Season, Slides, Substrates, Sampling.

Most work on the ecology of communities of attached algae has involved the investigation of populations which develop on artificial surfaces exposed in the water for a known period of time. The nature and position of the surface and length of time of exposure have been shown to influence the population which develops. No studies have related the structure of these populations to populations on natural surfaces. Microscope slides which had been exposed in a pond and a stream for 2 and 4 wk were sampled over a period of more than 1 yr, and natural vegetation was sampled at the same time. The populations of attached diatoms on each substrate were analyzed. The diatoms in the pond grew mainly in summer on the slides and in winter on the natural host. In the stream the main growth of the population was over the summer period in all cases. There were twice as many species of diatoms growing on natural hosts as on the slides, and the percentage importance of the species was different. The time of year at which some species grew was different on the slides and the natural vegetation. It was concluded that under these conditions the use of artificial surfaces is not a valid ecological method.--Copyright 1972, Biological Abstracts, Inc.
W72-11873

OIL POLLUTION OF WATER SUPPLIES--TASK GROUP REPORT.
American Water Works Association, New York. Committee on Oil Pollution of Water Supplies.
For primary bibliographic entry see Field 05G.
W72-11893

INDUSTRIAL WASTES AND WATER SUPPLIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05D.
W72-11903

FOREST CUTTING AND INCREASED WATER YIELD,
Forest Service (USDA), Elkins, W. Va. Elkins Research Center.
For primary bibliographic entry see Field 04C.
W72-11916

TRACE ELEMENTS IN SEWAGE SLUDGES,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
M. L. Berrow, and A. J. Webber.
Journal of Science of Food and Agriculture, Vol. 23, p 93-100, January 1972. 2 tab, 17 ref.

Descriptors: *Sewage sludge, *Trace elements, Spectroscopy, Sewage effluents, Chemical analysis, Copper, Zinc, Lead, Manganese, Nickel, Chromium, Strontium, Electrodes, Separation techniques, Solubility, *Pollutant identification, Water pollution sources, Soil analysis, Toxicity, Molybdenum, Methodology, Boron, Beryllium, Cadmium, Cobalt, Iron, Titanium, *Heavy metals, *Photometry.
Identifiers: Tin, Vanadium, Bismuth, Ashing, England, Wales, Microphotometry, Solution-spark analysis, Barium, Gallium, Lathanum, Lithium, Scandium, Yttrium, Zirconium, Sample preparation, Dissolved metals.

Analyses were carried out on 42 sewage sludge samples from rural and industrial towns in England and Wales for total trace and soluble element determinations. In order to determine the total trace element content, dried sludge was ground, and ashed at 450 C overnight. A portion of the ash was filled into a carbon electrode, after mixing with pure carbon powder (1:1), and then analyzed by the semiquantitative cathode layer direct current arc spectrographic method developed by Mitchell. The extractable trace element content was ascertained from samples prepared by extracting dried sludge with acetic acid, oxidizing the dried filtrate with HNo3, evaporating the product with 6 N HCl, and then absorbing it in hot 3 N HCl. Aliquotes of this solution were subjected to direct current arc analyses, porous-cup, solution-spark analysis, and a recording microphotometer method. Total contents of 5 percent Zn, nearly 1 percent Cr and Cu, and 0.5 percent Ni were found in certain dried sludges. Total contents of Cu, Sn, and Zn and, to a lesser extent, Ag, Bi, and Pb were much greater than the levels of these elements in soils. Total Cr and Ni were very high in a small number of samples, and acetic acid-soluble Zn and Cu levels were generally very much greater than in soils. Overall, Mn, Ni, and Zn had considerably higher percentage solubilities than Cr, Cu, Mo, Pb, Sn, and V. Zn, Cu, and Ni appear to be the elements most likely to give rise to toxicity problems in plants due to the use of sewage sludge as a soil additive. (Mackan-Battelle)
W72-11933

A MATHEMATICAL SIMULATION OF BEEF ANIMALS--A REALITY WITH POTENTIAL,
Oklahoma State Univ., Stillwater.
M. D. Paine, J. A. Witz, A. F. Butchbaker, J. E. McCroskey, and C. M. Bacon.
Paper presented at the 1971 Fall Meeting, Oklahoma Section, American Society of Agricultural Engineers Stillwater, November 5, 1971. 21 p, 7 fig, 3 tab, 9 ref.

Descriptors: *Mathematical models, *Cattle, *Environmental effects, *Computer models, Computer programs, Simulation analysis, Model studies, Numerical analysis, Data processing, Energy transfer, Metabolism, Theoretical analysis, Optimization, Feed lots, Nutrient requirements, Energy.
Identifiers: Thermal activity, Energy balance.

The development of beef feedlots with one time capacities of 30,000 head and more has created a need for better mathematical estimates of the effects of climate and nutrition upon beef production. This greater production places greater demands up0n management and encourages the use of systems modeling techniques to develop a better mathematical model of a beef animal than existed. This model would allow data from feeding trials to be applied to another location in a different environment. The basic conceptual model is represneted by a combination of three energy reservoirs with energy flow between the reservoirs. These reservoirs represent digestion, metabolism, and thermal activity. The model can then simulate growth responses to energy intake and environmental factors. The model can thus be

used to calibrate optimum values of the parameters used in a simulation and thus show the most economical feed ration or any other such factor. The model should prove, after further calibration, useful in feedlot situations. The present model and optimization routines can now be used to predict results of management decisions. (Dorland-Iowa State)
W72-11937

MAINTENANCE OF THE FLUSHING BAY AND CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-11951

A LAGRANGIAN METHOD FOR PREDICTING POLLUTANT DISPERSION IN BOLINAS LAGOON, MARIN COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
H. B. Fischer.
Available from GPO, Washington, D C 20402 Price 65 cents. Geological Survey Professional Paper 582-B, 1972. 32 p, 11 fig, 1 plate, 2 tab, 13 ref.

Descriptors: *Dispersion, *Mixing, *Path of pollutants, *Numerical analysis, *Mathematical models, *California, Lagoons, Bays, Water pollution sources, Dye releases, Tracers, Computer programs.
Identifiers: *Bolinas Lagoon (Calif).

A numerical method is given to predict the movement and dispersion of a pollutant in a tidal embayment. To use the method requires a knowledge of the embayment geometry and of a typical tidal cycle of water-surface elevations at various interior points. Each time increment includes a convective step, a diffusive step, and a concentration-decay step. The computer program will generate the motion and dispersion of a concentrated slug of pollutant, or it will predict the concentration of pollutant at all points within the embayment resulting from a constant discharge at one point. The method was verified by predicting the dispersion of a slug of pollutant discharged near the mouth of Bolinas Lagoon, Calif. A field experiment is described in which a slug of Rhodamine WT dye tracer disperses in reasonable conformity to the numerical prediction. A study was also made of the benefit resulting from detention of the pollutant during a 2-hour period at low tide. In this case a significant concentration reduction was observed in those parts of the lagoon which were previously the most seriously polluted. (Knapp-USGS)
W72-11985

OXYGEN DEPLETION IN ICE COVERED RIVER,
Alberta Univ., Calgary. Dept. of Civil Engineering.
P. H. Bouthillier, and K. Simpson.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers Vol 98, No SA2, Paper 8841, p 341-351, April 1972. 7 fig, 3 tab, 1 ref.

Descriptors: *Oxygen sag, *Biochemical oxygen demand, *Path of pollutants, *Ice cover, Rivers, Canada, Cold regions, Oxygen demand, Water pollution, Waste assimilative capacity.
Identifiers: *Red Deer River (Alberta).

Oxygen depletion of river waters is the most critical effect of municipal wastes in areas where the climate produces ice cover for a considerable part of the year. Studies of the Red Deer River in Alberta were carried out in the winter of 1970-71. Dissolved oxygen use during the critical winter period is much in excess of what might be expected from estimates based on the biochemical oxygen demand (3OD) of the wastes being discharged to the river. The rate of oxygen use is also very high in comparison to rate constants commonly used in estimating the oxygen sag of streams. Data obtained in this study are plotted to show the relationship between the oxygen use in the river, the BOD, and the total organic carbon based on river samples below the point of waste discharge. A comparison of river oxygen use to estimates based on waste analysis is also presented. (Knapp-USGS)
W72-11989

DISPERSION FROM RECHARGE WELL,
Missouri Univ., Columbia. Dept. of Civil Engineering.
C. W. Lenau.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers Vol 98, No EM2, Paper 8813, p 331-344, April 1972. 6 fig, 9 ref, append.

Descriptors: *Dispersion, *Waste disposal wells, *Path of pollutants, *Recharge wells, Diffusion, Mixing, Groundwater movement, Seepage, Waste water.

The dispersion of waste water from a recharge well is studied. The well is situated in a confined aquifer through which there is a natural uniform flow. The convective-dispersion equation is solved by application of the Fourier transform and the Wiener-Hopf technique. By replacing the local seepage velocity with the uniform flow velocity the convective-dispersion equation was solved by the Wiener-Hopf techniques. A closed form solution was obtained for the special case when longitudinal dispersivity equals 0. For problems likely to be encountered in practice this special case adequately describes the distribution of concentration. (Knapp-USGS)
W72-11992

MILITARY FACILITIES AND ENVIRONMENTAL STRESSES IN COLD REGIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
R. P. Murrmann, and S. Reed.
Army Cold Regions Research and Engineering Laboratory Special Report 173, June 1972. 21 p, 9 fig, 3 tab, 29 ref. 4A062112A891.

Descriptors: *Cold regions, *Permafrost, *Air pollution, *Water pollution effects, *Environmental effects, Oil spills, Ice fog, Tundra, Sanitary engineering, Waste disposal, Construction.

The Corps of Engineers has responsibility for construction and operation of many types of military facilities in a manner which is compatible with environmental concerns. The types of stresses imposed by military activities on the environment are not well known, nor is it possible in most cases to quantify or predict the impact of stresses on a long-term basis. This report was prepared as a preliminary step to identifying research problems which arise as a special consequence of military facilities in cold regions. Atmospheric impacts of military facilities are due primarily to emissions of combustion by-products. This problem differs in cold regions due to a combination of factors including local environmental conditions which cause accumulation of pollutants, higher inputs due to disposal and energy requirements, and the influence of temperature on physical and chemical interactions of combustion products. Under extreme conditions, the unique condition of ice fog occurs for which there is apparently no practical solution. Terrain impacts result from disposal on land of all types of solid and liquid wastes. Due to low temperature conditions, these wastes do not undergo biological or chemical degradation at desirable rates. Permafrost in arctic and subarctic areas exists in a delicate state of thermal balance which may be perturbed by alsmost any activity. (Knapp-USGS)
W72-12014

IRON BACTERIA IN SOME LAKES OF THE KARELIAN ISTHMUS,
Laboratory of Limnology, Leningrad (USSR).
V. G. Drabkova.
Hydrobiological Journal, Vol 7, No 1, p 21-27, 1971. 1 fig, 2 tab, 21 ref. (Originally published in Gidrobiologicheskiy Zhurnal, Vol 7, No 1, 1971.).

Descriptors: *Lakes, *Aquatic microbiology, *Aquatic bacteria, *Iron bacteria, Iron, Iron oxides, Oxygen, Oxygen sag, Oxidation, Oxidation-reduction potential, Hydrogen ion concentration, Temperature, Thermal stratification, Thermocline, Epilimnion, Mixing, Bottom sediments, Summer, Hypolimnion.
Identifiers: *USSR, *Karelian Isthmus, *Oozes, Metalimnion.

Concentration and distribution of iron bacteria, temperature and oxygen conditions, and oxidation-reduction potential and pH of ooze in 8 lakes of the Karelian Isthmus were investigated in the summers of 1964-65. The low redox potential of ooze in most of the lakes is conducive to reduction and conversion of iron hydroxide to dissolved ferrous oxide, which, on dissolving in water, is again oxidized by the iron bacteria. The redox potential is lowest in the eutrophic lakes. The water of Lake Vishnevskoye contains the largest amount of iron bacteria (20%-25% of the total number), especially in the bottom layer at the end of the ice period. In meromictic Lake Uzornoye where iron concentration at the bottom is about 71 mg/liter, iron bacteria develop at the boundary between the aerobic and anaerobic zones. No iron bacteria occur in Lake Michurinskoye, which is characterized by intensive mixing of water and by a high Eh of the ooze. The almost complete absence of iron bacteria in acidic, dystrophic Lake Serpovidnoye results in a fairly high ferrous oxide concentration in the water. (Josefson-USGS)
W72-12015

SOLUBILITY OF HYDROCARBONS IN WATER UNDER STRATAL CONDITIONS (O RASTVORIMOSTI UGLEVODORODOV V VODE V PLASTOVYKH USLOVIYAKH),
Akaemiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopaemykh.
For primary bibliographic entry see Field 02K.
W72-12022

DENSITY INDUCED MIXING IN CONFINED AQUIFERS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
L. W. Gelhar, J. L. Wilson, J. S. Miller, and J. M. Hamrick.
Copy available from GPO Sup Doc EP 2.10:16060 ELJ 03/72 for $1.25; microfiche from NTIS as PB-211 298, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, 1972. 130 p, 36 fig, 7 tab, 28 ref, 3 append. EPA Program 16060 ELJ 03/72.

Descriptors: *Mixing, *Dispersion, *Path of pollutants, *Waste disposal wells, Density stratification, Injection wells, Stratified flow, Artificial recharge, Hydraulic models, Confined water, Artesion aquifers.

Analytical techniques are given to describe the mixing of two fluids of different density in a confined aquifer, in which one fluid is introduced to the aquifer by well recharge. The immiscible displacement process in both linear and radial flows is analyzed and the effects of longitudinal and lateral dispersion are included using a boundary layer approximation. Hydrodynamic dispersion re-

tards gravity segregation due to density differences. During recharge excellent agreement between the theoretical predictions and experimental results was found and the predicted retarding effects of longitudinal dispersion are verified. During withdrawal some systematic differences between the theory and observation were noted. Theoretical predictions of recovery efficiency during a recharge-storage-withdrawal sequence show trends similar to those observed but are typically 5% to 10% lower than those observed. Direct theoretical predictions of recovery efficiency during single or multiple sequences of recharge-storage-withdrawal were developed for an immiscible system, and similar developments outlined for miscible displacement. (Knapp-USGS)
W72-12041

NITRATE IN THE UNSATURATED ZONE UNDER AGRICULTURAL LANDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt.
Copy available from GPO Sup Doc as EPA 16060 DOE 04/72, $0.55; microfiche from NTIS as PB-211 166, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 45 p, 9 fig, 9 tab, 12 ref. EPA Program 16060 DOE 04/72.

Descriptors: *Nitrates, *Water pollution sources, *Return flow, *Fertilizers, *Path of pollutants, Nitrification, Denitrification, Nitrogen, Irrigation practices, California, Leaching, Nitrogen compounds, Nutrients.
Identifiers: *Santa Ana River basin (Calif).

Factors that have an effect on the nitrate in drainage water under lands used for citrus and row crops in the Santa Ana River basin in Southern California are the difference between N input and N removed by harvested crops, the drainage volume in which the nitrate is dissolved, mineralization of N from the organic pool, and denitrification. The N input minus N removed in harvested crops provides a reasonable estimate of the nitrate that will leach to the groundwater from soils that have open-porous profiles with no layers that restrict water movement and in which there is no net change in the N in the organic pool. The transit times measured for drainage water to move to the groundwater suggests that the effects of agricultural land use in the 1920 to 1940 period are showing in wells in 1971 and that the effects of present practices will not show until about 1990 or 2000. Recommended practices for fertilizer N for citrus are such that when combined with adequate leaching and good yields will put no more than about 20 ppm nitrate into drainage effluents, assuming no denitrification. Very careful management could reduce this estimate to near 10 ppm. Recommended practices for N fertilizer in row crops would put the nitrate concentration between about 20 to 50 ppm, assuming no denitrification. (Knapp-USGS)
W72-12042

COUNTING AND RECORDING EQUIPMENT FOR COASTAL AND ESTUARINE POLLUTION STUDIES,
Water Pollution Research Lab., Stevenage (England).
K. G. Robertson.
Institution of Electronic and Radio Engineers, Conference on Electronic Engineering in Ocean Technology, Proceedings, No. 19, September 21-24, 1970, (Water Pollution Research Laboratory Reprint No. 610), 14 p, 10 fig, 12 ref.

Descriptors: *Water pollution sources, *Radioisotopes, *Dispersion, *Pollutant identification, *Path of pollutants, *Outfalls.
Identifiers: *Sewage outfalls, *Bromine-82.

To study the dispersion of sewage and other wastewaters, discharged to the sea or to estuaries, a tracer (bromine-82) is added continuously to the discharge from a submerged outfall or alternatively as a single dose at the site of a hypothetical outfall. Dispersion is mapped by scanning the area with gamma-scintillation counters towed at predetermined depths. Counting and recording equipment is mounted in the towing boat. The replay system provides computer-compatible paper tape. Results of typical surveys are given. (Goessling-Texas)
W72-12057

SAND AND GRAVEL OVERLAY FOR CONTROL OF MERCURY IN SEDIMENTS,
Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
For primary bibliographic entry see Field 05G.
W72-12069

MERCURY POLLUTION CONTROL IN STREAM AND LAKE SEDIMENTS,
Advanced Technology Center, Inc., Dallas, Tex.
For primary bibliographic entry see Field 05G.
W72-12070

EFFECT OF CHLORINATION ON SELECTED ORGANIC CHEMICALS,
Hydroscience, Inc., Westwood, N.J.
E. L. Barnhart, and G. R. Campbell.
Copy available from GPO Sup Doc EPA 12020 EXG 03/72, $1.00; microfiche from NTIS as PB-211 160, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1972. 103 p, 38 fig, 17 tab, 13 ref. EPA Program 12020 EXG 03/72.

Descriptors: *Chlorination, *Chemical reactions, *Biodegradation, Bioassay, Activated sludge, Toxicity, Instrumentation, Ecosystems, Food chains, Microorganisms, Laboratory tests, Waste water treatment.
Identifiers: *Degradation products, *Organic chemicals, *Respirometer studies.

Fourteen industrial organic chemicals were examined for their persistence through biological treatment, either as the initial compounds, or as degradation products. Semi-continuous activated sludge systems were employed. The ability of each of the chemicals to participate in reactions with free chlorine was then determined in a series of batch experiments. Certain of the test compounds formed persistent degradation products during treatment. Five of the initial compounds reacted readily with chlorine, under conditions commonly employed in effluent chlorination. Five of the chlorination products were further studied in respirometer experiments to evaluate their persistence in mixed microbial systems. Their toxicity to fish was determined using the static bioassay procedure. A series of bench scale, continuous flow ecosystems were established for the evaluation of longer term effects of three of the chlorination products. Several varieties of organisms, representing different levels in the food chain, were studied. (Lowry-Texas)
W72-12074

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
Bureau of Fisheries and Wildlife Service, Sacramento, Calif. Div. of River Basin Studies.
R. D. Earnest, and P. E. Benfille, Jr.
Pesticides Monitoring Journal, Vol 5, No 3, p 235-241, December 1971. 5 tab, 12 ref.

Descriptors: *California, *Estuaries, *Fish, *Crabs, *Perches, *Pesticide residues, *DDT, *DDE, *DDD, Lipids, Correlation analysis, Pollutant identification, Water pollution sources.
Identifiers: *San Francisco Bay.

Residue levels of DDT and its metabolites, along with lipid concentrations, were studied in eight fish species and one crab species from two areas in San Francisco Bay in 1969. The highest residue levels were found in dwarf and shiner perch and the lowest in flatfish and crabs. Correlation coefficients for percent lipid versus DDE, DDD, DDT, and total DDT were calculated. A positive correlation of ($P < .05$) between percent lipid and DDT and its metabolites was found in white perch, pile perch and staghorn sculpin while a negative correlation was observed in dwarf perch. (Ensign-PAI)
W72-12077

HYDRAULIC MODEL TEST ON THE DIFFUSION OF INDUSTRIAL WASTE-WATER IN THE SEA,
Mitsubishi Heavy Inudstries Ltd., Kobe (Japan). Kobe Technical Inst.
S. Koyama, T. Kyogoku, and T. Hamaoka.
Mitsubishi Heavy Industries, Vol. 8, No. 3, p 12-18, 1971. 10 fig, 6 ref.

Descriptors: *Hydrualic models, *Simulation analysis, *Industrial wastes, *Thermal pollution, *Diffusion, Waste water (Pollution), Gravity, Tides, Currents, Pumps, Valves.
Identifiers: *Japan, *Model tests.

Hydraulic model tests were carried out at the Kobe Technical Institute on the diffusion of waste-water as a preventive measure against water and thermal pollution. The Froude criterion was used to achieve the similitude of gravity and inertia force. Tanks used in the tests were 19 m x 12 m x 1 m and 8 m x 6 m x 0.5 m respectively. Exact simulations of tidal range, tidal times, tidal currents and ocean currents were set at the seaward end of the model. Pumps and valves were interlocked with the tide generator to simulate currents. Similitude theory, methods and equipment are described. (Ensign-PAI)
W72-12081

CONTAMINATION OF THE SEAS AND OCEANS BY ARTIFICIAL RADIOACTIVITY,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
A. Preston.
Underwater Journal and Information Bulletin, Vol. 4, No. 2, p 49-58, April 1972. 1 fig, 3 tab, 21 ref.

Descriptors: *Radioactivity, *Water pollution sources, *Disposal, *Control systems, Environmental effects, Monitoring, Regulation, Irradiation, Radioactivity effects, Public health.
Identifiers: ICRP, Acceptable dose limits.

Artificial radioactivity as a marine water contaminant is discussed considering both the history of the problem and future projections. The main objective of controlled disposal is to ensure that irradiation to the public is within International Commission on Kadrological Protection (ICRP) recommended dose limits. Control is achieved by assessing the potential consequences of any proposed disposal by application of critical path analysis techniques. If this objective is achieved damage to marine resources is completely negligible. Where significant fractions of the limiting capacity are utilized, sensible monitoring operations are conducted including monitoring based on results of a critical path analysis. The need for careful assessment and monitoring will be greatest in shallow estuaries and coastal waters and may grow to requirement for regional, national and international monitoring. (Ensign-PAI)
W72-12084

CONCENTRATION AND DISTRIBUTION OF OIL POLLUTANTS IN HALIFAX HARBOUR, 10 JUNE TO 20 AUGUST 1971,
Bedford Inst., Darmouth (Nova Scotia). Marine Ecology Lab.
P. A. Michalik, and D. C. Grodon, Jr.
Technical Report No. 284, October 1971. 28 p, 2 fig, 3 tab, 4 ref, 1 append.

Descriptors: *Canada, *Oil pollution, *Pollutant identification, *Sampling, *Spectrophotometry, Analytical techniques, Weather, Hydrography, Sewage, Ships, Industrial wastes, Accidents.
Identifiers: *Halifax Harbour, Oil concentrations, Oil types.

A survey of oil concentrations was conducted in Halifax Harbour from June 10 to August 19, 1971. The pollution stems from ships releasing oily wastes, refinery accidents and sewer discharge. Sampling was carried out at 15 stations in the Harbour along with additional surface samples at all times. Spectrophotometric analyses were performed. Results of the analyses on all oil concentrations are presented along with weather conditions, sea state, rainfall, visual observations, oil type and distribution patterns. (Ensign-PAI)
W72-12089

IMPACT OF PETROLEUM SPILLS ON THE CHEMICAL AND PHYSICAL PROPERTIES OF THE AIR/SEA INTERFACE,
Naval Research Lab., Washington, D.C.
W. D. Garrett.
Available from the National Technical Information Service as AD-738 423, $3.00 in paper copy, $0.95 in microfiche. NRL Report 7372, February 16, 1972. 20 p, 4 fig, 41 ref. RR 131-03-41-5907. NRL Problem G02-03.

Descriptors: *Oil spills, *Air-water interfaces, *Water pollution effects, *Physical properties, *Waves (Water), *Capillary action, *Gases, *Organic matters, Dispersion, Meteorology.
Identifiers: *Oil slicks, *Wave damping, Wind-wave interaction, Gas exchange, Liquid-solid exchange, Organic fallout concentration, Global impact.

Spreading time of oil spilled on the sea depends on the spill volume, character of the oil and the meteorological condition of the area. The oil is degraded to tarlike lumps and stable water-in-oil emulsions by weathering, dispersion and air/sea dynamics. Oil in these states has a long life in the sea and can influence the properties, and modify exchange processes of the air/sea interface. Capillary waves are resisted and attenuated and wind/wave interaction is uncoupled through the elimination of form drag. Gass exchange can be inhibited liquid and solid exchange is altered, organic fallout becomes concentrated at the surface by the oil and oil is transported into the marine atmosphere. Oils tend to replace a high-surface-tension, active water surface with a more stolid, less mobile organic/air interface. (Ensign-PAI)
W72-12090

MARINE AND FRESH WATER POLLUTANTS, (POLLUTIONS MARINES ET POLLUTIONS DES EAUX DOUCES),.
Institut Pasteur, Lille (France). Laboratoire d'-Hydrobiologie.
For primary bibliographic entry see Field 05C.
W72-12096

EFFECT OF STORM RUNOFF DISPOSAL AND OTHER ARTIFICIAL RECHARGE TO HAWAIIAN GHYBEN-HERZBERG AQUIFERS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 04B.
W72-12101

INDUSTRIAL WASTES: EFFECTS ON TRINITY RIVER ECOLOGY, FORT WORTH, TEXAS.
Texas Christian Univ., Fort Worth. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-12109

ISOLATION OF LYTIC AGENTS RELATED TO SPHAEROTILUS,
Randolph-Macon Coll., Lynchburg, Va.
For primary bibliographic entry see Field 05A.
W72-12120

VIRUCIDAL ACTIVITY OF TWO IODOPHORS TO SALMONID VIRUSES,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
For primary bibliographic entry see Field 05C.
W72-12160

MICROBIAL FLORA OF PACIFIC OYSTERS (CRASSOSTREA GIGAS) SUBJECTED TO ULTRAVIOLET-IRRADIATED SEAWATER,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
G. J. Vasconcelos, and J. S. Lee.
Applied Microbiology, Vol. 23, No. 1, p 11-16, January 1972. 3 fig, 4 tab, 31 ref.

Descriptors: *Marine microorganisms, Water pollution sources, *Ultraviolet radiation, *Oysters, *Pathogenic bacteria, *Irradiation, Marine fungi, Mollusks, Water pollution effects, Yeasts, Aerobic bacteria, Isolation, Biochemistry, Biological properties, Marine bacteria, Coliforms, Pseudomonas, Water sampling, Marine animals, Shellfish, Cultures, Enzymes.
Identifiers: Biochemical tests, Sample preparation, Acinetobacter, Moraxella, Bacillus, Flavobacterium, Cytophaga, Vibrio parahaemolyticus, Vibrio aliginolyticus, Aeromonas, Lactobacillus, Staphylococcus aureus, Culture media, Crassostrea gigas, Most probable number test, Pseudomonads.

The ability of oysters to rid themselves of bacterial contaminants was studied by comparing differences in the microbial flora of oysters which were and were not exposed to seawater irradiated by UV at an intensity of 960 microwatts/min/sq cm. Isolation of microbes from oysters was accomplished by spread-plating asceptically homogenized oysters onto nutrient agar. Those from seawater were isolated by passing samples over gridded Millipore filters. Gram-positive organisms were restreaked on Brain Heart Infusion agar (BHI) and incubated at 25 C for 3 days before coagulase, hemolysis, and deoxyribonuclease activity were tested. Results indicated that the microbial flora, except coliforms, remained unchanged in those oysters exposed to UV radiation. The coliform count (MPN) was reduced from 17 to less than 0.18 per 100 ml in those oysters exposed to the irradiated sea water. Some Pseudomonas species were also removed, but other harmful microorganisms such as gram-positive cocci and Vibrio species persisted for a longer period. The effects of lowering coliform counts by UV exposure and the similarity in bacterial composition in oysters and sea water showed that composition of an oyster's flora is related to its environment. (Long-Battelle)
W72-12164

CHEMICAL CHARACTERISTICS OF HUMIC COMPOUNDS ISOLATED FROM SOME DECOMPOSED MARINE ALGAE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
M. A. Rashid, and A. Prakash.
Journal of Fisheries Research Board of Canada, Vol. 29, No. 1, p 55-60, January 1972. 3 tab, 30 ref.

Descriptors: *Chemical analysis, *Decomposing organic matter, *Marine algae, Humus, Organic compounds, Pollutant identification, Aqueous solutions, Ion exchange, Methodology, Organic acids, Fulvic acids, Kelps, Water analysis, Exudation, Water pollution, Phytoplankton, Water pollution sources, Phaeophyta, Oxidation.
Identifiers: *Humic compounds, Column chromatography, Fucus vesiculosus, Laminaria digitata, St. Margaret's Bay, Scoudouc River, Humic acids, Oximation, Sample preparation.

The chemical characteristics of humic compounds isolated from decomposed marine algae were determined and compared with those extracted from river water. The chemical nature of humic compounds isolated from the exudates of live, intact plants of Fucus vesiculosus and Laminaria digitata was determined by analyses of their functional groups, molecular weight, elemental composition, and certain spectral properties. Water samples with a high, dissolved humic content were obtained from St. Margaret's Bay, Nova Scotia and Scoudouc River, New Brunswick. After the impurities were removed, the molecular weight was determined by a column chromatographic technique using Sephadex gels and total acidity measured by barium hydroxide solution in N2. The carboxyls were determined by ion-exchange with calcium acetate solution, and the carbonyls by oximation. The data for oxygen-containing functional groups indicated that as compared to humic acids, the fulvic acids showed relatively large values of total acidity and 1.5 - 2.5 times higher carboxyl content. The phenolic hydroxyl group content was low (0.0-1.0 milliequivalents per gram) in all samples and appeared to be characteristic of humic compounds originating originating in the marine environment. Except for Laminaria humic acids, carbonyl groups were high in all samples, particularly the fulvic acids isolated from river water and Laminaria exudate. In general, the molecular weight properties of humic and fulvic acids were similar to the corresponding fractions previously obtained from marine sediments. Optical density tests indicated a higher degree of condensation for marine as compared with freshwater humic compounds. (Byrd-Battelle)
W72-12166

ACCUMULATION OF ALDEHYDE INTERMEDIATE BY PSEUDOMONAS AERUGINOSA IN GROWING CULTURE ON TETRADECANOL, (ANREICHERUNG DER ALDEHYDZWISCHENSTUFE AUS DER WACHSENDEN KULTUR VON PSEUDOMONAS AERUGINOSA BEIM ABBAU VON TETRADECANOL),
Muenster Univ. (West Germany). Institut fuer Mikrobiologie.
H. Buning-Pfaue, and H. J. Rehm.
Archiv fur Mikrobiologie, Vol. 82, No. 3, p 213-218, March 10, 1972. 3 fig, 14 ref.

Descriptors: *Oxidation, *Microbial degradation, Bacteria, Pseudomonas, Aerobic bacteria, Chemical reactions, Organic compounds, Cultures, Biodegradation, Metabolism, Absorption, Alcohols, Aquatic bacteria, Water pollution sources, Pollutant identification, Pathogenic bacteria.
Identifiers: *Pseudomonas aeruginosa, *Substrate utilization, *Tetradecanol, Aldehydes, Paraffins, Tetradecanol, Accumulation, 2 4-dinitrophenylhydrazon, Semicarbazone, Culture media.

In the oxidation of tetradecanol by Pseudomonas aeruginosa, tetradecanol was accumulated as semicarbazone and was identified as 2,4-dinitrophenylhydrazon. This confirms the possibility of production of an intermediate aldehyde out of the growing culture. (Holoman-Battelle)
W72-12170

ESTER SYNTHESIS BY ZOOGLOEA RAMIGERA 115 GROWN IN THE PRESENCE OF ETHANOL,
Ohio State Univ., Columbus. Dept. of Microbiology.
G. H. Joyce, and P. R. Dugan.
Applied Microbiology, Vol. 23, No. 3, p 547-552, March 1972. 4 fig, 2 tab, 10 ref.

Descriptors: *Water pollution sources, *Pollutant identification, *Gas chromatography, Sampling, Cultures, Aerobic bacteria, Alcohols, Organic acids.
Identifiers: *Fatty acids, *Thin-layer chromatography, *Zoogloea ramigera, Paper chromatography, Gas-liquid chromatography, Infrared spectroscopy, Column chromatography, Substrate utilization, Culture media, Esters, Ethanol.

Zoogloea ramigera, a floc-forming bacterium indigenous to waste treatment plants and natural waters, was grown on a basal medium supplemented with short-chain alcohols (C1,-C8) WHICH GAVE AN ESTER=LIKE ODOR. In order to characterize and identify this odor, various analytical tests were performed. Samples were taken several times daily from a growing culture and assayed by two-dimensional thin-layer chromatography for esters and intermediate acids. Esters in liquid culture were identified by a combined gas-liquid chromatography and infrared spectroscopy. Results from infrared spectroscopy showed peaks corresponding to ethanol and ethyl butyrate. Data indicated that the formation of esters in the presence of alcohol-grown cells occurs more rapidly than on an alcohol-free medium. Growth on C6-C8 alcohols was considerably slower than on the shorter chained alcohols, C1-C5. (Long-Battelle)
W72-12171

MICROBIAL DEGRADATION OF STEROLS,
Searle (G.D.) and Co., Chicago, Ill. Div. of Biological and Biochemical Research.
W. J. Marsheck, S. Kraychy, and R. D. Muir.
Applied Microbiology, Vol. 23, No. 1, p 72-77, January 1972. 5 tab, 12 ref.

Descriptors: *Mycobacterium, *Microbial degradation, *Biodegradation, Bacteria, Cultures, Fermentation, Organic compounds, Degradation (Decomposition), Aromatic compounds, Organic wastes.
Identifiers: *Sterols, Cholesterol, Phytosterols, Culture media, Ketones, Androsta-1 4-diene-3 17-dione, Androst-4-ene-3 17-dione, Substrate utilization, Degradation products, Biotransformation, Steroids.

A process is described for the microbial degradation of cholesterol and plant sterols, to produce androsta-1,4-diene-3,17-dione and androst-4-ene-3,17-dione, by two newly isolated bacteria designated as Mycobacterium sp. NRRL B-3683 and Mycobacterium sp. NRRL B-3805. These myobacteria produce substantial amounts of 17-ketonic compounds without appreciable degradation of the steroid nucleus. No ring degradation inhibitory agents are necessary. The first microbiological production of 20 alpha-hydroxymethylpregna-1,4-dien-3-one is also reported. (Mackan-Battelle)
W72-12174

RAPID RECOVERY OF ESCHERICHIA COLI FROM ESTUARINE WATER,
Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit.
W. H. Andrews, and M. W. Presnell.
Applied Microbiology, Vol. 23, No. 3, p 521-523, March 1972. 3 tab, 3 ref.

Descriptors: *E. coli, *Cultures, *Testing procedures, Enteric bacteria, Coliforms, Pollutant identification, Temperature, Evaluation, Water quality control, *Estuarine environment, Methodology, Isolation.
Identifiers: Enrichment, Culture media, Standard methods, Selective media, Recovery, Enterobacter.

The reliability of E. coli recovery from field seawater samples was simultaneously compared by use of 3 methods: (1) elevated temperature test of Fishbein et al., (2) an experimental 24-hr elevated temperature test with a newly formulated medium, and (3) the 72-hr APHA standard methods procedure. Decimal diluted samples from 68 collections were inoculated onto lauryl sulfate tryptose broth (LST) or new medium A-1 (containing lactose, tryptone, NaCl, a surfactant and salicin) and incubated at 44 and 44.5 plus or minus 0.2 C, respectively, for the rapid tests. For the APHA method, samples were inoculated onto LST for enrichment, incubated at 35 plus or minus 0.5 C for 24-28 hrs and positive tubes then transferred to 2 C medium and incubated at 44.5 plus or minus 0.2 C for 24 hr. All positive tubes from the elevated temperature test were streaked on Levin's EMB agar, incubated and representative colonies placed in lactose broth and incubated again. All gas-forming tubes were: (1) tested by the IMViC procedure, at 35 plus or minus 0.5 C and (2) reinoculated into EC medium and incubated at 44.5 plus or minus 0.2 C for 24-28 hr to confirm gas production at elevated temperatures. From 1,710 tubes, E. coli was recovered 222 times in lauryl tryptose medium incubated at 44 plus or minus 0.2 C for 24 hr, 261 times in a experimental medium incubated at 44.5 plus or minus 0.2 C for 24 hr, and 257 times by the 72-hr APHA method. The number of false positives enumerated was similar in all three tests. The data indicated that E. coli in raw seawater could be determined in 24 hr without a significant loss of accuracy. (Mackan-Battelle)
W72-12178

SURVIVAL OF VIBRIO PARAHAEMOLYTICUS IN SHRIMP TISSUE UNDER VARIOUS ENVIRONMENTAL CONDITIONS,
Texas A and M Univ., College Station. Dept. of Animal Science.
For primary bibliographic entry see Field 05C.
W72-12181

PRELIMINARY OBSERVATIONS ON THE UPTAKE OF POLIOVIRUS BY WEST COAST SHORE CRABS,
Notre Dame Coll., Belmont, Calif. Dept. of Biology.
R. DiGirolamo, L. Wiczynski, M. Daley, and F. Miranda.
Applied Microbiology, Vol 23, No 1, p 170-171, January 1972. 2 fig, 9 ref.

Descriptors: Water pollution effects, *Path of pollutants, Absorption, Mollusks, Public health, Shellfish, Crabs, Commercial shellfish, Crustaceans, Marine animals, Mussels, Bioassay, Pollutant identification, Pacific Coast Region.
Identifiers: *Poliovirus, *Hemigrapsus nudus, *Pachygrapsus, *Bioaccumulation, Mytilus californianus, Tissue culture, Biological magnification, Macroinvertebrates.

The ability of West Coast shore crabs to accumulate high concentrations of poliovirus was investigated by exposing the crabs to seawater containing poliovirus and to a diet of virus-contaminated mussels. The quantity of virus taken up from contaminated water (34,000 PFU/ml) was measured by homogenizing exposed crabs and observing plaque formation on a monolayer tissue culture. Crabs allowed to feed on virus-contaminated mussels for 12 hours were assayed for virus in a similar manner. The virus-contaminated mussels used in the experiments contained 26,000 virus PFU/g, or, on a per unit weight basis, 75 percent of the virus present in 1 ml of water. The uptake of viruses by crabs exposed to virus-contaminated seawater varied from 1,800 PFU/g in 12 hr to a high of 4,900 PFU/g in 48 hr, representing uptakes of 28 and 63 percent, respectively. Exposure to contaminated mussels for 12 hr resulted in a 74-94 percent uptake of virus by the crabs. The high percentage of viral uptake by the crabs indicated that the viruses were not only taken up but also concentrated. Such viral accumulation by commercial shellfish could be a potential health problem. (Long-Battelle)
W72-12182

USE OF AROMATIC COMPOUNDS FOR GROWTH AND ISOLATION OF ZOOGLOEA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and Pennsylvania State Univ., University Park. Dept. of Microbiology.
R. F. Unz, and S. R. Farrah.
Applied Microbiology, Vol 23, No 3, p 524-530, March 1972. 2 fig, 5 tab, 25 ref.

Descriptors: Water pollution sources, *Pollutant identification, Cultures, Sampling, Aerobic bacteria, Separation techniques, Spectroscopy, Laboratory tests, Metabolism, Alcohols, Aromatic compounds, Organic compounds, Chemical reactions, *Isolation, Organic acids, Amino acids, Phenols, Growth rates.
Identifiers: *Zoogloea, *Substrate utilization, *Zoogloea ramigera, Culture media, Biochemical tests, Aromatic hydrocarbons, Catechols, Biological magnification, Cresol, Toluate, Benzoate.

Nine Zoogloea strains were examined for their ability to utilize 35 aromatic compounds. The primary isolation of Zoogloea was carried out in basal media supplemented with an aromatic carbon source and agar (1.0 percent (w/v) final concentration). Benzoate, toluates, phenols and cresols were utilized as a carbon source by eight strains. These strains exhibited meta cleavage of catechol and of methyl-substituted catechols. With the exception of L-tyrosine, none of the aromatic compounds tested supported growth of Z. ramigera. The meta clevage products of m-toluate catabolism provided a reliable method of identifying and isolating 37 zoogloea-forming bacteria from various waste waters. They were identified as strains of Zoogloea. (Long-Battelle)
W72-12186

NOTE ON THE DISTRIBUTION OF CESIUM 137 IN THE LIGURO-PROVENCAL BASIN (NOTE SUR LA DISTRIBUTION DU CESIUM 137 DANS LE BASSIN LIGURO-PROVENCAL),
Laboratoire de Chimie Nucleaire d'Orsay (France).
Y. Le Beyec, A. Morel, and P. Slizewicz.
Cahiers Oceanographiques, Vol 23, No 9, p 859-869, November 1971. 3 fig, 20 ref. English abstract.

Descriptors: *Cesium, *Distribution patterns, *Nuclear explosions, *Radioactive wastes, Diffusion, *Water pollution sources, Surface waters, Hypolimnion.
Identifiers: *Cesium-137, *Liguro-Provencal Basin, Vertical exchange.

Measurements of Cesium 137 concentrations from nuclear explosions taken at various depths in the Ligurian Sea are presented. Diffusion was adequate in purifying the surface waters but the intermediate waters were contaminated. At depths of 1000-1500 m, concentrations were less than 10% of the surface water values. Concentrations of Cs-137 in the deep waters showed vertical exchange. The integrated values of Cs-137 on the water column appeared smaller than generally acknowledged for overall fallout. (Ensign-PAI)
W72-12187

OCEANOGRAPHY OF THE NEARSHORE COASTAL WATERS OF THE PACIFIC

NORTHWEST RELATING TO POSSIBLE POLLUTION.
Oregon State Univ., Corvallis. Dept. of Oceanography.

Copy available from GPO Sup Doc EP2.10:16070 EOK 07/71 SN5501-0140 Vol I, $5.25, Vol II, $6.00; microfiche from NTIS as PB-211 275, $0.95/vol. 1. Environmental Protection Agency, Water Pollution Control Research Series, July 1971, Vol I. 615 p; Vol II. 744 p. EPA Program 16070 EOK 07/71.

Descriptors: *Oceanography, *Pacific Northwest, *Coast review, *Bibliographies, Water pollution sources, Thermal pollution, Reviews, *Data collections, Toxicity, Path of pollutants, *Metals, Trace elements, Pesticides, Salinity, Nutrients, Algae, Aquatic animals, Radionuclides.
Identifiers: *Literature reviews.

This study is limited to the coastal zone of the Pacific Northwest from high tide to ten kilometers from shore, and does not include estuaries and bays. The literature has been reviewed in 21 chapters including chapters on geology, hydrology, winds, temperature and salinity, heat budget, waves, coastal currents, carbon dioxide and pH, oxygen, nutrients, and biology. Special chapters deal with field studies on thermal discharges, heat dispersion models, pulp and paper industrial wastes, trace metals, radiochemistry, pesticides and chlorine, thermal ecology, and biology of 20 selected species. A summary chapter is entitled 'The nearshore coastal ecosystem: an overview.' The bibliography contains more than 3100 entries, most from the open literature, but some from unpublished reports. A separate volume (Vol II), includes the following appendices: (1) Wind Data; (2) Temperature and Salinity Data; (3) Wave Data; (4) Trace Metals (including trace metal toxicities); (5) Pesticide Toxicities; (6) Oxygen, Nutrient, and pH Data; (7) Radionuclides; and (8) An Annotated Checklist of Plants and Animals (including more than 4400 species).
W72-12190

GROUNDWATER POLLUTION IN ARIZONA, CALIFORNIA, NEVADA, AND UTAH,
Fuhriman, Barton and Associates, Provo, Utah.
D. K. Fuhriman, and J. R. Barton.
Copy available from GPO Sup Doc for $2.00; microfiche from NTIS as PB-211 145, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 10 fig, 27 tab, 241 ref. EPA Program 16060 ERU 12/71, Contract 14-12-919.

Descriptors: *Groundwater, *Water pollution sources, Groundwater basins, Salinity, Arizona, California, Nevada, Utah, *Nitrates, *Dissolved solids, *Mineralization, *Southwest U.S.

An investigation to determine the groundwater pollution problems which exist in the states of Arizona, California, Nevada, and Utah was conducted. Data were obtained through an extensive review of the literature and through interviews with engineers, scientists, and governmental officials concerned with water pollution in the four states of the project area. Mineralization of groundwater is the most prevalent factor in the degradation of groundwater quality in the project area. Large quantities of groundwater in each of the four states are undesirable for many uses because of excessive mineralization. Much of the mineralization of groundwater is a result of natural processes. Some is caused by man's activities--irrigation, oil field brine disposal, and over-pumping of aquifers are common causes of mineralization. Usually the degradation is caused by an excess of total dissolved solids, but at some locations, specific toxic substances are also found in the groundwater. Of the various forms of pollution of groundwater caused by man's activities, nitrate is probably most prevalent in the project area. A listing of conditions causing groundwater pollution in the project area is included.
W72-12193

RADIOECOLOGICAL STUDIES OF THE ENVIRONMENT OF THE EUREX NUCLEAR PLANT AT SALUGGIA (STUDIO DI RADIOECOLOGIA OPERATIVA NEI DINTORNI DELL'IMPIANTO EUREX DI SALUGGIA),
Comitate Nazionale per L'Energia Nucleare, Casaccia (Italy). Laboratorio Radioaattivita Ambientale.
A. Antonelli, M. A. Bombace, A. A. Cigna, L. Cigna Rossi, and U. Laneri.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 44 p, 1 fig, 11 tab, 8 ref.

Descriptors: *Europe, *Nuclear powerplants, *Environmental effects, *Nuclear wastes, Path of pollutants, Tracers, Tritium, Strontium radioisotopes, Radioecology, Potable water, Irrigation water, Milk, Food chains, Fish, Effluents, Rivers, Mixing, Waste dilution, Systems analysis, Water pollution control, Zinc radioisotopes, Cobalt radioisotopes.
Identifiers: Plutonium, Cesium radioisotopes, Zirconium radioisotopes, Cerium radioisotopes, Iron radioisotopes, Manganese radioisotopes, Ruthenium radioisotopes.

Tracer experiments were conducted of mixing in the Dora Baltea River and of the Po River downstream of its confluence with the Dora. Estimates were made of radionuclide pathways to man via drinking water, irrigation water (through vegetables and milk), AND FISH CONSUMPTION. Maximum release rates (for tritium, Mn, Fe, Co, Zn, Sr, Ru, Cs, Ce, and Pu radionuclides) are listed which ensure a wide safety margin. In all cases drinking water is the more critical pathway. (Bopp-ORNL)
W72-12194

TRITIUM CONTAMINATION OF THE ENVIRONMENT (UBER DIE TRITIUMKONTAMINATION DER UMWELT),
Kernforschungszentrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 07C.
W72-12195

APPLICATION OF EXPERIENCE IN MONITORING RADIOACTIVE WASTES TO INDUSTRIAL WASTES (ERFAHRUNGEN MIT RADIOAKTIVEN ABWASSERN ALS MODELL FUR EINE VERBESSERUNG DER UBERWACHUNG VON INDUSTRIEABWASSERN),
Bundesgesundheiteant, Berlin (West Germany). Institut fuer Wasser-, Bodes-, und Lufthygiene.
Karl Aurand.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 17 p, 8 fig, 12 ref.

Descriptors: *Monitoring, *Nuclear wastes, *Water pollution control, *Water pollution sources, Pesticide residues, Water sampling, Water analysis, Radioecology, Sedimentology.

Particularly with regard to the buildup of pollutants in ecosystems, semi-continuous methods are described for monitoring the radioactivity of surface-, drinking- and waste water. The samples are analyzed or stored at a central laboratory. Samplers are described for proportional sampling, for sampling water at depth, for bottom water, and for sediments. For organic pesticide determination in water at depth, only glass contacts the sample (thus avoiding absorption such as may occur with plastics). (Bopp-ORNL)
W72-12196

PREDICTING RADIOCONTAMINATION OF PLANTS THROUGH RAIN (AND IRRIGATION WATER) (ESTIMATION DU TAUX DE TANSFERT DE LA RADIOCONTAMINATION DE LA PLUIE AUX VEGETAUX),
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleatres.
J. Lehr, and C. Myttenaere.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man aand His Environment, Rome, Sept. 1971. 23 p, 5 fig, 4 tab.

Descriptors: *Irrigation water, *Nuclear wastes, *Fallout, *Agronomic crops, Water pollution effects, Path of pollutants, Soil-water-plant relationships, Radioecology, Strontium radioisotopes, Systems analysis, Reviews, Food chains.
Identifiers: Cesium radioisotopes.

Research on predicting radiocontamination of plants through rain and irrigation is reviewed. Radionuclide uptake from irrigation water varies more directly with the quantity of contaminants delivered than uptake by the leafy parts by interception of rainwater, where there is an inverse dependence on the time of delivery. A 2-3 mg Ca content of rainwater reduces Sr-90 uptake to 1/2 that from demineralized water. Uptake into cereal foods is particularly sensitive to climatic conditions at the time of maturation of the plants, and may exceed that into leafy vegetables and green forage. (Bopp-ORNL)
W72-12197

A MATHEMATICAL MODEL FOR EVALUATION OF RADIOACTIVE AND CONVENTIONAL POLLUTION OF SURFACE WATERS (MODELLO MATEMATICO PER LA VALUTAZIONE DI INQUINAMENTI RADIOATTIVI E CONVENZIONALI IN ACQUE SUPERFICIALI),
Comitato Nazionale per l'Energia Nucleare, Rome (Italy); and European Communities, Luxembourg. Commission.
F. Branca, F. Breuer, A. A. Cigna, and R. Amavis.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 31 p, 4 fig, 8 ref.

Descriptors: Strontium radioisotopes, *Potable water, *Irrigation water, *Nuclear wastes, Radioecology, Europe, Path of pollutants, Water pollution effects, Water pollution control, Public health, Vegetable crops, Milk, Systems analysis, *Mathematical models, Absorption, Sediments, Sediment transport, Flocculation, *Model studies.
Identifiers: *Cesium radioisotopes, *Ruthenium radioisotopes.

The internal dose to man from environmental contamination by reactor effluents is calculated using a compartmental model. Critical radionuclides and critical populations are Cs-137 for infants, Ru-106 for adults, and Sr-90 for both. Considering the pathways via drinking and irrigation water; the capacity of a river, with a flow of 100 cubic meters/sec and carrying 30 kg/sec of sediment, is 7.2 Ci/year of Cs-137, 0.22 Ci/year of Sr-90, and 200 Ci/year of Ru-106. (It is assumed that drinking water will be treated by flocculation with aluminum sulfate.) Planning of research in the field of chemical pollution may be facilitated using an analogous model. (Bopp-ORNL)
W72-12198

HAZARD POTENTIAL OF RADIOACTIVE WASTE,
Comitato Nazionale per l'Energia Nucleaire, Rome (Italy); and Oak Ridge National Lab., Tenn.
F. Gera, and D. G. Jacobs.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Enivronment, Rome, Sept. 1971, 17 p, 1 tab, 9 ref.

Descriptors: *Radioactivity, *Environment, *Radioactive wastes, *Hazards, *Evaluation, Estimating, Forecasting, Assessments, Air pollution, Water pollution, Water pollution sources, Toxicity, *Path of pollutants, Food chains, Radioisotopes, Radioecology.
Identifiers: Hazards analysis, *Prediction, Radiation exposure.

Concern has been expressed about the possible levels of contamination of the environment as a consequence of radionuclide releases, either intentional or accidental. A uniform method to evaluate the potential hazard associated with the existence of a certain amount of radioactive material might be useful. In order to permit the evaluation and the comparison of global hazards, the use of the Potential Hazard Index (PHI) is proposed. The hazard associated with radioactive materials is a function of the amount of activity, of the radiotoxicity of the nuclides and of the probability that human beings will be exposed to the radiation emitted by the radioactive nuclides. Quantitative information about environmental transfer processes and about the reliability of the long-term containment of radioactive wastes is necessary for adequate assessment of values for P. Some situations are reviewed for which possible ranges of P can be estimated. (Houser-ORNL)
W72-12199

PROBLEMS IN THE EVALUATION OF THE RADIOLOGIC RECEPTOR CAPACITY OF THE ENVIRONMENT - GENERAL METHOD OF APPROACH (PROBLEMES POSES PAR L'EVALUATION DE LA CAPACITE RADIOLOGIQUE LIMITE D'UN MILIEU RECEPTEUR - PRINCIPES GENERAUX D'APPROCHE),
Commissariat a l'Energic Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleatres.
G. Lacourly.
Paper presented at the Commission of the European Communities Internation Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 11 p, 5 ref.

Descriptors: *Systems analysis, *Nuclear wastes, *Water pollution control, *Fallout, Radioecology, Environmental effects, Radioactivity, On-site investigations, Forecasting, Mathematical models, Public health, Path of pollutants, Streams, Sedimentology, Oceans, Lakes.

On-site studies are necessary since complex parameters are involved (the physicochemical properties of the various radionuclides; effects of environmental parameters on rates of dilution, dispersion, and immobilization; the prevalence in the area of agriculture, industry, and recreation; and dietary habits of the population). Important parameters are discussed very briefly for: gaseous effluents ((1) meteorological conditions favoring dispersion, (2) those favoring fallout or rainout, (3) type of local agriculture, and (4) dietary habits), streams ((1) dilution, (2) fixation of radioisotopes on suspended particles and in biota-related sediments, and (3) the eventual steady-state contamination at the outfall), lakes, oceans, and soil contamination. (Bopp-ORNL)
W72-12201

RADIOECOLOGY AS AN AID TO THE GENERAL ENVIRONMENTAL POLLUTION PROBLEM,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Environmental Sanitation Sector.
J. Spaander, and L. Strackee.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971, 12 p, 7 ref.

Descriptors: *Environment, *Air pollution, *Water pollution, *Water pollution sources, *Nuclear explosions, Fallout, Transport, Oceans, Lakes, Rivers, *Radioecology, Radioactive waste disposal, Path of pollutants, Radioactive tracers, Ecology.
Identifiers: Critical nuclide, Critical nuclide pathway.

Except for pollution problems which bear a typical local character, the general solution of the problems can not be restricted to the territory of single countries or a small group of countries. The safeguarding of the waters of the large rivers and seas in Europe is in most cases a matter of international deliberation. The protection of the oceans against unacceptable pollution will require negotiations on a mondial level. The world-wide extent of the pollution problem was demonstrated first and most clearly on a mondial scale when the fatal results of the testing of nuclear weapons in the free atmosphere became manifest. Discussions are given relative to the pollution problem in the philosophy of waste disposal, the radioecological approaches, the critical pathway concept and its limitations, the use of radioactive tracers in ecological studies, and the interaction of different pollutants. (Houser-ORNL)
W72-12202

FIXATION OF SR, ZN AND CE RADIONUCLIDES BY SODIUM ALGINATE AND ALGINIC ACID FROM SEA WATER,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
G. E. Lazorenko.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 8 p, 5 fig, 5 ref.

Descriptors: *Marine algae, *Strontium radioisotopes, *Zinc radioisotopes, Absorption, Sedimentation, Analytical techniques, Molecular structure, Cation exchange, Radioecology, *Path of pollutants.
Identifiers: *Cerium radioisotopes.

Sedimentation and light scattering showed that sodium alginate obtained from Black Sea Cystoseira has two molecular weight fractions, 800,000 and 37,000. Ion exchange studies showed that Zn is bound by only the lower, Ce is bound to a greater extent by the higher, and Sr is bound by both. (Bopp-ORNL)
W72-12203

EXPERIMENTAL STUDY OF TH ISOTOPES ACCUMULATION BY MARINE ORGANISMS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
A. B. Nazarov, and A. Ya. Zesenko.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 9 p, 4 fig, 11 ref.

Descriptors: *Radioisotopes, *Marine algae, *Absorption, *Mine wastes, Radioecology, *Path of pollutants, Physicochemical properties.
Identifiers: Thorium radioisotopes.

To determine the role of marine organisms in migration of Th in mine wastes, uptake was studied by four species of algae from seawater containing oxalic and hydrochloric Th compounds. Possible reasons for differences between the concentration factors found and literature values are: (1) under natural conditions the time of algae contact with sea water is considerably more than in the present experiment, (2) the possible existence of regions of the ocean with high Th concentration, and (3) difference in the physicochemical state. (Bopp-ORNL)
W72-12204

A CUMULATIVE EXPOSURE INDEX (CUEX) FOR ASSESSING ENVIRONMENTAL RELEASES OF RADIOACTIVITY,
Oak Ridge National Lab., Tenn.
S. V. Kaye, R. S. Booth, P. S. Rohwer, and E. G. Struxness.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 12 p, 3 fig, 4 ref.

Descriptors: *Radioactivity, *Measurement, *Atmosphere, *Air pollution, Water pollution, *Soil contamination, *Environment, Water pollution sources, Radioecology, Human population, Food chains, Assay, Bioassay, Evaluation, Public health, Toxicity.
Identifiers: Dose, Dose calculation.

The Cumulative Exposure Index (CUEX) is being developed to facilitate efficient realistic assessment of environmental releases of radioactivity. The aim of CUEX is to assess the release on the basis of time-integrated radionuclide concentrations measured in suitable environmental sampling media. Typical measurements would be concentrations of radioactivity in air or water or on the land surface. The measured concentrations are assessed against basic radiation safety standards recommended for members of the public by recognized authorities. Because the recommended standards are expressed in units of dose (rem), the CUEX index, of necessity, embodies environmental models and dose models to convert the measured environmental radionuclide concentrations into estimates of radiation dose to man. The final estimate of dose and dose commitment used in calculation of CUEX includes contributions for each radionuclide and exposure mode of significance, and is compared to the appropriate radiation dose limit to complete the assessment. (Houser-ORNL)
W72-12205

RADIOACTIVE CONTAMINATION OF THE VENICE LAGOON FROM 1964 TO 1969 (L'INQUINAMENTO RADIOATTIVO DELLA LAGUNA DI VENEZIA DAL 1964 AL 1969),
Padua Univ. (Italy). Instituto di Igiene.
G. G. Calapaj, and D. Ongaro.
Minerva Fisiconucl. Vol 14, No 4, p 202-212, Oct-Dec 1971. 4 fig, 3 tab, 12 ref.

Descriptors: *Survey, Water pollution, *Lagoons, *Radioisotopes, Water pollution sources, *Strontium, *Cesium, Manganese, Food chains, Mollusks, Crustaceans.

A survey of the radioactive contamination from 90Sr, 137Cs and 54Mn of 12 edible species of molluscs and crustaceans of the Venice Lagoon, was carried out from 1964 to 1969. An estimate of the concentration of these radioisotopes in the surrounding water was also attempted, based on their levels in those mulluscs whose concentration factor (c.f.) was known from the literature. For the c.f. of 90Sr and 137Cs the lowest values, 0.6 and 6.0 respectively, found in the literature for genera normally living in the Lagoon have been assumed. The c.f. for 54 Mn had to be estimated from aquarium experience. The mollusc Pinna nobilis still living in the Venice Lagoon, whose charac-

teristic of accumulating the 54Mn from the environment was already known through previous work was chosen as the critical animal. (Houser-ORNL)
W72-12206

CHALK RIVER NUCLEAR LABORATORIES PROGRESS REPORT, OCT. 1 TO DEC. 31, 1971; BIOLOGY AND HEALTH PHYSICS DIVISION; ENVIRONMENTAL RESEARCH BRANCH,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
C. A. Mawson.
Available from NTIS, Springfield, Va. as AECL-4154, $3.00 paper copy; $0.95 microfiche. In: Report PR-B-92 (AECL-4154), p 57-79. March 1972. 3 fig, 30 ref.

Descriptors: *Radioactivity, *Monitoring, *Radioisotopes, *Nuclear wastes, Radioactivity techniques, Technology, Fish, Animal physiology, Absorption, Pesticide residues, Tritium, *Path of pollutants, Water pollution sources, Neutron activation analysis, Tracers, Trace elements, Water analysis, Water balance, Lakes, Canada, Cores, Sediments, Analytical techniques, Cobalt radioisotopes, Strontium radioisotopes, Nutrient cycling, Aquatic life, Soil-water-plant relationships, Crops.

Radioactivity monitoring of on-site surface waters and the Ottawa River, and Perch Lake studies (see W72-03334) continued. The specific activity of Sr-90 in the upper 10 cm of lake sediments indicated incomplete exchange with the water after 15 years exposure. About 30% of the Co-60 entering the lake was retained in the upper few cm of sediments. To correlate sedimentation rates with radionuclide profiles, analytic separations were developed for Zr, Th and Ce; but more work is required for Sr. Evaporation (10 cm for July) was estimated from tritium in water and vapor using mathematical models. Uptake of Co-60 by crops was relatively low for peat and organic-sludge soils (contrasting with Cs uptake). Uptake by aquatic life was affected by morphology, water currents, and fish feeding habits. In studies of nutrient and radionuclide uptake in lakes, large plastic cylinders were used to isolate volumes of the water. Sr uptake may be a sensitive detector of small sub-lethal, pesticide-induced disturbances in fish metabolism. Sr discrimination varied between fish species, was almost unaffected by environmental factors, and was less for uptake via the gut than via the gills. Rhodamine B tracer indicated small affect of the Glaverbel wharf on flow patterns past the Gentilly nuclear powerplant. (Bopp-ORNL)
W72-12207

RADIOACTIVITY IN SURFACE AND COASTAL WATERS OF THE BRITISH ISLES, 1970,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
N. T. Mitchell.
Available from NTIS, Springfield, Va. as FRL-8, $3.00 paper copy; $0.95 microfiche. Fisheries Radiobiological Laboratory Report 8, Dec. 1971, 38 p.

Descriptors: *Monitoring, *Aquatic environment, *England, *Radioactive waste disposal, *Effluents, Public health, Toxicity, Nuclear powerplants, Water pollution, Water pollution sources, Fallout, Background radiation, Path of pollutants, Radioisotopes, Water pollution control.
Identifiers: Wales, England, Radiation safety, Radiation control.

This is the fifth in an annual series of reports presenting the work of monitoring the aquatic environment by the Fisheries Radiobiological Laboratory, and it describes surveys made during 1970. Most of the laboratory's effort in this field is directed to fulfilling the Ministry's responsibilities in the control of radioactive waste discharges - that is, in England and Wales - and much of the information refers to these areas. Those establishments discharging liquid radioactive waste are listed in a table, which also includes a summary of the important factors in the critical exposure pathways. The quantities of radioactivity which each of these sites is permitted to dispose of are listed, with the percentage utilized alongside. The authorized limit is never allowed to exceed the limiting environmental capacity and for many disposals the quantities involved are only a very small proportion of it. Most of the data have been produced to demonstrate the radiological safety of environmental contamination. In addition to this basic work, research results are included - especially where they contribute to a better understanding of the extent and significance of the effects of particular disposals. This comprehensive monitoring of the environment confirms that adequate control of radioactive waste disposal has been maintained throughout 1970. (Houser-ORNL)
W72-12208

RADIONUCLIDE DISTRIBUTION IN COLUMBIA RIVER AND ADJACENT PACIFIC SHELF SEDIMENTS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
W. O. Forster.
Available from NTIS, Springfield, Va. as RLO-1750-49, $3.00 paper copy; $0.95 microfiche. RLO-1750-49, 1970, 59 p.

Descriptors: *Nuclear powerplants, *Effluents, *Water pollution, Water pollution sources, *Radioactive waste disposal, *Columbia River, Ecosystems, Sediment distribution, Pacific Ocean, Biota, Plankton.
Identifiers: Radiation safety and control.

Ideas of interest in radiogeological investigations of the Columbia River basin are presented. Much information is available from a wide range of tracer studies in this tagged ecosystem. Concern is expressed about the mechanisms operating to change the system by both artificial and natural processes. Studies have been made and are expected to continue to elucidate the complex pathways the radionuclides from Hanford's nuclear reactors take as they move downstream, continually mixing with the water and being sorbed on biota and sediments. The relationships between the radionuclides and their environment are discussed. (Houser-ORNL)
W72-12209

NON-BIOLOGICAL UPTAKE OF ZINC-65 FROM A MARINE ALGAL NUTRIENT MEDIUM,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05A.
W72-12210

VERTICAL DISTRIBUTION OF RADIOACTIVITY IN THE COLUMBIA RIVER ESTUARY,
Oregon State Univ., Corvallis. Oregon.
P. J. Hanson.
Available from NTIS, Springfield, Va. as RLO-1750-80, $3.00 paper copy; $0.95 microfiche. RLO-1750-80, June 1967, 86 p.

Descriptors: *Radioactivity, *Effluents, *Radioactive wastes, *Nuclear powerplants, *Estuarine environment, *Columbia River, Vertical migration, Depth, Temperature, Radioisotopes, Sampling, Analytical techniques, Assay, Mass spectrometry, Radiochemical analysis.
Identifiers: Hanford site.

In situ salinity, turbidity and temperature were measured at discrite depths, and water samples for radioanalysis were simultaneously collected in the Columbia River Estuary using a specially designed instrument package. Particulate radioactivity was concentrated by filtration and the dissolved radioactivity by evaporation or ferric oxide bulk precipitation. Radioanalysis was by gamma-ray spectrometry and data reduction by computer. Chromium-51 was mostly dissolved and conservative in brackish water, while zinc-65 was mostly particulate and non-conservative. The intrusion of salt water into the estuary was seen to greatly increase the concentrations of particulate chromium-51, and zinc-65 and scandium-46 near the bottom. The fall and rise in estuarine radioactivity levels were followed during an infrequent pause in Hanford reactor operations. (Houser-ORNL)
W72-12211

SEASONAL CHANGES IN PARTICLE SIZE DISTRIBUTION COMPOSITION, AND STRONTIUM EXCHANGE CAPACITY OF PARTICULATE MATTER SUSPENDED IN THE COLUMBIA RIVER,
Battell Pacific Northwest Labs., Richland. Wash.
R. E. Wildung, R. C. Routson, and R. L. Schmidt.
Available from NTIS, Springfield, Va. as BNWL-1638, $3.00 paper copy; $0.95 microfiche. Report BNWL-1638, Jan. 1972, 32 p.

Descriptors: Water pollution, Water pollution sources, *Effluents, *Radioactive wastes, *Columbia River, *Particle size, Suspended load, Distillation, Ion exchange, Separating techniques, Activated carbon, Strontium, *Seasonal, Distribution.
Identifiers: *Periodicity, Seasonal cycling.

A centrifugation method was employed to fractionate, according to equivalent spherical diameter, particulate matter suspended in the Columbia River during November, February, April, June and August. The isolated size fractions were characterized as to particle size distribution, carbon content, predominant primary and secondary minerals and strontium exchange capacity. The results were related to watershed characteristics and seasonal changes in river conditions. (Houser-ORNL)
W72-12212

HORIZONTAL AND VERTICAL DISTRIBUTIONS OF RADIONUCLIDES IN THE NORTH PACIFIC OCEAN,
Battelle Pacific Northwest Labs., Richland, Wash.
W. B. Silker.
Journal of Geophysical Research, Vol. 77, No. 6, p 1061-1070. Feb. 20, 1972, 4 fig, 3 tab.

Descriptors: *Radiation, *Radioactivity, *Profiles, *Stratification, *Gradients (Streams), *Pacific Ocean, Diffusivity, Diffusion, Sampling, Water pollution, Assay, Surface waters, Fallout.
Identifiers: Beryllium, Zirconium, Niobium, Ruthenium, Cerium.

Concentrations of 7Be, 95ZrNb, 106Ru, and 144Ce were determined in surface water and vertical profiles in the North Pacific Ocean. Latitudinal distribution of radionuclides in equatorial waters differed from previous patterns of both terrestrial and oceanic fallout of long-lived fission products. Fallout rates were quite uniform across narrow latitude belts, with constant amounts of radionuclides occurring both vertically and horizontally in the water mass. The short-lived radionuclides were uniformly distributed in the mixed layer, but decreased in concentration as the thermocline was penetrated. Vertical eddy diffusion coefficients, calculated from 7Be and 95ZrNb data, were 0.5-0.7 cm2/sec within the upper boundary of the main oceanic thermocline. Concentration data of the various locations sampled are given in tabular form. (Houser-ONRL)
W72-12213

CONCENTRATION OF IRON-55 IN COMMERCIAL FISH SPECIES FROM THE NORTH ATLANTIC,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
A. Preston.
Marine Biology, Vol. 6, No. 4, p 345-349, Aug. 1970, 1 fig, 4 tab, 24 ref.

Descriptors: *Nuclear explosions, *Civil defense, *Fallout, *Aggradation, *Atlantic Ocean, Fish, Food chains, Human population, Public health, Water pollution, Iron, Water pollution sources.
Identifiers: Deposition, Cod fish, North Atlantic Ocean.

Concentrations of the weapon-test, fallout radionuclide iron-55 have been reported for migratory species, such as the Pacific salmon, which suggest a marked decrease in concentration with decrease in latitude of the point of capture. This situation has been examined for North Atlantic cod stocks in order to provide data for a species representative of a large geographical area, but divided into more or less distinct stocks each with a restricted territory, in order to provide further data on the importance of latitude in determining iron-55 concentrations. The data obtained show that there is a marked dependence upon latitude, Arctic cod averaging 90 pCi 55Fe/mg Fe compared with 15 pCi 55Fe/mg Fe for cod from middle latitudes. (Houser-ORNL)
W72-12214

EXCESS-RADON AND TEMPERATURE PROFILES FROM THE EASTERN EQUATORIAL PACIFIC,
Scripps Institution of Oceanography, La Jolla, Calif.
Yu-Chia Chung, and H. Craig.
Earth and Planetary Science Letters, Vol 14, p 55-64, 1972, 6 fig, 2 tab.

Descriptors: *Profiles, *Stratification, *Gradients (Streams), *Radioisotopes, *Temperature, *Water temperature, *Pacific Ocean, Measurement, Model studies, Correlation analysis, Diffusivity, Diffusion.
Identifiers: *Radon.

A series of excess-radon and continuous temperature profiles in bottom water of the eastern equatorial Pacific was measured on SCAN Expedition. The results show that the temperature profiles have many characteristics which correlate with the radon profiles and provide important information on the nature of the bottom water processes. Highest model diffusivities for radon were encountered in regions where the temperature gradient was adiabatic; in constant diffusivity models these parametric values are about 200 cm2/sec, as compared with more generally observed values which are a factor of 10 lower. Four types of radon profiles are described; quasi-exponential, layered, cascade-type, and cusp-type profiles. The results of the model calculations are summarized. It is apparent that the simultaneous measurement of continuous temperature profiles with excess radon in bottom water will considerably enlarge the understanding of the mixing processes just above the sea floor. Results of the initial study indicate the desirability of (1) making temperature and radon measurements on a single cast, and (2) adding measurements of suspended material in the water. (Houser-ORNL)
W72-12215

SOME ASPECTS OF WATER MOVEMENT THROUGH SOILS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs.
In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 107-119. 5 fig, 18 ref.

Descriptors: *Soil water movement, *Mathematical models, *Percolation, *Hydraulic conductivity, Irrigation water, *Path of pollutants, Environmental effects, Deep percolation, Canal seepage.

Darcy's law for the flow of water through porous materials may be applied to obtain the flowpaths, and also the distribution of water content in unsaturated materials. As an example, the flow to great depths from irrigation channels is considered. When soils overlie a horizontal impermeable bed, the horizontal seepage may be obtained by solving Poisson's equation in order to obtain the integral of the product of hydraulic conductivity and soil-water pressure over the height, the gradient of which is the seepage rate at a given position. Boundary conditions between two porous materials explain the steady-state occurrence of wet soil in contact with a drier soil of coarser texture. Microscopic considerations must often replace the macroscopic approach which can only give an average flow path. (Bopp-ORNL)
W72-12216

SOME PROBLEMS IN THE DIFFUSION OF IONS IN SOILS,
Oxford Univ. (England). Soil Science Lab.
P. B. Tinker.
In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 120-134. 4 fig, 38 ref.

Descriptors: *Reviews, *Diffusion, *Simulation, *Ion transport, Soil water movement, Mathematical models, Convection, *Path of pollutants, Sorption, Percolation.

Methods of measuring and calculating diffusion coefficients are reviewed. No clear evidence has yet been found of important diffusion of adsorbed ions in soils. Problems of finding isotherm slopes due to adsorption hysteresis, exchange capacity saturation and electrolyte concentration changes are discussed. Solutions of the diffusion equation are available for simple systems, but concentration-dependent diffusion coefficients, irregular boundary conditions or convection with diffusion will usually require numerical solutions. An analogue method has been used to deal with non-symmetrical arrangements in space. (Bopp-ORNL)
W72-12217

CATION EXCHANGE IN SOILS,
Louvain Univ. (Belgium). Laboratoire Chimie Biologique.
H. Laudelout.
In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 33-39. 11 ref.

Descriptors: *Soil properties, *Ion exchange, *Physicochemical properties, *Thermodynamic behavior, Reviews, Mathematical models, *Path of pollutants, *Soil contamination, *Cation exchange.

Preliminary data indicate the thermodynamically expected relation between the activity of soil water and the ion-exchange selectivity (a parameter analogous to an equilibrium 'constant'). Although the thermodynamic method can predict the exchange reactions between two ions if that of each with a common ion is known, a systematic study in a given soil exchange complex has not been made. Unless the reversibility of the exchange reaction has been demonstrated, the thermodynamic formulation is limited to values obtained from extrapolating the experimental results to vanishing ionic strength. It has been observed for all exchanges studied that Scatchard's formulation of the excess free energy of mixing is satisfied at a sufficiently low temperature. (Bopp-ORNL)
W72-12218

SORPTION AND TRANSPORT IN SOILS,
Instituut voor Toepassing van Atoomenergie in de Landbouw, Wageningen (Netherlands).
M. J. Frissel, P. Poelstra, and P. Reiniger.
In: Sorption and Transport Processes in Soils, Society of Chemical Industry, London, S.C.I. Monograph No. 37, 1970, p 135-149. 12 fig, 1 tab, 5 ref.

Descriptors: *Fallout, *Soil water movement, *Ion transport, *Strontium radioisotopes, *Path of pollutants, *Simulation, Mathematical models, Diffusion, Sorption, Transfer, Percolation, Pesticide kinetics, *Model studies.

The importance of various parameters of a simulation model for the migration of Sr-90 fallout in pastures was evaluated by comparison with measurements at various locations in the European Community. When a profile of 40 cm depth was represented by 2 cm thick layers, doubling the layers was insignificant compared with experimental variations. Transfer rates between subsequent layers were computed for a time interval small enough to permit a given accuracy, repeating until the end of the simulated period. An apparent diffusion coefficient was derived by combining the variables moisture content, tortuosity, diffusion coefficient in water, dispersion coefficient and water flux. Ploughing increased the rate of transfer to deeper layers. (Bopp-ORNL)
W72-12219

AN ESTIMATE OF MORTALITY OF CHINOOK SALMON IN THE COLUMBIA RIVER NEAR BONNEVILLE DAM DURING THE SUMMER RUN OF 1955,
Bureau of Commercial Fisheries, Auke Bay, Alaska. Biological Lab.
For primary bibliographic entry see Field 05C.
W72-12250

HYDROLOGIC INTERPRETATIONS BASED ON INFRARED IMAGERY OF LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
E. J. Pluhowski.
Available from GPO, Washington, D.C. 20402 - Price $0.30 cents. Geological Survey Water-Supply Paper 2009-B, 1972. 20 p, 13 fig, 8 ref.

Descriptors: *Remote sensing, *Infrared radiation, *New York, *Hydrogeology, *Data collections, Thermal pollution, Discharge (Water), Water pollution sources, Water circulation, Ice cover.
Identifiers: *Long Island (NY).

Six remote-sensing flights over Long Island's north and south shores were made during the period July 13, 1967, to February 25, 1970. Infrared imagery in the 8- to 14-micrometer range was obtained; results varied from poor to excellent. The ability of the imagers to discern thermal contrasts of as little as 1 deg to 2 deg C permitted identification of areas of heavy groundwater discharge. These areas were concentrated primarily along the eroded headlands of the north shore and in the lower reaches of watercourses draining into Great South Bay. Only a few highly localized examples of direct groundwater discharge into the embayments along Long Island's south shore were detected in the imagery. Thermal loading emanating from a powerplant near Oceanside is quickly dissipated in Middle Bay. Infrared imagery may also be used to identify circulation patterns, ice cover, changes in stream-temperature regimen, and the location of sewer outfalls. Optimal time for the collection of infrared imagery for hydrologic studies on Long Island is in summer and in winter, when surface-water thermal differences are relatively large. (Knapp-USGS)
W72-12373

INVESTIGATION OF A LANDFILL IN GRANITE-LOESS TERRANE,
Idaho Univ., Moscow. Dept. of Civil Engineering.
H. R. Seitz, A. T. Wallace, and R. E. Williams.
Ground Water, Vol 10, No 4, p 35-41, July-August 1972. 9 fig, 2 tab, 3 ref.

Descriptors: *Landfills, *Water pollution sources, *Idaho, *Leaching, Infiltration, Path of pollutants, Groundwater movement, Hydrogeology, Loess, Granites.
Identifiers: *Moscow (Idaho).

The hydrogeologic environment adjacent to the sanitary landfill used by the city of Moscow, Idaho, was investigated in an attempt to identify the factors contributing to its alteration and to the reported alteration of groundwater downgradient from the fill. The refuse disposal trenches cut through loess and penetrate weathered granite. The major aquifer in the area is the weathered granite underlying the loess, particularly in draws. Surface water quality is slightly degraded and shallow groundwater is slightly contaminated. However, there is no serious widespread pollution of groundwater by the landfill. Electrical resistivity was tested as a means of detecting leachate from landfills in this type of environment. Comparison of resistivity data with water quality data showed that the technique is satisfactory, provided traverses are nearly horizontal. (Knapp-USGS)
W72-12378

APPLICATION OF THE FINITE ELEMENT METHOD TO REGIONAL WATER TRANSPORT PHENOMENA,
Alaska Univ., College. Inst. of Water Resources.
G. L. Guymon, and I. P. King.
In: Sparse Matrices and Their Applications; Plenum Press, New York, D. J. Rose, and R. A. Willoughby editors, p 115-120, 1972. 2 fig. OWRR A-036-ALAS (1).

Descriptors: *Finite element analysis, *Numerical analysis, *Path of pollutants, Streams, Lakes, Reservoirs, Rivers, Deltas, Estuaries, Oceans, Simulation analysis, Mathematical models.

A mathematical model based on the finite-element method is capable of simulating or predicting the movement and fate of pollutants in large freshwater lakes or reservoirs. A physical, or hydrodynamic, description of the water body is essential because the chemical and biological processes are dependent on the temporal and spatial flow field. The hydrodynamic state of the system must be known before the chemical-biological phenomena can be predicted since they are defined in terms of the hydrodynamic state of the system. Equations approximate bulk fluid movement and transport of discrete species in the horizontal plane. Similar equations can be written to solve the problem in the vertical plane. Thus a quasi-three-dimension solution may be obtained by a suitable meshing of the two different solutions. The variational principle technique used consists of finding an equivalent variational principle to the given differential equation system. The trial expansion function in the Galerkin method and in the minimization of the variational principle is systematically found by the finite element method. (See also W72-11866) (Knapp-USGS)
W72-12381

5C. Effects of Pollution

SOME DISTINCTIVE FEATURES OF AUSTRALIAN INLAND WATERS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
W. D. Williams, and Fong Wan Hang.
Water Research, Vol 6, No 7, p 829-836, July 1972, 6 tab, 17 ref.

Descriptors: *Water chemistry, *Water quality, *Australia, Ecology, Salinity, Sodium, Chlorides, Phosphates, Stratification, Lakes, Limnology, Streamflow, Water temperature, Thermal stratification.

Some distinctive features of Australian inland waters are discussed for possible use for water pollution control agencies. The distinctive features include: (a) the inapplicability of the concept of a standard composition for average fresh water; (b) the predominance of sodium and chloride ions in fresh waters; (c) the high proportion of saline bodies of water; (d) the high concentration of phospate in many lakes and reservoirs; (e) the absence of dimictic lakes, the presence of warm monomictic lakes, and the occurrence of an apparently unique thermal pattern in some highland lakes; (f) the pronounced seasonal and secular fluctuations in discharge of rivers; (g) the high faunal endemicity; and (h) the possible effects on the ecology of stream biotas of the absence of a well-defined seasonal terrestrial leaf fall. (Knapp-USGS)
W72-11742

SALINITY AND THE WHOLE ANIMAL,
Adelaide Univ. (Australia). Waite Agricultural Research Inst.
For primary bibliographic entry see Field 03C.
W72-11765

SALINITY AND ANIMAL CELLS,
New South Wales Univ., Kensington (Australia). School of Physiology and Pharmacology.
For primary bibliographic entry see Field 03C.
W72-11766

SALINITY AND THE WHOLE PLANT,
Adelaide Dept. of Agriculture (Australia).
For primary bibliographic entry see Field 03C.
W72-11767

SALINITY AND PLANT CELLS,
Sydney Univ. (Australia). School of Biological Sciences.
For primary bibliographic entry see Field 03C.
W72-11768

EFFECTS OF THE USE OF AGRICULTURAL PESTICIDES ON WATER POLLUTION,
State Coll. of Agronomical Science, Gembloux (Belgium).
P. Martens.
Ann Gembloux. Vol 77, No 1, p 39-47. 1971.
Identifiers: *Water pollution sources, Agriculture, *Pesticides, Runoff, Spraying.

While in terms of volume agricultural chemicals are not the most serious pollutants, their inherent toxicity more than compensates for any lack of volume. These chemicals may enter the water from aerial spraying or from runoff from farm lands. This is a problem in all areas of the world but it is perhaps most damaging in the USA where more of these chemicals are used. It is felt that strict regulations may be needed to protect the waterways from such contamination. Some of the chemicals involved are 2,4-D, DDT, aldrin, and lindane.--Copyright 1972, Biological Abstracts, Inc.
W72-11788

DISTRIBUTION AND ABUNDANCE OF PLANKTONIC CRUSTACEA IN STURGEON BAY AND SHAWANAGA INLET, GEORGIAN BAY, ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 02L.
W72-11795

GROWTH RATE OF ASPIDISCIDAE ISOLATED FROM ACTIVATED SLUDGE,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
R. Sudo, and S. Aiba.
Water Research, Vol. 6, No. 2, p 137-144, February 1972. 2 fig, 2 tab, 21 ref.

Descriptors: *Activated sludge, *Protozoa, *Growth rates, Cultures, Isolation, Food habits, Biochemical oxygen demand, Chemical oxygen demand, Temperature, Physical properties, Thermal properties, Chemical properties, Waste water treatment.
Identifiers: *Aspidisca costata, *Aspidisca lynceus, Activation energy, Monoxenic cultures, Enrichment, Paramecium caudatum, Culture media, Vorticella convallaria, Vorticella alba, Vorticella microstoma, Epistylis, Carchesium polypinum, Aspidisca spp, Loxophyllum spp, Litonotus, Amoeba spp, Arcella vulgaris, Astasia, Bodo edax, Pleuromonas, Oikomonas terma, Peranema, Tokophrya spp, Podophrya, Philodina roseola.

Isolation, stock and monoxenic culturing of two species of Aspidiscidae, Aspidisca costata and Aspidisca lynecus, have been successfully accomplished. Aspidiscidae are the typical protozoa found frequently in the activated sludge from municipal sewage treatment. Using a heterogeneous bacterial population isolated from the activated sludge as the protozoan food, the monoxenic growth rate (logarithmic growth phase) of Aspidiscidae and the effect of temperature on the growth rate were measured. The specific growth rate was 1.2-1.3/day at 20 C, about one-half of that observed with Vorticellidae at the same temperature. Aspidiscidae examined were 'stenphagic' and 'horozoic'. The optimum temperature for growth was about 30 C and the value of activation energy for growth was delta E equals 13,800 cal/mole. (Mackan-Battelle)
W72-11796

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY,
National Inst. of Environmental Health Sciences, Research Triangle Park, N.C.
For primary bibliographic entry see Field 05A.
W72-11797

MARINE ALGAE OF THE SMITHSONIAN--BREDIN EXPEDITION TO YUCATAN-1960,
Michigen Univ., Ann Arbor. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W72-11800

GEOGRAPHIC DISTRIBUTION AND RELATIVE ABUNDANCE OF SALPIDAE OFF THE OREGON COAST,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W72-11806

VARIATION OF MANGANESE, DISSOLVED OXYGEN AND RELATED CHEMICAL PARAMETERS IN THE BOTTOM WATERS OF LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 05B.
W72-11809

ACCUMULATION OF METHANOGENIC SUBSTRATES IN CC14 INHIBITED ANAEROBIC SEWAGE SLUDGE DIGESTER CULTURES,
Union Coll., Schenectady, N.Y.
R. M. Sykes, and E. J. Kirsch.
Water Research, Vol. 6, No. 1, p 41-55, January 1972. 9 fig, 3 tab, 20 ref.

Descriptors: *Methane, *Sewage sludge, *Inhibition, *Methane bacteria, *Anaerobic digestion,

Hydrogen, Organic compounds, Carbohydrates, Fermentation, Anaerobic bacteria, Sludge digestion, Anaerobic conditions, Growth rates, Biodegradation, Nutrients, Gas chromatography, Carbon, Organic acids, Cellulose, Oxygen, Nitrogen, Hydrogen ion concentration, Proteins, Limiting factors, Chlorides, Waste water treatment.
Identifiers: *Substrates, *Carbon tetrachloride, Culture media, Accumulation, Acetate, Propionate, Valerate, Caproate, Glucose, Starch, Fatty acids, Isobutyrate, Butyrate, Isovalerate, Substrate utilization, Glycerol, Stearic acid.

Sources of hydrogen and its importance to anaerobic digestion of sewage sludge were studied using the CC14 inhibition of methane formation technique. Cultures were obtained from laboratory-scale sewage sludge digesters, and both batch and fill-and-draw cultures were used. Primary sewage sludge diluted with deionized, activated carbon-treated water and buffered with NaHCO3 was used as a medium for the batch cultures. Fill-and-draw cultures were grown in a mixture of digesting sludge, raw primary sludge, and either glucose, starch, cellulose, protein, tripalmitin, or a mixture of glycerol and stearic acid. Gas chromatography was used to analyze for volatile fatty acids and for gases. Hydrogen appeared to be evolved only from carbohydrates and its source in primary sewage sludge was apparently polymeric carbohydrates. The formation of hydrogen, acetate, and propionate was inhibited by hydrogen gas. The inhibition of methane formation by CC14 stimulated the formation of valerate and caproate. Carbon recoveries in cultures supplemented with organic compounds ranges from 54 to 86 percent. This suggests that the fermentation gases and volatile fatty acids were not the only important fermentation products. Glucose, starch, and cellulose were apparently fermented by different organisms. (Mortland-Battelle)
W72-11816

STANDARD ERROR OF LC 50 AND SAMPLE SIZE IN FISH BIOASSAYS,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Research and Development.
For primary bibliographic entry see Field 05A.
W72-11821

THE TEMPERATURE DEPENDENCY OF BIOLOGICAL DENITRIFICATION,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
R. N. Dawson, and K. L. Murphy.
Water Research, Vol 6, No 1, p 71-83, January 1972. 7 fig, 5 tab, 22 ref.

Descriptors: *Denitrification, *Nitrogen, *Water quality control, *Nutrient removal, Temperature, Aerobic bacteria, Pseudomonas, Carbon, Nitrates, Hydrogen ion concentration, Cultures, Ammonia, Nitrites, Activated sludge, Resistance, Dissolved oxygen, Pollutant identification, Water, Chemical reactions, Kinetics, Microbial degradation, *Anaerobic digestion.
Identifiers: *Substrate utilization, Pseudomonas denitrificans, Arrhenius temperature, Sample preparation, Culture media, Kjeldahl nitrogen.

Laboratory batch denitrification tests were conducted on defined media utilizing a dominant culture of Pseudomonas denitrificans grown under controlled temperature, pH, and dissolved oxygen levels. Pure cultures were first grown on slants of agar and inoculated onto streak plates. Scrapings were then inoculated into the same media prepared as a broth. After 48 hr of aerobic growth in a shaker bath, the contents were poured into batch reactors containing a defined medium of potassium nitrate with sodium citrate as the carbon source. The results indicated that the temperature dependence of the specific denitrification rate can be closely approximated by an Arrhenius temperature relationship. Linear nitrate and carbon removal rates obtained following an initial lag period increased with decreasing temperature. Rates ranging from 0.013 at 5 C to 0.16 mg NO3 as N/mg of organisms/h at 27 C were observed. The results of the pure culture studies were related to mixed culture reactions on activated sludge. Samples were filtered, dried, and analyzed for ammonia, total Kjeldahl, nitrates, and nitrites. Data indicated that a significant number of denitrifying microorganisms are naturally present in activated sludge. Overall denitrification rates corresponding to those of Pseudomonas denitrificans would be observed when the suspended solids wer 2.5-4.0 times those of the pure culture. The results of these studies suggest that considerable denitrification of natural waters occurs in the cold water anaerobic regions of deep lakes or beneath the ice during winter. (Mortland-Battelle)
W72-11822

KINETICS OF GROWTH ON AQUEOUS-OIL AND AQUEOUS-SOLID DISPERSED SYSTEMS,
Pennsylvania Univ. Philadelphia. School of Chemical Engineering.
A. E. Humphrey, and L. E. Erickson.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 1, p 125-147, January 1972. 18 fig, 5 tab, 65 ref.

Descriptors: *Growth rates, *Kinetics, *Mathematical models, *Model studies, Yeasts, Cultures, Organic compounds, Lipids, Nutrient requirements, Growth chambers, Mathematical studies, Surfactants, Particle size, Drops (Fluids), Coalescence, Adsorption, Dissolved solids, Dispersion, Emulsions, Mixing, Solubility, Physical properties, Chemical properties, Bacteria, *Oil, Environment, Inhibition.
Identifiers: *Substrate utilization, Dispersed systems, Dodecene, Candida intermedia, Pichia, Brevibacterium, Candida tropicalis, Candida lipolytica.

Biological growth systems involving hydrocarbon fermentations act within at least 4 phases which contribute to growth. These are the gas phase (air), aqueous phase (water), dispersed phase (oil) and the solid phase (cells). Growth is affected by many factors in dispersed systems not found in single liquid phase systems. Many of these factors are presented and are considered from their mathematical and experimental data. Factors discussed include: (1) the mechanism of uptake in pure and non-pure dispersed systems; (2) the importance of the size, number, surface area, and distribution of oil drops; (3) distribution of the growth-limiting substrate; and (4) the variation of growth rates in relation to (a) the addition of surfactants to the dispersed system, (b) substrate concentration, and (c) temperature and agitation. The approach is based entirely upon previous literature and experimental data and upon mathematical explanations of the growth kinetics in the dispersed system. The concluding section gives consideration to the design of a continuous culture disperse system (mixing equipment). (Mackan-Battelle)
W72-11832

RESPONSE OF THE ALGA CHLORELLA SOROKINIANA TO CO-60 GAMMA RADIATION,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
W. F. Kunz.
Nature, Vol 236, No 5343, p 178-179, March 24, 1972. 2 fig, 11 ref.

Descriptors: *Cobalt radioisotopes, *Radiosensitivity, *Radioactivity effects, *Algae, Chlorella, Irradiation, Radioactivity techniques, Resistance, Cultures, *Chlorophyta.
Identifiers: *Chlorella sorokiniana, Co-60, Gamma radiation, Survival, Chlorella pyrenoidosa.

The response and survival characteristics of Chlorella sorokiniana to ionizing radiation had not been determined, although the thermophilic, blue-green algae had previously been used in bioregeneration studies in radiation environments. The survival of the cells to Co-60 gamma radiation was therefore measured in terms of colony-forming ability after exposing aliquots of the stock culture to Co-60 radiation at an absorbed dose rate of 15 krad/min in fully aerobic conditions. The exposed cells were plated and incubated on glucose-supplemented Knop's agar, and scored 6 days later for visible cultures. In addition, the survival-absorption relationship was determined for 1-hr. old cells by exposure to different single doses and measuring the surviving fractions. Sublethal damage repair, repair rate, and the influence of sublethal damage repair on age and response functions were all tabulated. From the results it is most obvious that survival with repair is always higher than that without repair, regardless of the cell's age. Survival curves are included for all the tests. (Mackan-Battelle)
W72-11836

ISOLATION OF INFECTIOUS PANCREATIC NECROSIS VIRUS FROM WHITE SUCKERS (CATASTOMUS COMMERSONI),
Guelph Univ. (Ontario). Dept. of Microbiology.
R. A. Sonstegard, L. A. McDermott, and K. S. Sonstegard.
Nature, Vol 236, No 5343, p 174-175, March 24, 1972. 1 tab, 6 ref.

Descriptors: *Viruses, *Fish diseases, *Salmonids, Water pollution sources, Bioassay, Brook trout, Shiners, Yellow perch, Isolation, Separation techniques, Microorganisms, Freshwater fish, Water pollution effects, Epizootiology, Fish parasites.
Identifiers: *White suckers, *Infectious pancreatic necrosis, *Catastomus commersoni, *IPN virus, Tissue, Biological samples, Sample preparation, Perca flavescens, Esox lucius, Notropis spp, Northern pike, Epizootic, Spleen, Kidneys.

Infectious pancreatic necrosis (IPN) is an acute, highly contagious viral disease normally found in salmonid fishes. The occurrence of the IPN virus in non-salmonid fishes is reported for the first time. Various species of fish were collected with a fish shocker from the trail waters of two trout hatcheries known to contain IPN-infected brook trout. Viral assays included portions of the spleen and kidney (Hoffman method), visceral homogenates, and the gonad cell line (Wolf and Quimby technique). Only one isolation was made of all fishes examined and this was from one visceral homogenate made from 10 yearling white suckers (Catastomus commersoni). This suggests that non-salmonid fishes may play a role in the ecology and epizootiology of IPN. (Mackan-Battelle)
W72-11837

ECOLOGICAL STUDIES OF MERCIERELLA ENIGMATICA FAUVEL (ANNELIDA: POLYCHAETA) IN THE BRISBANE RIVER,
Queensland Univ., Brisbane (Australia). Dept. of Zoology.
D. Straughan.
The Journal of Animal Ecology, Vol 41, No 1, p 93-136, February 1972. 12 fig, 22 tab, 51 ref.

Descriptors: *Environmental effects, *Limiting factors, *Biological properties, *Ecology, Australia, Water pollution, Annelids, Invertebrates, Animal populations, Brackish water, Spatial distribution, Water temperature, Distribution patterns, Water quality, Ecological distribution, Biorhythmns, Water pollution effects, Physicochemical properties, Estuarine environment, Animal behavior, Competition, Reproduction, Larval growth stage, Water pollution sources, Salinity, Calcium, Ions, Breeding, Growth rates.
Identifiers: *Mercierella enigmatica, Polychaetes, *Brisbane River, Substrates, Survival.

The general biology and ecology of the tube building annelid, Mercierella enigmatica, has been studied in a locality where the serpulid is not a pest (Brisbane River) in order to help elucidate possible natural population control factors. The study centered around 7 stations along the river where rapid, boat surveys of the river banks were possible. Collections ranged from rare (1-5/sq ft) to abundant (100 plus/sq ft). Bakelite fouling plates and chequer board plates were placed in wire frames and suspended in the water in order to test horizontal distribution, larvae settling and surface preferences. The galvanized wire frames were also used to determine vertical distributions. Rates of survival, growth, maturation, sex ratios, numbers, and length of the specimens and tubes were all recorded as well as the salinity, temperature and chemical composition of the water at the collection sites. Results show the distribution of the worm to be primarily controlled by the area of larval settlement, which is affected by salinity, Ca ions, competition, predation, and pollution. Abundance of larval settlement is governed by water flow and substrate and attraction to areas already occupied by Mercierella. Breeding occurs from September to May at salinities from 0.7-3.5 percent. Growth rate depends on age, temperature, salinity, competition and pollution levels. (Mackan-Battelle)
W72-11840

MERCURY IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL APPRAISAL,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
L. Friberg, G. Lindstedt, G. Nordberg, C. Ramel, and S. Skerfving.
Available from the National Technical Information Service as PB-205 000, $10.75 in paper copy, $0.95 in microfiche. November 1971. 550 p, 23 fig, 47 tab, 913 ref.

Descriptors: *Mercury, Water pollution effects, *Public health, *Toxicity, *Heavy metals, *Path of pollutants, *Metabolism, Metals, Water pollution sources, Air pollution, Resistance, Environmental effects, Physiological ecology, Inhibitors, Genetics, Animal metabolism, Animal physiology, Pollutants, Water quality, *Reviews.
Identifiers: *Mercury poisoning.

A review of the toxicity of mercury (Hg) is presented. The report, which was based on a literature survey, presents basic information on the toxic action of Hg and on quantitative information regarding the relationship between dose and effect on human beings and animals. Methods of analysis of Hg in the air and in biological material are presented, with transport and transformation of Hg in nature and possible routes of exposure. Hg metabolism is discussed relative to absorption, biotransformation and transport, distribution, retention and excretion, and indices of exposure and retention. The following topics also are included: symptoms and signs of intoxication, normal concentrations of Hg in biological material, exposure/effect relationships of inorganic and organic Hg, and genetic effects of Hg. (LeGore-Washington)
W72-11842

IMMOBILIZATION OF FINGERLING SALMON AND TROUT BY DECOMPRESSION,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. F. Sutherland.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Price $0.25. NOAA Technical Report NMFS SSRF-655, March 1972. 7 p, 3 fig, 2 tab, 5 ref.

Descriptors: *Salmonids, *Chinook salmon, *Rainbow trout, Commercial fish, *Anadromous fish, *Fish barriers, Fish physiology, *Fishkill, Dams, *Columbia River, *Bioassay, Fish, Fish migration, Fisheries, Pressure.
Identifiers: *Coho salmon, *Decompression, Ice Harbor Dam, Snake River, Fingerlings, Immobilization.

Laboratory experiments revealed that some chinook salmon (Oncorhynchus tshawytschka) and coho salmon (O. kisutch) fingerlings are immobilized when decompressed from atmospheric pressure to high negative pressures. The coho salmon were less severely affected than were the chinook salmon. Studies with coho salmon and rainbow trout (Salmo gairdneri) to determine the effects of decompression within a turbine of a dam did not provide conclusive results. However, some fingerlings caught in the tailrace immediately after their release in the turbine intake were immobilized. Exposure to negative pressure below turbine runner blades is one possible cause of immobilization. (Svensson-Washington)
W72-11844

SURVIVAL OF SOME FRESHWATER FISHES IN THE ALKALINE EUTROPHIC WATERS OF NEBRASKA,
Hastings Coll., Nebr.
D. B. McCarraher.
Journal of the Fisheries Research Board of Canada, Vol 28, p 1811-1814, 1971. 2 tab, 10 ref.

Descriptors: *Freshwater fish, *Alkaline water, Lakes, Ponds, *Mineral water, *Aquatic environment, *Bioassay, Water quality, Fish, Water properties, *Nebraska, Perches, Minnows, Sunfishes, Pikes, Bullheads, Channel catfish, Walleye, Bass.
Identifiers: *Carbonate alkalinity, *Eutrophic waters.

Of 14 species of freshwater fishes held in cages in one or more of 13 alkaline lakes and ponds in Nebraska, few species survived more than a month where carbonate alkalinity, mostly as compounds of Na2CO3 and KCO3, was above 300 mg/l. Of the 14 species tested, Sacramento perch (Archoplites interruptus), fathead minnow (Pimephales promelas), northern pike (Esox lucius), and the black bullhead (Ictalurus melas) were the most tolerant of alkaline environments. Most centrarchid fish except A. interruptus and the green sunfish (Lepomis cyanellus) did not survive more than a month in alkaline waters greater than 950 mg/l total alkalinity. A lake classification index for slightly to strongly alkaline environments is presented, along with suggested fish species for introduction into such waters. (Svensson-Washington)
W72-11845

ROTENONE TOLERANCE IN MOSQUITOFISH,
Mississippi State Univ., State College. Dept. of Entomology.
D. L. Fabacher, and H. Chambers.
Environmental Pollution, Vol 3, p 139-141, 1972. 4 ref.

Descriptors: *Rotenone, *Pesticides, *Insecticides, *Pesticide toxicity, *Enzymes, Fish physiology, *Piscicides, Animal physiology, Bioassay, Pest control, Aquatic environment, Aquatic animals, Fish.
Identifiers: *Pesticide tolerance, *Mosquitofish, Sesamex.

Resistance to rotenone is very common among arthropods. An apparent case of rotenone resistance in mosquitofish is reported. A research project was established to determine the toxicity of rotenone to resistant and to susceptible fish. Resistant mosquitofish showed a 1.8-fold tolerance to rotenone over a susceptible strain. The 24 hr LC-50 values for rotenone in susceptible and resistant fish were 0.017 mg/l and 0.031 mg/l, respectively. Results with sesamex, an inhibitor of mixed function oxidase enzymes, indicated that rotenone tolerance in mosquitofish is solely the result of increased levels of mixed function oxidase enzymes. (Svensson-Washington)
W72-11846

EFFECTS OF PENTACHLOROPHENOL ON ENZYMES INVOLVED IN ENERGY METABOLISM IN THE LIVER OF THE EEL,
Goteborg Univ. (Sweden). Dept. of Zoophysiology.
S-L. Bostrom, and R. G. Johansson.
Comparative Biochemistry and Physiology, Vol 41B, p 359-369, 1972. 1 fig, 3 tab, 24 ref.

Descriptors: *Fish physiology, *Pesticides, *Fungicides, *Enzymes, *Eels, *Metabolism, Animal physiology, Phenolic pesticides, Biochemistry, Proteins, Water pollution effects.
Identifiers: *Pentachlorophenol, Metabolic pathways.

The effects of PCP in vivo and in vitro on the activity profiles of hexokinase, glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase, pyruvate kinase, lactate dehydrogenase, fumarase and cytochrome oxidase in the liver of the eel were investigated. In vivo results varied according to the enzyme. After a recovery period of 30 days in uncontaminated water the PCP treated eels showed higher activity levels for all the investigated enzymes compared to the controls. Comparison of enzyme activity ratios in vivo suggests a shift between different metabolic pathways. In vitro PCP inhibits all the investigated enzymes. (Svensson-Washington)
W72-11847

EFFECTS OF N-NITROSODIMETHYLAMINE ON THE CRAYFISH, PROCAMBARUS CLARKII,
Smithsonian Institution, Washington, D.C.
J. C. Harshbarger, G. E. Cantwell, and M. F. Stanton.
In: Proceedings of the 4th International Colloquium on Insect Pathology with the Society for Invertebrate Pathology, August 1970. College Park, Maryland. 1971, p 425-430. 7 fig, 8 ref.

Descriptors: *Animal pathology, Animal physiology, *Crayfish, Bioassay, Aquatic animals, Invertebrates, Chemical wastes, Public health, Water pollution effects.
Identifiers: *Pathological models, *Tumors, *Carcinogens, *N-nitrosodimethylamine, *Hyperplasia, *Sublethal effects, Antennal gland, Hepatopancreas, Biological models, *Procambarus clarkii.

Procambarus clarkii were maintained for 6 months in aqueous solutions containing 10, 100, and 200 mg/l N-nitrosodimethylamine--a liver and kidney carcinogen in a variety of invertebrates. Microscopical studies revealed extensive degeneration in all parts of the antennal gland and hyperplasia of the tubular cells in the hepatopancreas. This discovery of the sensitivity of an easily reared aquatic invertebrate to a water soluble nitrosamine introduces a practical model for the further study of the biological activity of this family of compounds. (LeGore-Washington)
W72-11849

EFFECTS OF TWO INSECTICIDES ON THE VULNERABILITY OF ATLANTIC SALMON (SALMO SALAR) PARR TO BROOK TROUT (SALVELINUS FONTINALIS) PREDATION,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
C. T. Hatfield, and J. M. Anderson.
Journal of the Fisheries Research Board of Canada, Vol 29, p 27-29, 1972. 1 fig, 11 ref.

Descriptors: *Pesticides, *Insecticides, *Atlantic salmon, *Brook trout, *DDT, Fish, Salmonids,

Trout, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Water pollution effects.
Identifiers: *Sublethal effects, *Sumithion, Vulnerability, Salmo salar, Salvelinus fontinalis.

Experiments were conducted in large outdoor concrete pools in which salmon had access to a safe haven. After exposure for 24 hr to 1 mg/l of the organophosphate insecticide, Sumithion, Atlantic salmon parr were more vulnerable than unexposed fish to predation by large brook trout. Sumithion at .1 mg/l, and DDT at 0.07 mg/l had no noticeable effect. The results, particularly for Sumithion, correlate well with previous laboratory work on the effect of insecticides on the learning ability of salmon. (Svensson-Washington)
W72-11850

INITIAL BIOLOGICAL AVAILABILITY OF THE HEAVY METAL RUTHENIUM IN FRESHWATER, I. INFLUENCE OF SALTS, ANIMAL SPECIES, AND TEMPERATURE UNDER CONTROLLED CONDITIONS,
Centre d'Etude de l'Energie Nucleaire, Mol (Belgium). Laboratoires.
H. Beque, S. Van Puymbroeck, J. Jaumier, R. Bittel, and O. Van Der Borght.
Environmental Physiology, Vol 1, p 37-50, 1971. 12 fig, 3 tab, 10 ref.

Descriptors: *Nuclear wastes, *Radioactive wastes, *Heavy metals, *Snails, Freshwater fish, Aquatic animals, Absorption, Adsorption, Water temperature, Freshwater, Physicochemical properties, Water pollution effects, Bioassay.
Identifiers: *Ruthenium, Biological availability, *Ruthenium salts, *Bleaks, Desorption, Lymnaea spp., Alburnus spp.

The influence of several parameters on the uptake of ruthenium by freshwater organisms had been studied under laboratory conditions during a period of 5 days. The organisms used were Lymnaea stagnalis, Alburnus lucidus, and empty shell of L. stagnalis. These organisms were placed in five different salt solutions: RuCl3, RuNO (NO3)3, RuNOCl3, RuNO (OH)3, and Na2 (RuNO (NO2)4. Some experiments were simultaneously run at three different temperatures. Temperature seems to have little or no influence on the fixation of Ru by snails and fish but is likely to play on important role in the absorption of Ru on empty shells or glass walls. The composition of the solution and thus of the ruthenium salts themselves is the predominant factor governing all fixation and adsorption phenomena. The amount of Ru fixed by the organisms varies by a factor of 14, depending on the salt present in the solution. The study of the biological availability of heavy metals has thus to be coupled with the physicochemical study of the complexes which are released into the biosphere. (Svensson-Washington)
W72-11853

ECOLOGICAL STUDIES ON MACROINVERTEBRATE POPULATIONS ASSOCIATED WITH POLLUTED KELP FORESTS IN THE NORTH SEA,
Durham Univ. (England). Dept. of Botany.
D. J. Jones.
Helgolaender wissenschaftliche Meeresuntersuchungen, Vol 22, p 417-441, 1971. 10 fig, 7 tab, 44 ref.

Descriptors: Water pollution effects, Ecology, Ecosystems, *Biological communities, *Succession, Aquatic environment, *Ecological distribution, *Estuarine environment, Habitats, Aquatic life, Heavy metals, Industrial wastes, Invertebrates, Algae, *Kelp.
Identifiers: *North Sea, *Laminarea spp., Sewage pollution, Epifauna.

Two gradients of pollution, one estuarine and one off the open coast, are described. The intervening seacoast has little or no pollution. A comparative method of pollution surveying is presented. Ecological comparison is made of the community development described for clean and polluted stations. Two ecological barriers to normal community development in the polluted environment are postulated. (Svensson-Washington)
W72-11854

UPTAKE AND ELIMINATION OF SIMAZINE BY GREEN SUNFISH (LEPOMIS CYANELLUS RAF.),
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
C. A. Rodgers.
Weed Science, Vol 18, No 1, p 134-136, January 1970. 4 tab, 2 ref.

Descriptors: Pesticides, *Triazine pesticides, *Pesticide residues, *Sunfishes, *Aquatic weed control, Fish physiology, *Bioassay, Organic pesticides, Pesticide kinetics, Pesticide removal, Carbon radioisotopes, Herbicides.
Identifiers: *Simazine, Lepomis cyanellus.

The uptake and release of 2-chloro-4,6-bis (ethylamino)-s-triazine (simazine) by green sunfish were measured during a 3 week exposure to either non-labelled or symetrically ring-labelled C-14-simazine. Exposure was by feeding (3 and 10 mg/kg body weight) or bath (1 and 3 mg/l). To determine the retention of simazine, treated fish and remaining after exposure and sampling were placed in freshwater for 4 weeks. This water was changed weekly. Fish in the bath absorb simazine in amounts directly proportional to the concentration in the water, i.e. 0.95 and 2.29 ppm total residue after 3 weeks exposure to 1.0 and 3.0 mg/l, respectively. Little or no simazine was found in feed-exposed fish 72 hr after feeding. Almost all of the residue was in the viscera. No simazine residue was detected in fish from the water bath exposure after they had been in fresh water for seven days. (Svensson-Washington)
W72-11855

THE EFFECT OF SUBLETHAL CONCENTRATION OF LAS ON THE ACUTE TOXICITY OF VARIOUS INSECTICIDES TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS REFINESQUE),
Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
J. M. Solon, J. L. Lincer, and J. H. Nair, III.
Water Research, Vol 3, p 767-775, 1969. 6 tab, 23 ref. PHS ES-00213-02.

Descriptors: *Pesticide toxicity, Pesticide kinetics, *Insecticides, *DDT, *Endrin, Freshwater fish, Bioassay, *Alkyl benzene sulfonate, Organophosphorous pesticides, Teleosts, Piscicdes, Lethal limit, Water pollution effects.
Identifiers: *Fathead minnow, *Sublethal concentrations, *Synergism, Pimephales spp.

Simultaneous exposure of the fathead minnow to lethal concentrations of parathion and a sublethal concentration of linear alkyl benzene sulfonate (LAS) resulted in a synergism in the toxic action of the two compounds. This was indicated by a drop in the 96 hr TLm value from 1.410 mg/l for parathion alone to 0.720 mg/l when LAS was present. The mean per cent survival at duplicate 0.800 mg/l concentrations of parathion in the presence of 1.000, 0.500 and 0.250 mg/l LAS was 5.0, 38.5, and 97.5, respectively. The mean survival at duplicate concentrations of 0.800 mg/l parathion alone was approximately 95%. A simple analysis of variance on the above tests showed the difference between the per cent survival for fish exposed to 0.800 mg/l parathion in the presence of 1.000 and 0.500 mg/l LAS respectively and the same concentration of parathion alone to be significant at the 0.05 level. The results of similar tests for DDT were inconsistent and the variability of DDT toxicity appears to be too great to accurately determine any synergistic action with LAS. Comparison of the toxicity of endrin in the presence and absence of LAS shows no synergism between the two compounds. (Katz-Washington)
W72-11856

BIOLOGICAL MAGNIFICATION OF A POLYCHLORINATED BIPHENYL (AROCLOR 1254) FROM WATER BY AQUATIC INVERTEBRATES,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
H. O. Sanders, and J. H. Chandler.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 5, p 257-263, 1972. 2 fig, 2 tab, 14 ref.

Descriptors: Pesticides, *Pesticide residues, Pesticide kinetics, *Aroclors, *Polychlorinated biphenyls, *Crustaceans, *Aquatic insects, Chlorinated hydrocarbon pesticides, Aquatic animals, Bioassay, Stoneflies, Dobsenflies, Mosquitoes, Midges, Shrimps, Crayfish, Daphnia, Gas chromatography, Absorption.
Identifiers: *Biological magnification, Scuds, Biological accumulation.

This study determined the rate of accumulation and biological magnification of Cl-36-labelled Aroclor 1254 from water by eight species of aquatic invertebrates. The animals were exposed to Aroclor 1254 at concentrations less than 0.003 mg/l. In addition to measurements of accumulation, scud exposed to Aroclor 1254 were analyzed by gas-liquid chromatography to investigate potential shifts in residue composition, which may have occurred as a result of metabolism. (Svensson-Washington)
W72-11857

EFFECTS OF COPPER, TITANIUM AND ZIRCONIUM ON THE GROWTH RATES OF THE RED TIDE ORGANISM, GYMNODINIUM BREVE,
University of South Florida, Tampa. Dept. of Chemistry.
D. F. Martin, and W. K. Olander.
Environmental Letters, Vol 2, No 3, p 135-142, 1971. 2 tab, 10 ref. PHS 1K04 GM 4259-03.

Descriptors: *Copper, *Titanium, *Red tide, *Gymnodinium, *Growth rates, *Dinoflagellates, Humic acids, Public health, Aquatic environment, Chelation, Florida, Water pollution effects.
Identifiers: Trace metals, *Zirconium, Growth constants, Static cultures, Gymnodinium breve.

The role of trace metal elements in outbreaks of the Florida red tide organism, Gymnodinium breve, has been a matter of speculation for many years. The effects of increments of three trace metal elements on the growth constants of unialgal cultures of G. breve were determined. The results indicate that the growth constants are inversely related to cupric ion concentration ($r = -0.714$, $p = 0.1$). Zirconium and titanium were found to be concentrated in water taken from a 1956 bloom. In this study, zirconium had no discernable effect and the observed growth constant decreased with increasing concentration of titanium ($r = -0.990$, $p = 0.1$). (Svensson-Washington)
W72-11860

DIESEL OIL CONTAMINATION OF BROWN TROUT (SALMO TRUTTA L.),
Torry Research Station, Aberdeen (Scotland).
P. R. Mackie, A. S. McGill, and R. Hardy.
Environmental Pollution, Vol 3, p 9-16, 1972. 4 fig, 1 tab, 9 ref.

Descriptors: *Absorption, Oil, *Oil pollution, *Oil spills, Water pollution effects, Fuels, Fish physiology, *Trout, *Brown trout.
Identifiers: *Seafood contamination, Seafood, Residues, Food contamination, Hydrocarbon residues, Salmo trutta.

Hydrocarbons chemically identical to those present in diesel fuel oil have been isolated from trout caught eleven days after a spillage of diesel fuel oil had occurred in their environment. Both the fish after cooking and the hydrocarbon fraction isolated from the uncooked fish smelled and tasted similar to the fuel oil. (LeGore-Washington)
W72-11861

EFFECTS OF SEWAGE SLUDGE UPON THE GROWTH AND MORTALITY OF SOME BIVALVE MOLLUSKS, (IN JAPANESE),
Y. Tanaka.
Bulletin of the Tokai Regional Fisheries Research Laboratory (Japan), No 63, p 65-73, November 1970. 2 fig, 8 tab, 8 ref. English summary.

Descriptors: *Sewage sludge, *Mollusks, *Oysters, *Marine animals, Municipal wastes, Water pollution effects, Invertebrates, Pelecypods, Bioassay, Growth, Mortality, Clams, Microorganisms.
Identifiers: *Toxicity bioassay, *Fertilized eggs, *Mollusk food, Tapes spp., Fulvia spp., Monochrysis spp., Meretrix spp., Phaeodactylum spp.

The effects of sewage sludge on the growth and mortality of clams and oysters were investigated. Fifty per cent of Tapes philippinarum died after one week in a 3% mixture of sludge and seawater. The survivors when cooked were inedible. Fulvia mutica fed sludge for 15 days did not grow. In seawater containing more than 0.05% sludge, the fertilized eggs of oysters developed abnormally and the 'D' shaped larvae did not feed. Bivalve larvae could grow in concentrations of sludge of less than 0.025%. Deleterious effects of sludge on bivalves is due to the suspended matter, bacterial content and chemical constituents. (Katz-Washington)
W72-11862

DEGRADATION OF DDT BY GOLDFISH,
New York State Coll. of Agriculture, Ithaca. Dept. of Entomology.
R. G. Young, L. St. John, and D. J. Lisk.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 4, p 351-354, 1971. 1 tab, 14 ref.

Descriptors: *DDT, *DDD, *DDE, Metabolism, Freshwater fish, Aquatic life, *Chlorinated hydrocarbon pesticides, Pesticide residues, Fish physiology, Degradation (Decomposition).
Identifiers: *Goldfish, Fish feeding, Phenobarbitol, Metabolites.

Goldfish were fed DDT for three weeks, then were exposed to phenobarbital solution for one week to study the possibility of microsomal enzyme induction and therefore possible enhanced insecticide excretion. Analysis of DDT, DDE and DDD were made at intervals up to six weeks. Forty percent of the DDT fed was incorporated during the feeding. It was recovered mainly as DDE (68-96%). Significant differences between pesticide levels of phenobarbital treated and control fish were not found. (Katz-Washington)
W72-11863

METHOXYCHLOR, A NEW THREAT TO THE ATLANTIC SALMON,
Sir George Williams Univ., Montreal (Quebec).
G. M. Kruzynski, and G. Leduc.
Atlantic Salmon Journal, No 1, 5 p, 1972. 6 fig, 1 tab, 14 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Atlantic salmon, *Brook trout, Organic pesticides, Pesticides, Environmental sanitation, Pesticide kinetics, Chemcontrol, Lethal limit, Salmon, Trout.
Identifiers: *Methoxychlor, Salmo spp., Salvelinus spp.

Brook trout, Salvelinus fontinalis, were exposed for periods of up to 40 days to an artificial diet containing 0.5-100 ppm of methoxychlor. These dietary levels were chosen on the basis of methoxychlor residues found in aquatic insects which had been exposed to 0.075 mg/l of the insecticide, the standard dosage presently used on the Quebec North shore for blackfly control. Methoxychlor had little effect on the growth in length and weight but produced intermittent mortality and a reduction in swimming stamina at exposure levels of 0.01-0.16 mg/kg/day, while fish that had received 1.00 and 2.00 mg/kg/day had a markedly increased stamina. Residue determinations at the end of the exposure period revealed methoxychlor levels of 2-44 mg/kg in whole fish, while the fat bodies of fish that died during the exposure period contained up to 584 mg/kg of the insecticide. Histopathological observations revealed extensive degenerative changes in liver and kidney tissues and a lowered red blood cell count in fish which had been exposed to the insecticide. (LeGore-Washington)
W72-11864

DISTRIBUTION OF IRON, MANGANESE, COPPER, ZINC, AND SILVER IN OYSTERS ALONG THE GEORGIA COAST,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, and R. G. Smith.
Journal of the Fisheries Research Board of Canada, Vol 29, No 4, p 450-452, 1972. 1 tab, 5 ref.

Descriptors: Water pollution effects, *Absorption, Metals, *Heavy metals, *Oysters, *Iron, *Manganese, *Copper, *Zinc, *Georgia.
Identifiers: Metal residues, Silver.

The shells and soft tissues of approximately 50 oysters (Crassostrea virginica) collected along the Georgia coast were analyzed for iron, manganese, copper, zinc, and silver. Manganese was the only metal found to be more concentrated in the shells. Correlations between the metals in the soft tissues suggest that iron and manganese, and copper, zinc, and silver form two separate groups of metals which are concentrated similarly by the oyster. Geochemical characteristics of a given metal are an important control in their uptake by the oyster. (Note: In the original title, 'Magnesium' is incorrectly substituted for 'Manganese.' The error was corrected in an errata.) (LeGore-Washington)
W72-11865

EFFECT OF PESTICIDE RESIDUES AND OTHER ORGANOTOXICANTS ON THE QUALITY OF SURFACE AND GROUND WATER RESOURCES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
J. L. Ahlrichs, L. Chandler, E. J. Monke, and H. W. Reuszer.
Available from the National Technical Information Service as PB-211 080, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No 10, June 1970. 108 p, 23 fig, 17 tab, 45 ref. OWRR A-005-Ind (16).

Descriptors: *Organic pesticides, *Carbamate pesticides, Dragonflies, Stoneflies, *Pesticide adsorption, Pesticide residues, Pesticide movement, Pesticide kinetics, Adsorption, Farm ponds, Reservoirs, *Indiana, Water pollution effects, *Path of pollutants, *Soil contamination.
Identifiers: Collembola, Odonta, Phorate, Carbaryl.

An interdisciplinary study was made on the terrestrial and aquatic effects of two organo-toxicants, a phorate and a carbaryl, as applied on experimental watersheds in Southern Indiana. Studied were the physio-chemical properties of the soil constituents on the sorption reactions of the toxic substances; bacterial degradation of the pesticides in the reservoirs, terrestrial and aquatic indicator organisms which denoted the presence or effect of the substances, and feasible methods for removal of the substance once entered into the water system. The amount of pesticide lost from an application site into the water system was dependent on the occurrence of runoff-producing storms shortly after application. The two pesticides studied were highly adsorped on the soil as a result applications 4 times recommended dosages produced virtually no trace of the substances in the water. Bacteria were found which could break the ring structure of the carbaryl; however, data concerning the role of microorganisms in the elimination of organo-toxicants from surface water were variable. Detailed before and after application observations of Collembola and Odonata indicated no environmental side effects created by the pesticides. (Wiersma-Purdue)
W72-11867

THE ACUTE TOXICITY OF HEAVY METALS TO THE LARVAE OF SOME MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
P. M. Connor.
Preprint, International Council for the Exploration of the Sea, Shellfish and Benthos Committee, Reference 'E', 1971. 9 p, 3 fig, 1 tab, 6 ref.

Descriptors: *Shrimp, *Heavy metals, *Mercury, *Copper, *Zinc, *Lethal limit, Bioassay, *Toxicity, Mortality, Aquatic environment, Water pollution effects, Water quality, *Larvae, Marine animals.
Identifiers: *Trace metals, Crangon spp., Ostrea spp., Carcinus spp., Homarus spp., Median lethal concentration.

The toxicity of copper, mercury and zinc to the larvae of Ostrea edulis, Crangon crangon, Carcinus maenas and Homarus gammarus is examined over a period of up to 70 hr. Mercury was more toxic than copper and zinc, which had similar levels of toxicity. Over the experimental period, the relationship between toxicity and concentration was linear. Larvae were from 14 to 1000 times more susceptible than adults of the same species. The median lethal concentrations (LC50) of each metal to the most sensitive species of larvae, tested over a 48 hr period, exceeded the concentrations found in natural seawater by a factor of 100. For longer test periods, the LC50 would be considerably less and this factor would then be considerably reduced. Hence the continued addition of these metals to confined waters should give cause for concern. (Svensson-Washington)
W72-11869

THE USE OF A CONTINUOUS FLOW APPARATUS IN THE STUDY OF LONGER-TERM TOXICITY OF HEAVY METALS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
K. W. Wilson, and P. M. Connor.
Preprint, International Council for the Exploration of the Sea, Fisheries Improvement Committee, Reference 'C', 1971. 9 p, 6 fig, 7 ref.

Descriptors: *Toxicity, *Shrimp, *Mercury, *Cadmium, *Heavy metals, *Lethal limit, Bioassay, Mortality, Aquatic environment, Water pollution effects, Water quality.
Identifiers: *Trace metals, Crangon spp., Moulting, Median lethal concentration.

A continuous flow apparatus capable of administering different, yet constant, concentrations

of toxin to twenty experimental tanks was built and used to study the toxicity of mercury (as mercuric chloride) and cadmium (as cadmium chloride) to the brown shrimp, Crangon crangon, over several weeks. After 1500 hr exposure these metals were toxic at 1/1000 and 1/100 of their 48 hr LC50 values. No lethal threshold concentration was established. Although the toxins did not affect the rates at which the animals molted, at the higher concentrations newly molted animals were much more vulnerable, as shown by a decrease in survival time after molting. Smaller shrimp were more sensitive to the toxicants. (Svensson-Washington)
W72-11870

THE RESPONSE OF AQUATIC COMMUNITIES TO SPILLS OF HAZARDOUS MATERIALS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
J. Cairns, Jr., K. L. Dickson, and J. S. Crossman.
In: Proceedings of the 1972 National Conference of Hazardous Material Spills, p 179-197. 17 fig, 5 tab, 19 ref.

Descriptors: Water pollution effects, *Chemical wastes, *Ecosystems, *Aquatic environment, *Fish populations, Rivers, Streams, *Aquatic populations, Acidic water, Water pollution, Ecology.
Identifiers: *Aquatic communities, Caustic spills, Ethyl benzene-creo-sote, *Hazardous material spills, Macroinvertebrate communities, Species diversity.

From the four case history studies presented it appears that the biological recovery of damaged rivers is a function of the physical, chemical, and biological characteristics of the receiving stream, the severity and duration of the stress, and the availability of undamaged areas to serve as sources for recolonizing organisms. Short term acute stresses produced by the release of acidic of caustic materials into a receiving stream elicit a response pattern in the macroinvertebrate and fish communities typified by an immediate reduction in the number of specimens. When no residual toxicity is found and there are undamaged areas available to act as sources for recolonizing organisms, a rapid recovery may be expected. For a long term acute stress, and stresses from materials with residual toxicities, the general response pattern is an immediate reduction in both diversity and density of organisms. However, with residual toxicities, the macroinvertebrate organisms that survive the stress seem to be able to establish an interim type of community structure, which lasts as long as the toxicity persists. (Svensson-Washington)
W72-11871

THE SYNERGISTIC EFFECTS OF TEMPERATURE, SALINITY, AND MERCURY ON SURVIVAL AND METABOLISM OF THE ADULT FIDDLER CRAB, UCA PUGILATOR,
South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
W. B. Vernberg, and J. Vernberg.
Fishery Bulletin, Vol 70, No 2, p 415-420, 1972. 6 fig, 7 ref. EPA Program 18080 FYI.

Descriptors: *Water temperature, *Salinity, *Mercury, *Crabs, Animal physiology, *Estuarine environment, *Toxicity, Aquatic environment, Metabolism, Bioassay, Mortality, Water pollution, Water pollution effects.
Identifiers: *Sublethal effects, *Fiddler crabs, Uca spp.

Gill tissues of fiddler crabs were the major site of mercury concentration; lesser amounts accumulated in the hepatopancreas and green gland. Very small amounts were found in the carapace and muscle tissue. No significant differences in the amount of mercury in tissues of males and females were found. A concentration of mercury sublethal to fiddler crabs under optimum conditions of temperature and salinity greatly reduced survival times when crabs were placed under conditions of temperature and salinity stress. Males were more susceptible to the synergistic effects of mercury in combination with environmental stress than were females. Metabolic rates of male and female fiddler crabs were affected by prolonged exposure to mercury both under optimum environmental conditions and under temperature and salinity stress. Metabolic rates of males were more adversely affected than those of females. (Svensson-Washington)
W72-11872

THE ALGAL BIOLOGY OF A TROPICAL MONTANE RESERVOIR (MLUNGUSI DAM, MALAWI),
Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
B. Moss.
Br Phycol J., Vol 5, No 1, p 19-28, 1970. Illus. Maps.
Identifiers: *Algae, Benthos, Biology, Dams, Flow, Malawi, Mlungusi Dam, Nutrients, Plankton, Populations, Reservoirs, Spirogyra, *Tropical regions.

The relationships between population changes of planktonic and bottom living algae and major environmental factors are reported for a small tropical reservoir and its inflow stream. Changes in algal crops were largely determined by water flow. The water had levels of dissolved ions comparable with those of rain but maintained large crops of mat-forming algae, particularly Spirogyra sp. This was attributed to an ability of this species to absorb nutrients at low ambient levels while being able to build up a large crop size as a result of its growth-form-resistance to displacement by water movements. Aspects of the biology of benthic algae are discussed in relation to their crop sizes.--Copyright 1972, Biological Abstracts, Inc.
W72-11874

EFFECTS OF OXYGEN DEPLETION AND OF CARBON DIOXIDE BUILDUP ON THE PHOTIC BEHAVIOR OF THE WALLEYE (STIZOSTEDION VITREUM VITREUM),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
E. Scherer.
Journal of the Fisheries Research Board of Canada, Vol 28, No 9, p 1303-1307, 1971. 4 fig, 13 ref.

Descriptors: *Dissolved oxygen, Fish physiology, *Carbon dioxide, *Walleye, Fish behavior, Respiration, Hydrogen ion concentration, Water pollution effects.
Identifiers: *Oxygen depletion, *Photic behavior, *Phototacticity, Photosensitivity, Stizostedion spp., Sublethal effects.

In laboratory experiments under overhead white light, wall-eyes displayed a negative phototactic response consistent with field observations and histological features of the walleye eye. The strength of this innate response proved to be largely dependent on the given respiratory situation: during oxygen depletion and during buildup of free carbon dioxide, the response diminished to the point of obliteration, which occurred at levels leaving mobility and equilibrium of the test specimens still intact. Whereas during the course of oxygen depletion a wide indifference zone (little or no chance of light behavior) could be observed from saturation (=acclimation) level down to about 4-2 mg/l, the fish reacted rather sensitively to increase of free CO2. Starting from acclimation levels of 1.0-2.0 mm Hg CO2, the light avoidance response declined gradually while approaching tensions of 5 mm Hg or more, being completely abandoned at levels above 15 mm Hg. This effect could not be attributed to pH shifts. (Svensson-Washington)
W72-11875

ENVIRONMENTAL CHANGES ASSOCIATED WITH A FLORIDA POWER PLANT,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
M. A. Roessler.
Marine Pollution Bulletin, Vol 2, No 6, p 87-90, June 1971. 3 fig, 1 tab, 9 ref.

Descriptors: Bays, *Marine algae, *Marine animals, *Thermal pollution, *Thermal power, Atlantic Ocean, Marine biology, Benthic flora, Bioassay, Cyanophyta, *Florida, Coral, Salinity, Currents (Water), Mollusks, Environmental effects.
Identifiers: *Biscayne Bay (Florida), Heated effluent, Turkey Point (Florida), Turtle grass, Thalassia spp., Udotea spp., Penicillus spp., Laurencia spp., Sponges.

Damage to the biota of Biscayne Bay by the heated effluent of a power plant is demonstrated quantitatively and qualitatively. Algae and grasses are replaced by blue-green filamentous algal mats; seasonal recovery is slow and the affected areas contain fewer kinds and smaller numbers of animals. Increased temperature is the chief cause of the changes. (Katz-Washington)
W72-11876

TOXIC EFFECTS OF ZINC SULPHATE ON THE GILLS OF RAINBOW TROUT,
Bristol Univ., (England). Dept. of Zoology.
J. F. Skidmore, and P. W. A. Tovell.
Water Research, Vol 6, p 217-230, 1972. 12 fig, 15 ref.

Descriptors: Fish, *Zinc, *Pathology, *Rainbow trout, Aquatic animals, *Toxicity, Water pollution effects, Salmonids, Cold-water fish, Fish physiology.
Identifiers: *Gills, *Inflammatory response, Epithelium, Lamellae, Pillar cells, Blood flow, Granulocytes, Respiratory collapse.

The initial changes that occur in the gill tissue of rainbow trout exposed to 40 mg/l Zn (2+) are typical of an acute inflammatory reaction. The epithelium covering the secondary lamellae lifts away in a continuous sheet from the pillar cell system, thus increasing the diffusion distance from water to blood. Blood flow patterns through the lamellae change, granulocytes appear in large numbers within the lamellar blood spaces and beneath the raised epithelium. Finally the lamellar blood circulation stagnates, terminating in respiratory collapse and death of the animal. The dynamics of blood flow during the progressive stages of gill damage are discussed. (Katz-Washington)
W72-11877

WATER QUALITY EXAMINATION BY MEANS OF A CHLAMYDOMONAS TEST,
Hydraulic Research Inst., Prague (Czechoslovakia).
D. Matulova.
Revue Roumaine de Biologie, Serie de Zoologie, Vol 14, No 2, p 133-138, 1969. 4 fig, 1 tab, 5 ref.

Descriptors: Water quality, *Aquatic microbiology, Waste water (Pollution), *Chlamydomonas, Methodology, Bioindicators, Testing procedures, *Bioassay, Water pollution effects.
Identifiers: *Romania, *Saprobity, Saprobic zones, *Vltava River (Rom), Chlamydomonas gelatinosa.

The bioassay with Chlamydomonas cultures, originally proposed as a toxicological test, was applied for water quality examination. Three sampling points near the confluence of the highly polluted and variable in composition Botic stream and the Vitava River were chosen. Experiments were carried out with samples collected at the same sampling points for a period of 4 months. The degrees of saprobity of all the samples collected were determined simultaneously. The results ob-

tained by means of the Chlamydomonas test and the determined degrees of saprobity and the intensity of growth of the testing algae are discussed. (Katz-Washington)
W72-11878

LABORATORY STUDIES ON THE SUSCEPTIBILITY OF MOSQUITO-EATING FISH, LEBISTES RETICULATUS AND THE LARVAE OF CULEX PIPIENS FATIGANS TO INSECTICIDES,
Taiwan Provincial Malaria Research Inst., Taipei.
P. S. Chen, Y. N. Lin, and C. L. Chung.
Journal of the Formosan Medical Association, Vol 70, No 1, p 28-35, January 1971. 2 fig, 4 tab, 8 ref.

Descriptors: *Pesticide toxicity, *Mosquitoes, Biocontrol, *Insect control, *Pest control, *Chemcontrol, Pesticides, Insecticides, Larvae, Public health, Vectors (Biological), DDT, Agricultural chemicals, Water pollution sources, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Carbamate pesticides, Diazinon.
Identifiers: *Guppies, Culex spp., Lebistes spp., Lindane, Parathion, Malathion, Sumithion, Sevin, Arprocarb.

The common guppy, Lebistes reticulatu, is very useful for the control of the mosquito, Culex pipiens fatigans in Bangkok. Synthetic organic insecticides are widely used in an agricultural pest control program as well as in a variety of control programs aimed at the suppression of vector mosquitoes in Taiwan. The toxic effects of some of these compounds to C. pipiens and to L. reticulatus have been compared for the purpose of drawing a basis in the integration of chemical and biological control of C. pipiens to ensure an effective control in the future. (Svensson-Washington)
W72-11879

INFLUENCE OF FERTILIZER PRACTICES ON WATER AND THE QUALITY OF THE ENVIRONMENT,
Nebraska Univ., Lincoln. Water Resources Research Inst.
R. A. Olson, E. C. Seim, J.Muir, and P. N. Mosher.
Available from the National Technical Information Service as PB-211 081, $3.00 in paper copy, $0.95 in microfiche. OWRR B-004-NEB (2). Completion Report, June 1, 1972. 96 p, 48 fig, 17 tab, 10 ref.

Descriptors: *Nitrogen, *Phosphorous, *Nebraska, *Nutrients, Eutroplication, *IRRIGATION SYSTEMS.
Identifiers: Soil nutrient accumulations, *Fertilizer pollution, Nutrient sinks, *Groundwater nutrients, Nutrient scavenging, Soil sampling, Surface water nutrients.

This project measured the extent of N and P movement beyond the rooting zone under different agricultural management systems in relation to nutrient contents of ground and surface waters of Nebraska. Deep profiles of land devoted to wheat-fallow, irrigated alfalfa, grass and heavily fertilized corn on hardlands showed limited evidence of deep penetration of nutrients toward the water table. Grass for the upper levels and alfalfa for the deeper profile appeared to be effective scavengers of N that might otherwise have escaped the rooting zone. Movement of N to the water table was evident, however, in valley situations of shallow water table, also in upland areas of deep, coarse textured soils recently brought under intensive agricultural production by center pivot irrigation. Additionally, local mineral N deposits of geologic origin have been found contributing to high nitrate levels of adjacent wells. Although no evidence was found of P movement downward from agricultural practice, concentration of the element in much of the mantlerock of the state was found to be high enough to contribute adequate P to water in contact for eutrophication. Limited change occurred in groundwater nutrient levels during a 10-year period of greatly increased fertilizer use. Concentrations were most closely related to density of irrigation wells and intensity of agricultural production. Stream nutrient concentrations were greatest adjacent to areas of greatest population density and associated maximum sewage and industrial wastes, and with extensive irrigation of adjacent bench and bottomlands. Stream reservoirs were noted to act as nutrient sinks, with positive effects on water quality. Precipitation was found to be a significant source of nutrients, especially in eastern Nebraska.
W72-11880

EFFECT OF IRON SUPPLY ON THE ACTIVITIES OF THE NITRATE-REDUCING SYSTEM FROM CHLORELLA,
Sevilla Univ. (Spain). Dept. of Biochemistry.
J. Cardenas, J. Rivas, A. Paneque, and M. Losada.
Archives fur Mikrobiologie, Vol. 81, No. 3, p 260-263, January 17, 1972. 2 fig, 16 ref.

Descriptors: *Enzymes, *Iron, *Nitrates, *Reduction (Chemical), Chemical reactions, Chlorella, Ammonia, Cultures, Inhibition, Inhibitors, Chlorophyta, Water pollution effects, Nitrites.
Identifiers: *Chlorella fusca, Ferrous sulfate, Culture media, Enzymatic inhibitors, Chemical interference.

In order to study the effect of iron supply on enzymatic activities of the nitrate-reducing system from Chlorella, algal cells were grown on ammonia, a nutritional repressor of the enzymes of the nitrate-reducing system, thereby reducing their levels to negligible values. These cells were then placed in a medium containing iron, as ferrous sulfate, at concentrations from 0-100 micro M, and then measuring the growth as indicated by absorbance changes at 660 nm. Enzyme activities were determined by harvesting, washing, centrifuging, and grinding the cells and then running enzyme and protein tests on supernatant of the extracted, broken cells. It was shown that, in Chlorella, the cellular level of nitrite reductase activity specifically increases in response to the iron content of the culture medium. By contrast, nitrate reductase activity is not affected by iron concentration in the nutrient solution under the same conditions. (Mackan-Battelle)
W72-11919

A QUANTITATIVE STUDY OF FACTORS AFFECTING ALGAL DIVISION SYNCHRONY MEASUREMENTS,
Saint Louis Univ., Mo. Dept. of Biology.
D. W. Rooney.
Mathematical Biosciences, Vol. 13, No. 3/4, p 205-211, April 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Algae, *Model studies, Mathematical studies, Digital computers, Data analysis, Equations, Reproduction, Biorhythms, Measurement, Populations, Cytological studies, Statistical methods, Cultures.
Identifiers: *Errors, *Synchronous cultures, Autospores, Variability, Bias, Synchrony index, Counting.

A digital computer was used to simulate errors in algal cell number measurements used in synchrony index computations. The index S sub R is based on cell counts over a time period in which the number of cells per unit volume increases. Repeated simulations demonstrated that the resulting degrees of bias and variability in the measured synchrony index S sub R depend not only on the magnitude of error in cell number measurements, but also on the number of such measurements and the autospore yield at division. The simulations demonstrated that bias and variability in measured S sub R decrease with increases in autospore yield. The variability in measured S sub R increases with increasing frequency of periodic cell counts. Minimal bias of S sub R occurs at intermediate cell count frequencies. (Snyder-Battelle)
W72-11920

DUCK HEPATITIS VIRIS INTERACTIONS WITH DDT AND DIELDRIN IN ADULT MALLARDS,
Wisconsin Univ., Madison. Dept. of Veterinary Science.
M. Friend, and D. O. Trainer.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 4, p 202-206, April 1972. 1 fig, 1 tab, 15 ref.

Descriptors: *Dieldrin, *DDT, *Mallard duck, *Pesticide toxicity, Viruses, Waterfowl, Gas chromatography, Ducks (Wild), Chlorinated hydrocarbon pesticides, Lethal limit, Chemical analysis, Bioassay, Metabolism, Halogenated pesticides, Biodegradation, Mortality.
Identifiers: *Duck hepatitis virus, *Chemical interaction, Anas platyrhynchos.

Adult mallard ducks injected with a lethal dose of a duckling lethal strain of duck hepatitis virus (DHV) were used to determine if infection with DHV had any effect on the toxicity of p,p'-DDT or technical grade dieldrin. Pesticide-treated rations of 500 or 900 ppm DDT, or 40 or 80 ppm of dieldrin were fed to the test animals. Mortality in all but one group (40 ppm dieldrin) receiving both DHV and either pesticide was less than the mortality in the corresponding group receiving a pesticide only. Gas chromatographic analyses indicated that the average ratios of brain to whole carcass pesticide residues at the end of the experiment were approximately 2-3 times greater among the pesticide-only groups than for those exposed to both DHV and a pesticide. The 'protective effect' of DHV was manifest as reduced total mortality, delayed onset of mortality, and altered mortality pattern. The delayed onset of mortality is deemed to be due to the stimulation of enzymes systems responsible for DDT and dieldrin metabolism which allows for the degradation of larger amounts of pesticides in the liver. Therefore the amount of residue reaching the brain is reduced. (Holoman-Battelle)
W72-11922

EYES BENEATH THE WAVES,
Durham Univ. (England). Dept. of Botany.
D. Bellamy.
New Scientist, Vol. 54, No. 791, p 76-68, April 13, 1972. 3 fig.

Descriptors: *On-site investigations, *Scuba diving, *Sea water, *Data collections, Copper, Lead, Heavy metals, Mussels, *Kelps, Starfish, Crustaceans, Food chains, Food webs, Water pollution effects, Aquatic environment, Turbidity, Water pollution, Phaeophyta, Mollusks, Marine algae, Marine animals.
Identifiers: England, Bioaccumulation, Biological magnification, Fate of pollutants.

Data collected by amateur divers along the east coast of Britain shows that in polluted sites kelp fails to grow at depths below 4 m, whereas in unpolluted waters it normally grows to at least twice that depth. Since kelp depth ranges can be controlled by at least 2 main factors, light and bare rock area, it is presumed that increased turbidity is the controlling factor in polluted water. Studies in naturally turbid water support this contention. In another study, the background count of heavy metals of an 'inshore food web' was ascertained by the collection of algae, mussels and starfish for analysis of lead and copper in their tissues. At the two unpolluted sites tested, both metals appeared to be biologically concentrated along the food chain, while at the 2 polluted sites no overall biological concentration was indicated. The

animals from the polluted areas display concentration of the metals at 1-2 times the concentration in unpolluted samples. (Mackan-Battelle)
W72-11925

HYDROBIOLOGICAL STUDIES IN THE CATCHMENT OF VAAL DAM, SOUTH AFRICA. PART 3. NOTES ON THE CLADOCERA AND COPEPODA OF STONES-IN- CURRENT, MARGINAL VEGETATION AND STONY BACKWATER BIOTOPES,
National Inst. for Water Reserve, Congella (South Africa). Regional Lab.
F. M. Chutter.
Internationale Revue der Gesamten Hydrobiologie, Vol. 56, No. 3, p 497-508, December 31, 1971. 2 tab, 57 ref.

Descriptors: Water pollution effects, *Copepods, *Distribution patterns, Spatial distribution, Waterfleas, Biorhythms, Sediments, Sewage effluents, Stratification, Effluents, Juvenile growth stage, Density, Aquatic environment, Sampling, Crustaceans, Seasonal, Aquatic animals, Industrial wastes, Rivers, Vegetation, Daphnia.
Identifiers: *Cladocera, *South Africa, *Vaal Dam, Biotopes, Bosmina, Moina, Diaptomus, Simocephalus expinosus, Simocephalus serrulatus, Simocephalus vetulus, Ceriodaphnia, Ilyocryptus, Macrothrix, Acroperus, Alona, Camptocercus, Leydigia, Pleuroxus, Chydorus, Mesocyclops, Paracyclops.

The occurrence of Cladocera and Copepoda in the catchment of Vaal Dam was related to the biotopes sampled, the seasons and the zonation of the rivers. A square foot Surber sampler or a circular hand net was used to sample the 'stones-in-current' fauna, while collection of organisms in the 'marginal vegetation' zones was done by hand net. Zones where conditions were unstable due to the deposition and/or transport of sediments yielded the fewest specimens. Population levels were down during the summer rainy season but increased during the winter to peak in early summer. Large densities of Cladocera and Copepoda were found in locations where treated sewage and industrial effluents entered the rivers. (Snyder-Battelle)
W72-11926

EFFECTS OF FEEDLOT RUNOFF ON WATER QUALITY OF IMPOUNDMENTS,
Robert S. Kerr Water Research Center, Ada, Okla.
W. R. Duffer, R. D. Kreis, and C. C. Harlin, Jr.
Copy available from GPO Sup Doc EPA-16080 GGP, $0.65; microfiche from NTIS as PB-211 124, $0.95. Supt. of Documents U.S. Gov't. Print. Off. Washington, D.C. 20402. Water Pollution Control Research Series, Environmental Protection Agency July 1971, 53 p, 13 fig, 7 tab, 9 ref, append. EPA Program 16080 GGP 07171.

Descriptors: Reservoirs, *Fishkill, *Ammonia, *Dissolved oxygen, Runoff, *Feedlots, Organic wastes, Nutrients, Phytoplankton, Light penetration, Zooplankton, Bethos, *Farm wastes, Water pollution sources, Cattle.
Identifiers: Solids concentrations.

Effects of rainfall runoff from a beef cattle feedlot on the water quality of a small impoundment were determined. Changes in chemical concentration of impounded water and changes in the community structure of aquatic organisms were measured and related to the amount and composition of feedlot runoff received. Water quality changes were also monitored in a nearby reservoir which received no feedlot runoff to serve as a control. Rainfall from feedlots was retained in collection ponds and pumped into the impoundment over a relatively short period of time, creating in effect a 'slug' discharge conditon. Changes in chemical concentration or population structure of organisms were not apparent for discharges of about one-part feedlot runoff to 40 parts receiving water. Runoff discharges for two pumping periods with each contributing one-fourth of the volume of the receiving water were shown to degrade water quality in the impoundment. Several significant chemical and biological changes occurred. The concentration of salts, solids, oxygen-demanding organic compounds and nutrients increased. Population levels decreased for organisms having negative tolerances for low dissolved oxygen and high ammonia concentrations. The most dramatic reduction in the biological community was the suffocation of about 90% of the game fish in the impoundment. Reduction in population levels of 'stressed' organisms was followed by increased productivity of phototropes in response to higher nutrient concentrations. (Dorland-Iowa State)
W72-11935

OXYGEN DEPLETION IN ICE COVERED RIVER,
Alberta Univ., Calgary. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-11989

THE STANDING CROP AND PRIMARY PRODUCTIVITY OF THE EPIPHYTON ATTACHED TO EQUISETUM FLUVIATILE L. IN PRIDDY POOL, NORTH SOMERSET,
Alberta Univ., Calgary. Dept. of Botany.
M. Hickman.
BR Phycol J. 6 (1): 51-59. Illus. 1971.
Identifiers: England, *Epiphyton, *Equisetum-Fluviatile-P, North, Pool, Priddy, *Primary productivity, Somerset, Standing crops.

The standing crop and primary productivity of a defined epiphytic algal community was studied over a period of 2 yr. The primary productivity method was analyzed statistically. Because of the shallowness of the pond and large surface area of Equisetum stems available for colonization the epiphyton is the most productive algal community.--Copyright 1972, Biological Abstracts, Inc.
W72-12007

IRON BACTERIA IN SOME LAKES OF THE KARELIAN ISTHMUS,
Laboratory of Limnology, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W72-12015

RELATIONS BETWEEN FE IN IRRIGATION WATER AND LEAF QUALITY OF CIGAR WRAPPER TOBACCO,
Agricultural Research and Educational Center, Quincy, Fla.
For primary bibliographic entry see Field 03F.
W72-12028

CHANGES IN WATER QUALITY RESULTING FROM IMPOUNDMENT,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05G.
W72-12072

EFFECT OF CHLORINATION ON SELECTED ORGANIC CHEMICALS,
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 05B.
W72-12074

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES,
Bureau of Fisheries and Wildlife Service, Sacramento, Calif. Div. of River Basin Studies.
For primary bibliographic entry see Field 05B.
W72-12077

A STUDY OF THE EFFECTS OF A COMMERCIAL HYDRAULIC CLAM DREDGE ON BENTHIC COMMUNITIES IN ESTUARINE AREAS,
Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab.
M. F. Godcharles.
Technical Series No. 64, July 1971. 58 p, 6 fig, 13 tab, 34 ref. NOAA PL 88-309, Project No. 2-53-R.

Descriptors: *Florida, *Estuaries, *Dredging, *Clams, *Benthos, *Aquiculture, Benthic fauna, Vegetation regrowth, Grasses, Harvesting, Fish harvest.
Identifiers: Trynet sampling, Benthic plug sampling, *Dredging effects.

A systematic sampling program to study the effects of a Maryland soft-shell escalator clam dredge, the R/V Venus, on bottom habitats in Tampa Bay was conducted. Trynet samplings were taken before dredging and at various intervals after dredging. Benthic plug and sediment samples were included in the final sampling. Fauna were collected, identified, counted and measured. Recolinization of seagrasses had not occurred after more than one year after dredging. No increase of clam set was observed. Trynet haul analysis revealed no faunal variation between dredged and control areas. Benthic plug samples showed faunal differences at only one station. Dredging uprooted all vegetation and tracks remained from 86 to 500 days. An inventory of clams was conducted in Tampa and Boca Ciega Bays, Cedar Keys and the Tarpon Springs area. Results are given and recommendations are made to harvesters. (Ensign-PAI)
W72-12083

AQUATIC VASCULAR PLANT DISTRIBUTION IN CHEAT LAKE (LAKE LYNN), WEST VIRGINIA,
West Virginia Univ., Morgantown.
J. F. Clovis.
Castanea. Vol 36, No. 3, p 153-163. 1971. Illus. Map.
Identifiers: Mine acids, *Aquatic plants, Distribution, *Cheat Lake (W. VA.), Water pollution, Records, Wastes, West Virginia.

A compiling of the aquatic vascular plants of Cheat Lake, with notes as to their abundance and distribution, is given. Cheat Lake is fed by Cheat River, which is becoming increasingly mine-acid polluted, and a record of the plants and some present conditions was considered improtant to future studies. Ten new county records and 2 new state records are included.–Copyright 1972, Biological Abstracts, Inc.
W72-12085

PRELIMINARY INVENTORY OF MARINE INVERTEBRATES COLLECTED NEAR THE ELECTRICAL GENERATING PLANT, CRYSTAL RIVER, FLORIDA, IN 1969,
Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab.
W. G. Lyons, S. P. Cobb, D. K. Camp, J. A. Mountain, and T. Savage.
Professional Papers Series, No. 14, June 1971. 53 p, 10 fig, 5 tab, 73 ref.

Descriptors: *Florida, *Water pollution effects, *Electric powerplants, *Thermal pollution, *Invertebrates, *Distribution patterns, *Spawning, *Seasonal, *Temperature, *Salinity.
Identifiers: *Crystal River (Florida), Species composition.

An inventory of marine invertebrates in the estuarine area near the elecetrical generating plant at Crystal River, Florida, was taken. Two hundred and eight-six taxonomic groups of invertebrates were collected and studied for composition, distribution, spawning periods and seasonal occurrence in relation to the effects of heated effluents

from the adjacent power plant on these organisms. Temperature was of less importance than salinity in determining local distribution. Most Crystal River species are wide ranging forms capable of a wide variation of environmental conditions. Distribution patterns of these estuarine species ranged from the Gulf of Mexico to New England, others from the Carolinas to Brazil and some species from New England to Brazil. (Ensign-PAI)
W72-12087

IMPACT OF PETROLEUM SPILLS ON THE CHEMICAL AND PHYSICAL PROPERTIES OF THE AIR/SEA INTERFACE,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-12090

ECOLOGICAL CONSEQUENCES OF MARINE POLLUTION,
Ljubljana Univ., (Yugoslavia). Dept. of Biology.
J. Stirn.
Revue Internationale D'Oceanographie Medicale, Vol. 24, p 13-46, 1971. 7 fig, 7 tab, 45 ref.

Descriptors: *Pollutants, *Organic matter, *Sewage, *Primary productivity, *Secondary productivity, *Equilibrium, *Ecology, Physical properties, Nutrients, Trace elements, Vitamins, Amino acids, Plant physiology.
Identifiers: North Adriatic, North Africa coast (Lake of Tunis).

The effects of primary organic pollution on biological equilibrium and bioproduction were studied in the North Adriatic and northern African coastal waters. Physio-ecological stresses, regressions in specific diversity, reductions of natural interspecific competition and the nutritive and fertilizing effects of primary organic pollution were considered. Secondary organic pollution, under certain circumstances, causes an increase of bioproductivity in discharge areas. Marine primary productivity correlates in polluted environments with supplies of inorganic nutrients, trace elements, some vitamins, certain amino-acids, and unknown sewage born factors which may be related to plant hormonal activity. Control of marine organic pollution and possible constructive uses of this pollution are suggested. (Ensign-PAI)
W72-12094

MARINE AND FRESH WATER POLLUTANTS, (POLLUTIONS MARINES ET POLLUTIONS DES EAUX DOUCES),.
Institut Pasteur, Lille (France). Laboratoire d'-Hydrobiologie.
H. Leclerc.
Revue Internationale D'Oceanographie Medicale, Vol. 24, p 155-170, 1971. 32 ref. Article in French.

Descriptors: *Microbiology, *Pollutants, *Public health, *Epidemiology, *Industrial plants, *Standards, *Bacteria, *Salmonella, Outlets, Sewage bacteria, Waste water treatment, Sampling, Waste dilution, Diffusion, Resources, Investment, Productivity, Ecology.
Identifiers: *Vibrio parahaemolyticus, *Clostridium botulinum, Type E.

Microbial pollutants in the marine and freshwater environments are studied in regard to the pollutants' influence on public health. Stricter supervision of the marine consumable products industry is suggested. Investigation problems of the virus Salmonella as a contaminant are discussed. The inaccuracies in sampling, the inability of wastewater treatment to eliminate bacterial and viral pollutants, the dynamics of the bacterial particles at an outfall site, epidemiological surveys in recreation areas and the dilution and diffusion phenomena are dealt with taking into consideration the local resources, investments, marine productivity and ecology. (Ensign-PAI)
W72-12096

BIG BEEF ESTUARY PHYTOPLANKTON AND BACTERIA STUDIES 1968-1969,
Washington Univ., Seattle.
F. Palmer, J. Heller, J. Gatjens, and R. Hung.
Washington Sea Grant Program, WSG-MP 71-5, December 1971. 34 p. 12 fig, 8 tab, 4 ref. GH-9 and GH-40.

Descriptors: *Estuaries, *Data collections, *Phytoplankton, *Animal populations, *Bacteria, *Shellfish, *Indicators, *Ecology, *Washington.
Identifiers: *Big Beef Estuary (Wash), *Hood canal.

Data from studies at Big Beef Estuary are presented in tables and figures and each is explained. Estimates of phytoplankton populations, bacteria of shellfish sanitation significance, total food for shellfish and indicators of ecological change are emphasized. The data will be used to compare Big Beef with other estuaries and as a reference for future long-term changes at Big Beef. (Ensign-PAI)
W72-12097

INDUSTRIAL WASTES: EFFECTS ON TRINITY RIVER ECOLOGY, FORT WORTH, TEXAS.
Texas Christian Univ., Fort Worth. Dept. of Biology.

Copy available from GPO Sup Doc as EPA 18050 DBB 12/71, $1.50; microfiche from NTIS as PB-211 167, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971, 163 p, 21 fig, 77 tab, 77 ref, append. EPA Program 18050 DBB 12/71.

Descriptors: *Bioassay, Water quality, *Industrial effluents, Water pollution, *Toxicity, *Sewage effluents, *Benthic fauna, *Seston, Fish, Minnows, Fry, Channel catfish, Shiners, Bass, Sunfish, Fish eggs, Trace metals, Biochemical oxygen demand, Chemical oxygen demand, Conductivity, Food processing industry, Acid wastes, *Texas.
Identifiers: *Fish development, *Abioseston, *Bioseston, *Fort Worth (Tex), *Trinity River, Quantitative study, Distribution, Invertebrates, Turbidity, River discharge, Food processing wastes, Dissolved oxygen.

Toxicity of industrial effluents discharged directly into or in close proximity to the Trinity River was investigated through a 27-month period. The investigation was concerned with four aspects--bioassay, growth and development, chemistry and benthos. Three industries contributed toxic materials which had a significant influence on the surrounding aquatic community. Toxicity ranges were established for the respective effluents using mature minnows, fry and spawn. Fry surviving 96-hour exposure to some of the effluents later developed orientation problems and varied noticeably in growth. Fry were only slightly less resistant to the effluents than minnows, but were judged to be reasonably reliable bioassay test organisms. Effluents from a railroad equipment cleaning area, a plant producing cracking catalysts used in processing combustion engine fuels and a sewage treatment plant influenced the water quality of the river downstream from the outfalls. The ranges of nitrates, phosphates, biochemical oxygen demand and specific conductance for the river were increased by the effluents. Environmental stress was detected at the railroad equipment cleaning area outfall and even more at the plant producing cracking catalysts. Benthos were not able to live in the flocculent material discharged in the latter effluent. The drastic reduction in invertebrates at the sewage treatment plant is believed to have resulted from the chlorinated effluent.
W72-12109

EFFECTS OF LONG-TERM EXPOSURE TO CARBARYL (SEVIN) ON SURVIVAL, GROWTH, AND REPRODUCTION OF THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
National Water Quality Lab., Duluth Minn.
A. R. Carlson.
Journal of the Fisheries Research Board of Canada, Vol. 29, No. 5, 1972, p 583-587. 4 tab, 18 ref.

Descriptors: *Pesticide toxicity, *Carbamate pesticides, *Minnows, *Bioassay, Life history studies, *Spawning, *Toxicity, Water pollution effects.
Identifiers: *Carbaryl toxicity, *Acute toxicity, *Fathead minnows.

When fathead minnows (pimephales promelas) were exposed to five concentrations (0.008-0.68 mg/liter) of the insecticide carbaryl for 9 months and throughout a life cycle, the highest concentration prevented reproduction and decreased survival. At the high concentration, testes contained motile sperm and ovaries were in a flaccid condition and appeared to be in a resorptive state. At the 0.68 mg/liter concentration, carbaryl appeared to contribute to mortality of larvae (produced by unexposed parents) within 30 days of hatching. Survival of young grown in the 0.008 mg/liter concentration was reduced. Since no demonstrable effects were noted for survival, growth, or reproduction at the 0.017, 0.062, and 0.21 mg/liter concentrations, this low survival value is considered not due to carbaryl. The 96-hr median tolerance concentration (TL 50) and the lethal threshold concentration (LTC) for 2-month-old fathead minnows were 9.0 mg/liter. The maximum acceptable toxicant concentration (MATC) for fathead minnows exposed to carbaryl in water with a hardness of 45.2 mg/liter and a pH of 7.5 lies between 0.21 and 0.68 mg/liter. The application factors (MATC/96-hr TL50 and MATC/LTC) both lie between 0.023 and 0.075. (Lewis-EPA)
W72-12119

VIRUCIDAL ACTIVITY OF TWO IODOPHORS TO SALMONID VIRUSES,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
D. F. Amend, and J. P. Pietsch.
Journal of Fisheries Research Board of Canada, Vol. 29, No. 1, p 61-65, January 1972. 4 tab, 9 ref.

Descriptors: *Viricides, *Fish diseases, *Pesticide toxicity, *Viruses, Water pollution sources, Fish parasites, Pest control, Disinfection, *Salmonids, Pollutant identification, Fish eggs, Fish hatcheries.
Identifiers: *Iodophors, Infectious hematopoietic necrosis, Infectious pancreatic necrosis, Viral hemorrhagic septicemia, Betadine, Wescodyne, IHN virus, IPN virus, VHS virus, Iodinated hydrocarbon pesticides, Pimephales promelas, Fathead minnows.

The virucidal activities of Wescodyne (trademark) and Betadine (trademark) organic iodine complexes have been tested against infectious hematopoietic necrosis (IHN), infectious pancreatic necrosis (IPN), and viral hemorrhagic septicemia (VHS) viruses isolated from rainbow trout. The viruses were grown, isolated, diluted, and mixed with an equal volume of each diluted iodophor. Both iodophors were about equally effective on all three viruses. Each iodophor completely destroyed IHN virus within 30 seconds at 12 ppm iodine, and was not affected by water hardness. However, virucidal activity was reduced at pH levels above 8.0 in the presence of organic matter. After being compared with seven disinfectants commonly used in fish hatcheries for their virucidal activities against IHN virus, Wescodyne as well as chlorine were the only disinfectants to completely destroy the virus. Either Wescodyne or Betadine would effectively destroy the salmonid viruses at less than 25 ppm iodine within 5 minutes in solutions near neutrality. (Byrd-Battelle)
W72-12160

INACTIVATION OF VIBRIO PARAHAEMOLYTICUS IN DISTILLED WATER,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
J. S. Lee.
Applied Microbiology, Vol. 23, No. 1, p 166-167, January 1972. 2 fig, 5 ref.

Descriptors: *Pathogenic bacteria, *Inhibition, Aerobic bacteria, Osmosis, Water treatment, Water pollution control, Water quality, Osmotic pressure, Water quality control, Enteric bacteria, Pseudomonas.
Identifiers: *Inactivation, *Vibrio parahaemolyticus, *Distilled water, Cytolysis.

The osmotic fragility of Vibrio parahaemolyticus was demonstrated by placing a loopful of cells, grown on salt-supplemented Brain Heart Infusion agar (BHI), into sterile, glass-distilled water. A 1-ml sample of this suspension was resuspended in 99 ml of a sterile 3 percent NaCl solution at 1 minute intervals for 30 min. One-tenth-ml samples of appropriate dilutions were spread-plated on BHI agar and incubated for 24 hr at 37 C. It was discovered that 90 percent of the cells are readily inactivated within 0.9-4.4 min, and that increasing cultural age imparted only slight resistance against inactivation. (Mackan-Battelle)
W72-12163

EFFECT OF PH ON THE PATHOGENIC FUNCTIONS OF SALMONELLA TYPHIMURIUM,
McGill Univ., Sainte Anne de Bellevue (Quebec). Dept. of Microbiology.
E. S. Idziak, and P. Suvanmongkol.
Canadian Journal of Microbiology, Vol. 18, No. 1, p 9-12, January 1972. 2 fig, 4 tab, 16 ref.

Descriptors: *Pathogenic bacteria, *Toxicity, *Hydrogen ion concentration, Aerobic bacteria, Salmonella, Acidity, Alkalinity, Separation techniques, Food processing industry, Water pollution effects, Acidic water, Water properties.
Identifiers: *Salmonella typhimurium, Culture media, Endotoxin.

Toxicity changes of Salmonella typhimurium appear related to pH changes during incubation and growth. To test this, shake cultures of the microbe were incubated at 37 C on a growth media of Brain Heart Infusion (BHI) agar at pH 5.5, 7.5, and 9.5. Cells for endotoxin extraction were grown at 37 C in 10 l of pH adjusted test media in an impeller drawn fermentor. Cell suspensions were centrifuged washed in saline, and divided for identification and lyophilization. A crude endotoxin (LPS) was extracted from the lyophilized cells by a phenol-water procedure and the toxicity of the extract assayed by inoculating the chorioallantoic membrane of 10-day chick embryos. The infectivity and virulence of the cells grown at different pH levels were determined by inoculating the yolk sac of 1 day old chicks. Results of the testing show that Salmonella typhimurium increased in virulence during growth in an acid environment whereas in a near neutral environment, the reverse was true. The lipopolysaccharide content of acid- and alkaline-grown cells remained relatively constant during growth, but that in neutral-grown cells decreased. The crude endotoxin extracted from acid-grown cells was slightly more toxic than that extracted from either neutral-or alkaline-grown cells. (Mackan-Battelle)
W72-12165

ACCUMULATION OF ALDEHYDE INTERMEDIATE BY PSEUDOMONAS AERUGINOSA IN GROWING CULTURE ON TETRADECANOL, (ANREICHERUNG DER ALDEHYDZWISCHENSTUFE AUS DER WACHSENDEN KULTUR VON PSEUDOMONAS AERUGINOSA BEIM ABBAU VON TETRADECANOL),
Muenster Univ. (West Germany). Institut fuer Mikrobiologie.
For primary bibliographic entry see Field 05B.
W72-12170

USEFULNESS OF CULTURES IN THE TAXONOMY OF BLUE-GREEN ALGAE, (BENUTZUNG VON KULTUREN IN DER BLAUALGEN-TAXONOMIE),
Ceskoslovenska Akademie Ved, Trebon. Botanicky Ustav.
J. Komarek.
Schweizerische Zeitschrift fur Hydrologie, Vol. 33, No. 2, p 553-565, December 1971. 3 fig, 2 tab, 17 ref.

Descriptors: *Cyanophyta, *Cultures, *Systematics, Classification, *Aquatic algae.
Identifiers: Cultuturing techniques, Culture media, Algology, Taxon.

Cultivation, behavior pattern and other difficulties arising from the study of blue-green algae in cultures are studied. Some of the properties of the Cyanophyta which cause complications in taxonomy include the following: (1) Special nutrient solutions are needed for many strains; (2) The great variety of ecological needs places particular demands on cultivation and presupposes technical equipment which cannot be standardized; (3) Atypical forms that do not correspond to ecotypes in nature result when many of the strains are cultivated; (4) It is difficult to draw general conclusions from the relatively small amounts of comparable data obtained from parallel experiments. However, cultivation is recommended for the following cases: (a) study of potential variability in the clonal population; (b) comparison of induced variability of one feature in several strains; (c) definition of quantitative or qualitative differences among some strains or verification of their taxonomical identity; (d) determination of ultrastructural, physiological and biochemical properties of a taxon. (Snyder-Battelle)
W72-12172

MICROBIAL DEGRADATION OF STEROLS,
Searle (G.D.) and Co., Chicago, Ill. Div. of Biological and Biochemical Research.
For primary bibliographic entry see Field 05B.
W72-12174

SURVIVAL OF VIBRIO PARAHAEMOLYTICUS IN SHRIMP TISSUE UNDER VARIOUS ENVIRONMENTAL CONDITIONS,
Texas A and M Univ., College Station. Dept. of Animal Science.
C. Vanderzant, and R. Nickelson.
Applied Microbiology, Vol 23, No 1, p 34-37, January 1972. 4 fig, 7 ref.

Descriptors: *Pathogenic bacteria, *Shrimp, *Environmental effects, Aerobic bacteria, Resistance, Hydrogen ion concentration, Temperature, Freezing, Cultures, Heat resistance, Enteric bacteria.
Identifiers: *Vibrio parahaemolyticus, *Survival, *Tissue culture, Culture media, Sample preparation, Pseudomonads, Biological samples.

In order to determine its role in foodborne illness, Vibrio parahaemolyticus, culture O, was isolated from Gulf Coast shrimp and maintained on trypticase soy agar slants at 25C. Survival studies involved inoculation of whole or homogenated uninfected, skinned shrimp and then subjecting the samples to freezing (3,7,10, minus 18C), heating (60,80,100C) and changing pH (1-10). In another test, cells were added to porcine gastrointestinal contents. After treatment samples were stored and plated for counting at intervals of 0-8 days. Counts were made by spreading appropriate dilutions on either MT medium or TSA plates and incubating for 24 hr at 35C. Although large decreases in viable populations occurred during storage for 2 days at 10 to minus 18C, survivors were present even after 8 days. No significant differences were observed in the population changes of inoculated whole shrimp as compared with shrimp homogenates. Low populations 500/ml of V. parahaemolyticus were destroyed by heating shrimp homogenates at 60, 80, and 100C for 1 min. With larger populations 200,000/ml, some survivors were present after heating at 60 and 80C for 15 min. None survived 1 min at 100C. V. parahaemolyticus was very sensitive to pH values below 6.0. Cells survived for several hours in the contents of the porcine gastrointestinal tract. (Mackan-Battelle)
W72-12181

BIOLOGICAL IMPACT OF A LARGE-SCALE DESALINATION PLANT AT KEY WEST,
Westinghouse Ocean Research Lab., Annapolis, Md.
R. H. Chesher.
Copy available from GPO Sup Doc as EPA 18080 GBX 12/71 for $1.25; microfiche from NTIS as PB-211 183, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 150 p, 60 fig, 10 tab, 45 ref, append. EPA Program 18080 GBX 12/71.

Descriptors: Water pollution effects, *Desalination plants, *Biological communities, *Copper, *Toxicity, Thermal stratification, Subtropic, *Florida, Thermal pollution, Ions, *Flash distillation, Corrosion.
Identifiers: *Key West, Multi-stage-flash evaporation process.

An eighteen month biological study showed the heated brine effluent from a desalination plant in Key West, Florida caused a marked reduction in biotic diversity. Some organisms were more abundant in the receiving waters than in control areas but these were generally capable of isolating themselves from the effluent by closing up or by moving to other areas during periods of high contamination. Ionic copper, discharged from the plant, was the most toxic feature of the effluent. Temperature and salinity of the effluent and the receiving water were such that the effluent stratified at the bottom of the receiving basin. This stratification reduced water circulation and the man-made harbor acted as a settling basin which lessened the impact of the discharge on surrounding natural environments. Periodically, the plant shut down for maintenance or cleaning. When it resumed operations, low temperature water of ambient salinity was discharged which was highly contaminated with ionic copper. These sudden effusions caused more biological damage than steady-state conditions. At the end of the study, extensive engineering changes were made to correct corrosion problems and lower copper discharge.
W72-12188

LAKE SUPERIOR PERIPHYTON IN RELATION TO WATER QUALITY,
Minnesota Univ., Minneapolis.
T. A. Olson, and T. O. Odlaug.
Copy available from GPO Sup Doc as EPA 18050 DBM 02/72 for $2.00; microfiche from NTIS as PB-211 185, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, February 1972. 253 p, 171 fig, 41 tab, 7 ref, 4 append. EPA Program 18050 DBM 02/72 (formerly WP-00828).

Descriptors: *Chlorophyll, *Plant pigments, Aquatic productivity, *Primary productivity, *Algae, *Diatoms, *Periphyton, *Phytoplankton, *Sessile algae, *Lake Superior, Limnology, Fertility, Photosynthesis, Respiration, Eutrophication, Plant population, Classification, Sampling, Chlorophyta, *Chrysophyta, Cyanophyta.

Laboratory and field studies were conducted to evaluate the importance of periphyton in western Lake Superior with special reference to the make-up and distribution of the periphyton growths and to the overall importance of productive capacity of

this assemblage of organisms. The taxonomic portion of the investigation indicated that over 90% of the total number of organisms were diatoms and that the phyla to which these diatoms belonged were the Chrysophyta, the Chlorophyta, and the Cyanophyta. Predominant genera were Synedra, Achnanthes, Navicula, Cymbella, and Comphonema. In many respects, the periphyton of Lake Superior was similar to that found in streams and there was evidence that the interrelated factors that affected periphyton growths were temperature, light intensity, depth of water, water movements, nutrient levels, and the type of substrate. Artificially denuded rocks demonstrated definite re-growth but after 46 days this growth level was only 18% of that occurring naturally. The mean total counts of organisms in the primary sampling area ranged from 497,000 to 1,470,000 per square centimeter of rock surface. Studies of the pigment concentrations showed that the biomass of periphyton along the North Shore of Lake Superior resemble those of other oligotrophic bodies of water and range from 0.338 to 3.59 mg of total pigment per 100 square centimeters of rock surface. The average was 1.36 mg per 100 square centimeters of rock surface. Pigment ratios indicated that the Lake Superior periphyton was dominated by the Chrysophyta.
W72-12192

CONCENTRATION FACTORS FOR RADIONUCLIDE UPTAKE BY BIOTA OF THE RIVER GARIGLIANO (DETERMINAZIONE DI FATTORI DI CONCENTRAZIONE IN COMPONENTI ABIOTICI E BIOLOGICI DEL FIUME GARIGLIANO),
Comitato Nazionale per l'Energia Nucleare, Cassaccia (Italy). Laboratorio Radioattivita Ambientale.
A. Antonelli, M. Castaldo, L. Cigna Rossi, U. Laneri, and R. Pagnotta.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 15 p, 7 tab, 8 ref.

Descriptors: *Nuclear powerplants, *Nuclear wastes, *Radioactivity effects, *Water pollution effects, Estuarine environment, Cobalt radioisotopes, Food chains, Fish, Crustaceans, Gastropods, Vegetation, Radioecology, Absorption.
Identifiers: Cesium radioisotopes, *Garigliano River (Italy).

Discharges from a nuclear powerplant to the Garigliano River produced measurable effects in the estuary about 12 kilometers downstream. From measurements on samples and from an estimate of the radioactivity of the water (based on monthly values of the radionuclides discharged and the average river flow rate), concentration factors were calculated - fish: Co, 25-55; Cs, 300-700 - crustaceans: Co, 800-4600 - gastropods: Co, 3500-13,000 - sediment: Co, 4000-6400 - plants: Co, 14,000-16000. (Bopp-ORNL)
W72-12200

EFFECTS OF ACUTE BETA AND GAMMA RADIATION ON DEVELOPING EMBRYOS OF CARP (CYPRINUS CARPIO),
Oak Ridge National Lab., Tenn. Health Physics Div.
B. G. Blaylock, and N. A. Griffith.
Radiation Research, Vol 46, p 99-104, 1971. 2 tab, 9 ref.

Descriptors: *Carp, *Growth stages, *Radioactivity effects, Water pollution effects, Radiosensitivity, Lethal limit.
Identifiers: *Cyprinus carpio.

The one-cell stage of the developing carp eggs was relatively resistant to both acute beta and gamma radiation (LD50 doses were 500.5 rads for beta and 601.3 rads for gamma radiation). Dose rates were 7.1 rads/sec for gamma radiation and 1.4 rads/sec for beta radiation; thus for a dose of 1000 rads the developing eggs would be exposed for 2.3 minutes for a gamma dose and 11.9 minutes for a beta dose. Although the eggs would still be in the one-cell stage following a 1000-rad dose of beta radiation, this is a very active stage of development shortly before cell division and the radiation sensitivity of the egg could change rapidly. (Bopp-ORNL)
W72-12220

EXPERIMENTAL-ECOLOGICAL INVESTIGATIONS ON PHAEOCYSTIS POUCHETI (HAPTOPHYCEAE): CULTIVATION AND WASTE WATER TEST,
Biologische Anstalt Helgoland (West Germany).
H. Kayser.
Helgolaender wissenschaftliche Meeresuntersuchung, Vol 20, p 195-212, 1970. 13 fig, 6 ref.

Descriptors: *Marine algae, *Laboratory tests, *Chemical waste, *Growth rates, *Seawater, *Toxicity, *Nutrients, Lethal limits, Methodology, Industrial wastes, Domestic wastes, Bioassay, Sulfates, Iron compounds, Sewage, Nitrates, Phosphates.
Identifiers: Silt-water-plant relationships, North Sea, Phaeocystis spp., Soil cultures, Titanium dioxide wastes, Helgoland.

The influence of light, temperature, nutrients, industrial and domestic wastes on the alga, Phaeocystis poucheti, under laboratory conditions was observed. The multiplication rates of the various stages in soil, nitrate and phosphate solutions, and seawater solutions under various cultural methods was determined. Industrial waste water (consisting primarily of H_2SO_4 and $FeSO_4$) from a titanium dioxide factory favors the growth of the colony stage of P. poucheti in a dilution of 1 part waste water to 100,000 parts of nutrient medium. A dilution of 1:4000 significantly reduces the multiplication rates of colonies. A dilution of 1:2250 is lethal. Unfiltered domestic sewage in concentrations of 1-5 parts of sewage to 1000 parts of sea water results in a vigorous development of the colony stage, which is followed by damage to the colonies. The single cell stage shows slightly increased multiplication rates all of the time. Ten parts of sewage to 1000 parts seawater results in toxicity to both stages. (Katz-Washington)
W72-12239

MODIFICATION OF SOME PHYSIOLOGICAL METHODS FOR ESTIMATION OF WATER QUALITY AND THEIR RELATIONSHIP TO DEGREES OF SAPROBITY (MODIFIKACE VYBRANYCH FYZIOLOGICKYCH METOD STANOVENI KVALITY VODY A JEJICH VZTAH K STUPNUM SAPROB ITY),
Vysoka Skola Chemico-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
D. Matulova.
Vodni Hospodarstvi, Vol 9, p 393-395, 1967. 1 tab, 18 ref. English summary.

Descriptors: *Water quality, *Bioindicators, *Water analysis, *Bioassay, *Comparative productivity, Aquatic microbiology, Eutrophication, Municipal wastes, Freshwater algae, Water pollution effects, Domestic wastes, Industrial wastes, Environmental effects, Analytical techniques, Physiological ecology, Plant physiology.
Identifiers: *Algal culture, *Biomass titer, *Biological index, *Saprobity, Prague, Czechoslovakia, Laboratory procedures, Statistical procedures, BMT.

Studies were made with sewage and industrial wastes collected from several areas near Prague, especially where the Botic empties into the River Vltava, to determine its effect on algae. A technique was developed to evaluate its toxicity to algae. On the basis of results obtained using the biomass titer (BMT) as a criterion, a biological index of water quality was obtained. The index enabled the calculation of different degrees of saprobity. The values obtained by the laboratory experiments were compared with findings in the field. A good correlation of beta saprobic to polysaprobic waters was found. (Katz-Washington)
W72-12240

INFLUENCE OF DILUTED SEAWATER ON THE PHYSIOLOGICAL ACTIVITY OF BABY--NECK CLAM, VENERUPIS JAPONICA, AND THE TOXIC EFFECT OF A HERBICIDE PCP, PENTACHLOROPHENATE,
K. Okubo, and T. Okubo.
Bulletin of the Tokai Regional Fisheries Research Laboratory, No 44, p 31-40, October 1965. 6 fig, 7 tab, 12 ref. Japanese with an English summary.

Descriptors: *Pentachlorophenate, *Water pollution, *Brackish-water fish, *Fish physiology, *Marine fish, *Clams, *Animal physiology, *Osmotic pressure, *Salinity, *Toxicity, *Bioassay, Fishkill, Benthic fauna, Mollusks, Water pollution effects.
Identifiers: Japan, Rainfall, Kyushyu, PCP, Pentachlorophenol, Body fluids.

A mass destruction of littoral fishes and clams occurred in early July, 1961 and 1962, on the coast of the Ariake Sea, Kyushu, Japan. It was reported to have taken place just after use of a herbicide (PCP), followed by a heavy rainfall. Laboratory experiments mainly on osmotic pressures of body fluids of V. japonica and the toxic effect of PCP were carried out. The osmotic pressures of body fluids of V. japonica are easily balanced with those of diluted seawater, but they never decrease beyond the threshhold value corresponding to the concentration of seawater, i.e. 5.5 ppt chlorinity. In seawater of about 5.5 ppt chlorinity, the tolerance of V. japonica to PCP drops to one-tenth the normal value. With the recovery of chlorinity of the seawater to the normal level, the osmotic pressures of body fluids and physiological activity of V. japonica resume rapidly. (Katz-Washington)
W72-12241

SHRIMPS IN RELATION TO OXYGEN DEPLETION AND ITS ECOLOGICAL SIGNIFICANCE IN A POLLUTED ESTUARY,
King's Coll., London (England).
R. Huddart, and D. R. Arthur.
Environmental Pollution, Vol 2, p 13-35, 1971. 10 fig, 1 tab, 10 ref.

Descriptors: *Shrimp, *Dissolved oxygen, *Estuarine environment, *Water pollution effects, Oxygen sag, Migration, Ecology, Computer models, Mathematical models, Bioassay.
Identifiers: Oxygen depletion, Tidal currents.

There is a substantial body of evidence that the lack of shrimp at any one time during their season is associated with low oxygen tension of Thames River estuarine water. A major effect of reducing the oxygen tension for shrimp is stimulated swimming, during which they move upward more vertically through the water. The ecological implications in a polluted estuary are that the higher the vertical height attained by the shrimp the longer they take to sink passively downward. The longer they take to sink, the greater will be the distance covered horizontally when they are transported by the tidal current, and the faster the current the greater will be this distance. Within the context of the tidal Thames with its 14.5-km tidal excursion, the results have been computer-simulated and a model of shrimp migration suggested. (Svensson-Washington)
W72-12242

EFFECT OF HEAVY METALS ON MORTALITY AND GROWTH,
Queen Mary Coll., London (England).
B. Brown, and M. Ahsanullah.
Marine Pollution Bulletin, Vol 2, No 12, p 182-188, December 1971. 7 fig, 4 tab, 17 ref.

Descriptors: *Heavy metals, *Mortality, *Growth rates, Mercury, Copper, Cadmium, Iron, Lead, Bioassay, Aquatic animals, Toxicity, Brine shrimp, Worms, Larvae, Water pollution effects, Zinc.
Identifiers: *Sublethal effects, Artemia spp., Ophryotrocha spp.

Toxicity of heavy metals is usually measured in acute tests, but in a natural situation their sublethal effects may be at least as damaging. The effect of heavy metals on the growth rate of a worm and a brine shrimp, as well as on their mortality, are discussed. (Svensson-Washington)
W72-12243

NITROGEN GAS BUBBLE DISEASE RELATED TO A HATCHERY WATER SUPPLY FROM THE FOREBAY OF A HIGH-HEAD RE-REGULATING DAM,
Oregon Fish Commission, Clackamas.
E. J. Wyatt, and K. T. Beiningen.
Fish Commission of Oregon Research Report 3, p 3-12, November 1971. 3 fig, 1 tab, 11 ref.

Descriptors: *Nitrogen, *Fishkill, *Fish diseases, Pathology, Bioassay, Mortality, Fish hatcheries, Salmonids, Forebays, Dams, Chinook salmon, Water chemistry, Hydraulic properties, Fish behavior, Water pollution effects, Water pollution sources, Water pollution.
Identifiers: *Gas bubble disease, Nitrogen supersaturation, Embolism, Foster dam, Steelhead, Fish pathology.

Studies of the water supply system at the Fish Commission of Oregon's South Santiam River Hatchery were made following the loss of nearly a half million salmonid fishes due to gas embolism. Hatchery water from the forebay of adjacent Foster Dam had become supersaturated with dissolved nitrogen as the result of air entering the supply system. Experiments revealed that fish were exposed to concentrations in excess of 150% of saturation and rapidly died from the effects of gas bubble disease. Biological assay data regarding supersaturation rates, exposure times, death rates, and gross pathology are reported. (Svensson-Washington)
W72-12244

EFFECTS OF PETROLEUM MICROORGANISMS, AS DIET, UPON THE GROWTH RATE AND BLOOD PROPERTIES OF SEA BREAM, CHRYSOPHRYS MAJOR TEMMINCK AND SCHLEGEL,
Hiroshima Univ. (Japan).
K. Nanba, S. Murachi, C. Kitajima, and T. Matsuzato.
Journal of the Faculty of Fisheries and Animal Husbandry, Hiroshima University, Vol 10, No 1, p 21-27, July 1971. 1 fig, 4 tab, 12 ref.

Descriptors: *Fish diets, *Fish food organisms, Aquatic microorganisms, Growth rates, Fish physiology, Bioassay.
Identifiers: *Petroleum microorganisms, Blood properties, Sea bream, Cholesterol, Chrysophrys spp.

Investigations have been carried out in order to see the effects of the introduction of petroleum microorganisms in the diet of cultivated marine fishes. Sea bream were used as the experimental fish. Studies were made by comparing the growth rates and blood properties of fish under two types of feeding, i.e. feeding on a diet containing petroleum microorganisms vs. a diet of fish meal alone. (Svensson-Washington)
W72-12245

MORPHOLOGICAL CHARACTERS OF YOUNG BREAM INHABITING THE ZONE AFFECTED BY THE WASTE WATER OF THE KONAKOVO POWER STATION,
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
T. S. Zhiteneva.
Journal of Ichthyology, Vol 11, No 3, p 439-443, 1971. 1 fig, 2 tab, 12 ref.

Descriptors: *Fish physiology, *Heated water, *Water pollution effects, Water temperature, Power plants, Aquatic environment, Thermal pollution, Water quality, Fish populations, Reservoirs, Water water (Pollution).
Identifiers: Bream, Morphological characters, Morphological ratios.

A comparative study of the morphology of the bream (Abramis brama orientalis) was made to evaluate the effects from the discharge of heated waters from the Konakovo power station into Ivan'kovo reservoir. Young bream 2+ yrs old inhabiting the zone of waste water are characterized by a lower figure of relative body depth than the young bream from other areas of the reservoir. This is explained by the adverse feeding conditions for the bream in the zone of waste water from the power station. The morphological features which distinguish young bream of the warm water zone from the young of other areas of the reservoir (low body depth, greater range of variation in the relative magnitude of a number of characters) justify the assumption that the young bream keep to permanent feeding grounds in the spring, summer and fall, and that one of these is the warm water zone. (Svensson-Washington)
W72-12246

WATER QUALITY OF SOME LOGGED AND UNLOGGED CALIFORNIA STREAMS,
California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
For primary bibliographic entry see Field 04C.
W72-12248

AN ESTIMATE OF MORTALITY OF CHINOOK SALMON IN THE COLUMBIA RIVER NEAR BONNEVILLE DAM DURING THE SUMMER RUN OF 1955,
Bureau of Commercial Fisheries, Auke Bay, Alaska. Biological Lab.
T. R. Merrell, Jr., M. D. Collins, and J. W. Greenough.
US Fish Wild Serv Fish Bull. Vol 68, No 3, p 461-492. 1971. Illus. Maps.
Identifiers: Bonneville Dam, *Columbia River, *Mortality, Oncorhynchus-Tshawytscha, *Chinook salmon.

In 1955 the Oregon Fish Commission estimated the numbers of dead chinook salmon, Oncorhynchus tshawytscha, near Bonneville Dam and studied the probable causes of death. The estimates of numbers of dead fish were made from ratios of tagged to untagged floating carcasses below the dam. Tagged salmon carcasses were released at the dam, and the river below the dam was searched systematically to recover tagged and untagged carcasses. The introduced tagged carcasses and the untagged carcasses of fish that died in the river were assumed to have equal chances of recovery, provided they were not too severely mutilated to be recoverable. This assumption was verified experimentally. On June 30 and July 1, 1955, when riverflows were relatively high, 1169 tagged chinook salmon carcasses were released at Bonneville Dam. Thirty-one tagged and 117 untagged carcasses were recovered in searches down-stream from the release point. On the basis of these recoveries, an estimated 4412 summer-run chinook salmon died near the dam between June 21 and July 10. On the basis of this estimate, 16.8% of the total chinook salmon run died at Bonneville Dam in this period. The numbers of floating carcasses in 1954 and 1955 were directly related to spillway discharge; greatest numbers of floating dead fish coincided with Columbia River flows in excess of 7100 c.m.s. (m cu/sec). At Bonneville Dam fall chinook salmon runs have never been subjected to flows above 7100 c.m.s. (killing flows); spring runs are exposed to such flows in some years; and summer runs nearly always encounter such flows. Water temperature, turbidity, disease, and injuries from gill nets did not affect the number of carcasses. Although the specific causes of death and the precise areas at Bonneville Dam where death occurred were not determined in our study, the major source of chinook salmon mortality was associated with the spillway during high flows. Other investigators subsequently demonstrated that during high flows the Columbia River that has plunged over dam spillways in supersaturated with atmospheric N. This supersaturation may be one of the principal causes of death of fish at mainstream dams. Bonneville Dam is only about 18.3 m high, and hundreds of thousands of salmon successfully negotiate the fishways each yr; yet many salmon are killed during periods of high flow. Complacency about the efficiency of salmon passage over large dams is, therefore, unwarranted, even when elaborate well-designed passage facilities are present and few dead or injured fish are noticed.--Copyright 1972, Biological Abstracts, Inc.
W72-12250

A PROPOSED BIOCHEMICAL MECHANISM OF THE TOXIC ACTION OF DDT,
Illinois Natural History Survey, Urbana.
R. C. Hiltebran.
Transactions of the Illinois State Academy of Science, Vol 64, No 1, p 46-54, 1971. 2 tab, 44 ref.

Descriptors: *DDT, *Pesticide toxicity, *Enzymes, *Fish physiology, *Bioassay, *Inhibitors, Pesticides, Insecticides, Biochemistry, Metabolism, Oxygen, Freshwater fish, Magnesium, Manganese, Pesticide kinetics, Chlorinated hydrocarbon pesticides.
Identifiers: *Biochemical mechanisms, *Bluegills, Succinate, Mitochondria, Alpha-ketoglutarate, Adenosinetriphosphate.

DDT at 5.9 x 0.0001 g/ml of reaction medium inhibited oxygen uptake by bluegill liver mitochondria in the presence of succinic acid. DDT increased the hydrolysis of adenosinetriphosphate in the presence of magnesium and manganese ions. A biochemical mechanism of the toxic action of DDT is suggested. (Svensson-Washington)
W72-12251

SEASONAL CHANGES OF THE HETEROTROPHIC MICROFLORA OF THE ILAWA LAKES BOTTOM DEPOSITS,
Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland).
S. Niewolak.
Polskie Archiwum Hydrobiologii, Vol 15 (28), No 3, p 211-224, 1968. 5 fig, 2 tab, 42 ref.

Descriptors: *Aquatic microorganisms, *Bottom sediments, *Seasonal, *Annual succession, Aquatic bacteria, Aerobic bacteria, Spores.
Identifiers: *Ilawa Lakes (Poland), Heterotrophic bacteria, Poland, Spore forming bacteria, Proteolytic bacteria, Sandy bottom, Mud bottom.

The distribution of the heterotrophic microflora in the bottom sediments of the Ilawa lakes depends mainly on the bottom type. The total number of heterotrophic bacteria, aerobic spore forming bacteria, proteolytic bacteria, as well as those liberating ammonia is higher in bottom deposits of the muddy type, lower in sandy bottom deposits. Seasonal fluctuations in the development of heterotrophic bacteria display a regularity, that is maximum numbers of bacteria occur in the vegetative period, minimum numbers in winter. The bot-

tom deposits of the lake Jeziorak Maly, which is polluted with industrial effluents and farm sewage, contain a heterotrophic flora greater in number, the maximum of bacteria occurring at different seasons, sometimes also in winter. (LeGore-Washington)
W72-12254

THE INFLUENCE OF ALCOHOL EXTRACTS OF SOME ALGAE (CHLORELLA AND SCENEDESMUS) ON AQUATIC MICROORGANISMS,
Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland).
S. Niewolak.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 31-42, 1971. 1 fig, 3 tab, 25 ref.

Descriptors: *Algal toxins, *Inhibition, *Chlorella, *Scenedesmus, Aquatic microorganisms, Aquatic bacteria, Aquatic algae, Algae, Chlorophyta, Pseudomonas, Enteric bacteria.
Identifiers: Bacillus, Micrococcus, Gram negative bacteria.

Alcohol extracts of algae of the general Chlorella and Scenedesmus inhibit the development of about 20% of water microorganisms. Particularly vulnerable are Gram-positive bacteria of the genera Micrococcus and Bacillus. Among the Gram-negative bacteria, the greatest number of vulnerable strains can be found in the Pseudomonas group and in the Enterobacteriaceae family. Chlorella extracts have more extensive scope of antagonistic action than have Scenedesmus extracts. The latter, however, are more active and they inhibit the growth of bacteria in larger areas. (LeGore-Washington)
W72-12255

A WINTER SPORT FISHING SURVEY IN A WARM WATER DISCHARGE OF A STEAM ELECTRIC STATION ON THE PATUXENT RIVER, MARYLAND,
Benedict Estuarine Lab., Md.
C. J. Moore, and C. M. Frisbie.
Chesapeake Science, Vol 13, No 2, p 110-115, June 1972. 2 fig, 3 tab, 4 ref.

Descriptors: *Winter sports, *Fishing, *Sport fishing, *Creel census, *Thermal pollution, *Water temperature, Warm-water fishing, Recreation, Heated water, Water pollution effects, Thermal powerplants, Maryland, Discharge (Water), Review, White perch, Thermal water, Water pollution sources, Steam turbines, Electric power, Outlets, Maryland.
Identifiers: Warm water discharge, Patuxent River (Maryland), Discharge canal, Fishing intensity, Fishing pressure, Catch per unit effort, Morone spp.

An interview-count sport fishing survey was conducted from January through April, 1970, along a one mile discharge canal of the Potomac Electric Power Company's Steam Electric station located at Chalk Point, Maryland. The study was to investigate the fishery in a warm water discharge. An estimated 20,335 fishing trips, representing 77,943 hrs of fishing, were made during the period sampled. On interview days, 8,758 fishermen were counted, and 4,716 were interviewed. An estimated 58,453 fish, representing 9 species, were taken, with an average of 0.71 fish caught per man-hour of effort. White perch, Morone americana, dominated the catch during all months sampled. No significant correlation could be made between water temperature of the canal and number of fish caught per man-hour of effort. (Katz-Washington)
W72-12256

TOXICITY OF MERCURY COMPOUNDS TO AQUATIC ORGANISMS AND ACCUMULATION OF THE COMPOUNDS BY THE ORGANISMS,
Freshwater Fisheries Research Lab., Tokyo (Japan).
Y. Matida, H. Kumada, S. Kimura, Y. Saiga, and T. Nose.
Bulletin of the Freshwater Fisheries Research Laboratory, Vol 21, No 2, p 197-227, 1971. 4 fig, 11 tab, 33 ref.

Descriptors: *Mercury, *Public health, *Shellfish, Water pollution effects, Toxicity, Water pollution, Food chains, Path of pollutants, Bioassay, Fish, Rainbow trout, Aquatic life, Aquatic environment, Fish physiology, Algae, Daphnia.
Identifiers: *Mercury compounds, *Minamata Disease, Biological magnification, Minamata Bay (Japan), Organic mercury compounds, Biosynthesis, Guppies.

This study confirmed that fish feeding on mercury-contaminated organisms from Minamata Bay, Japan, suffer from mercury poisoning. The results of studies of chronic toxicity to fish of toxic shellfish containing some methyl mercury compounds and of various mercury compounds are discussed. In addition, the results of some experiments on biological magnification of mercury compounds through the food chain from phytoplankton to fish, and on biosynthesis of organic mercury from inorganic mercury are considered. (Svensson-Washington)
W72-12257

THE INFLUENCE OF INCUBATION TEMPERATURE ON TOTAL COUNTS OF BACTERIA IN WATER (WPLYW TEMPERATURY INKUBCJI WYSIEWOW NA OZNACZANIE OGOLNEJ LICZBY BAKTERII W WODZIE),
Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland). Katedra Mikrobiologii Technicznej.
S. Niewolak.
Zeszyty Naukowe Wyzszej Szkoly Rolniczej w Olsztynie, Vol 23, No 581, p 513-521, 1967. 2 tab, 13 ref.

Descriptors: *Aquatic bacteria, *Water temperature, *Temperature, Aquatic microorganisms, Incubation, Seasonal, Annual succession.
Identifiers: *Incubation temperature, *Ilawa Lakes (Poland), Lake water, Poland.

Studies were carried out on the influence of incubation temperature on total counts of bacteria in lake water of the Ilawa region, when inoculated and grown on broth-agar medium at 20 and 26C. Considerable variations in bacterial counts were found in summer and in winter as determined at the above mentioned temperatures. The same is true regarding the morphological composition of the microflora determined. The total year counts of bacteria were, however, only 10% higher when incubated at 20C (for 7 days) than when incubated at 26C. These differences were statistically insignificant. (LeGore-Washington)
W72-12258

MICROBIOLOGICAL CHARACTERIZATION OF GROUND DEPOSITS IN THE LAKES OF THE DISTRICT OF ILAWA IN THE YEARS OF 1960-1963 (CHARAKTERYSTYKA MIKROBIOLOGICZNA OSADOW DENNYCH JEZIOR ILAWSKICH W LATACH 1960-1963),
Wyzsza Szkola Rolnicza, Olsztyn-Kortowa (Poland). Katedra Mikrobiologii Technicznej.
S. Niewolak.
Zeszyty Naukowe Wyzszej Szkoly Rolniczej w Olsztynie, Vol 26, No 784, p 613-635, 1970. 7 fig, 6 tab, 43 ref.

Descriptors: *Aquatic microorganisms, *Aquatic bacteria, *Bottom sediments, *Seasonal, *Annual succession, Aerobic bacteria, Spores.
Identifiers: *Ilawa Lakes (Poland), Poland, Spore forming bacteria, Sandy bottom, Clay bottom, Gram negative bacteria, Gram positive bacteria.

Microbiological studies of Lakes Jeziorak Maly and Jeziorak (Poland) were carried out. Clay bottoms contained more bacteria than did sandy bottoms. Seasonal variations in the counts of saprophytic and proteolytic bacteria reached their highest values in summer and autumn, when the accumulation of organic substances considerably increased. Gram-positive bacilli dominated among the bacteria. Average percentages of cocci and Gram-negative bacteria were 30% and 18-30%, respectively. Spore-forming bacteria seemed very scarce in the lakes studies. (LeGore-Washington)
W72-12259

UPTAKE OF POLYCHLORINATED BIPHENYLS FROM SEA WATER BY GAMMARUS OCEANICUS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick).
D. J. Wildlish, and V. Zitko.
Marine Biology, Vol 9, No 3, p 213-218, May 1971. 5 fig, 6 tab, 13 ref.

Descriptors: *Absorption, *Polychlorinated biphenyls, *Aroclors, Sea water, Industrial wastes, Crustaceans, Weight, Feeding rates, Animal metabolism.
Identifiers: Gammarus spp., Intermolt, Aroclor 1254, Corexit 7664, Body weight, Surface area, Exposure time.

The uptake of a polychlorinated biphenyl preparation containing 5-7 chlorine atoms per molecule, solubilized in a nonionic surfactant in sea water, by Gammarus oceanicus was measured spectrophotometrically. Uptake occurred in living animals across the general integument. It is suggested that uptake rates are dependent upon the total surface area of the integument, although no accurate method of determining this is known. The rate of uptake decreased after 4-6 hr exposure and uptake was dependent upon concentration of polychlorinated biphenyls in sea water. The stage of the intermolt of G. oceanicus did not affect uptake rates. (Katz-Washington)
W72-12262

POLYCHLORINATED BIPHENYLS (PCB) IN SEA WATER AND THEIR EFFECT ON REPRODUCTION OF GAMMARUS OCEANICUS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick).
D. J. Wildlish.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 2/3, p 182-187, 1972. 4 tab, 8 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Sea water, *Reproduction, *Lethal limit, Bioassay.
Identifiers: *Gammarus spp., *Aroclor 1254, *Median lethal time, Short-term exposure, Corexit 7664, Static bioassay, Mating success, Detoxification.

A study was made on the effect of short-term exposure to PCB in sea water on the median lethal time and reproductive performance of Gammarus oceanicus. Exposure of the organism to 0.2 mg/l of Aroclor 1254 solubilized in Corexit 7664 in sea water for 10 hr produces and LT-50 of 35.1 days. No significant biological detoxification is indicated. Effects on mating success is interpreted as responses of the male to impending death caused by PCB poisoning. (Katz-Washington)
W72-12263

EFFECTS OF FOUR INSECTICIDES ON THE ABILITY OF ATLANTIC SALMON PARR (SALMO SALAR) TO LEARN AND RETAIN A SIMPLE CONDITIONED RESPONSE,
Queen's Univ., Kingston (Ontario).
C. T. Hatfield, and P. H. Johansen.
Journal of the Fisheries Research Board of Canada, Vol 29, p 315-321, 1972. 5 fig, 14 ref.

Descriptors: *Insecticides, *Fish behavior, *Laboratory tests, *Atlantic salmon, *DDT, Pesticides, Chlorinated hydrocarbon pesticides, Organophosphorous pesticides, Water pollution effects, Lethal limit.
Identifiers: *Learning ability, *Conditioned response, *Sumithion, *Acetone, Methoxychlor, LC50, Sublethal effects.

The learning ability of untreated, acetone-treated, and insecticide-treated Atlantic salmon parr was determined in a shuttlebox conditioning apparatus. Learning improvement on second conditioning was also tested. The results were that: (1) acetone did not affect learning; (2) with treatment for 24 hr at the 96 hr LC50 Sumithion completely inhibited learning, Abate retarded learning, DDT mildly enhanced learning, and methoxychlor was without a detectable effect; (3) when Abate and methoxychlor-treated salmon in item (2) above were retrained 1 or 7 days later, their learning ability improved, but DDT-treated fish showed no improvement; (4) four days of recovery from a 24 hr exposure to the 96 hr LC50 of Abate or Sumithion still resulted in slow learning ability, although after 7 days of recovery, learning rate was the same as in controls; (5) insecticide treatment at the 96 hr LC50 level for 24 hr interposed between first and second conditioning had little or no effect on learning ability; (6) insecticide concentrations at 1/10 the 96 hr LC50 or lower had no effect on learning ability. (Katz-Washington)
W72-12264

SOME ASPECTS OF THE CHEMISTRY AND ACUTE TOXICITY OF THE IRON ORE FLOTATION AGENT DIMETHYL AMMONIUM ALKYL HYDROXAMATE AND SOME RELATED COMPOUNDS TO BROOK TROUT,
Bedford Inst., Dartmouth (Nova Scotia).
G. L. Fletcher, and R. F. Addison.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 2/3, p 147-159, 1972. 2 fig, 4 tab, 15 ref.

Descriptors: *Brook trout, *Bioassay, *Water pollution effects, *Water temperature, Toxicity, Flotation, Freshwater, Alkalis (Bases), Temperature, Lethal limit, Aquatic environment, Water quality, Industrial wastes.
Identifiers: *Dimethyl ammonium alkyl hydroxamate, *Hydroxylamine, *Hydroxamate group, Acute toxicity, Ore flotation agents, Salvelinus spp., Static bioassay, Continuous flow bioassay.

Dimethyl ammonium alkyl hydroxamate (DMAH) was lethal to brook trout (Salvelinus fontinalis) at concentrations as low as 4.5 mg/l. Since DMAH consisted of a number of molecular species in equilibrium, experiments were conducted with several of them in an attempt to evaluate their contribution to its toxicity. Of the compounds tested, dimethylamine proved to be non-toxic, hydroxylamine was as lethal as DMAH (on a molar basis) and NaClO hydroxamate was 5-10 times more toxic than hydroxylamine of DMAH. Although hydroxylamine may have played a small part in the toxicity of DMAH, the hydroxamate group appeared to be the major lethal component. (Katz-Washington)
W72-12265

A LABORATORY APPARATUS FOR MAINTAINING UNIFORM SUSPENSIONS OF FINE--GRAINED SEDIMENT,
Johns Hopkins Univ., Baltimore, Md.
J. R. Schubel, E. W. Schiemer, and G. M. Schmidt.
Chesapeake Science, Vol 13, No 2, p 154-156, June 1972. 5 fig, 1 ref. NMFS AFC 5-1.

Descriptors: *Methodology, *Suspended solids, Laboratory equipment, Laboratory tests, Bioassay, Sediment load, Turbidity, Particle size, Aquatic life, Aquaria.
Identifiers: *Continuous flow bioassay, Sediment suspensions, Fine-grained sediments, Homogenous suspensions.

An apparatus was designed and built for maintaining and renewing uniform suspensions of fine-grained sediment for laboratory experiments on the effects of suspended sediment on organisms. The suspensions are maintained with vertically reciprocating perforated plates driven by gearmotors. Suspensions with concentrations of up to 500 mg/l were maintained to within about 15% of their mean concentration for 5-7 days. The suspensions were completely replaced every 24 hr by periodic additions. The particles had a mass-weighted mean settling velocity of about 0.005 cm/sec. (Katz-Washington)
W72-12266

HISTOPATHOLOGIC LESIONS IN CUTTHROAT TROUT (SALMO CLARKI) EXPOSED CHRONICALLY TO THE INSECTICIDE ENDRIN,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo.
L. L. Eller.
American Journal of Pathology, Vol 64, No 2, p 321-336, 1971. 9 fig, 34 ref.

Descriptors: *Insecticides, *Endrin, *Chlorinated hydrocarbon pesticides, *Pathology, Cutthroat trout, Water pollution effects, Fish physiology, Gonads, Reviews.
Identifiers: *Chronic exposure, *Gill damage, Histopathology, Fish pathology, Lersions, Lesions, Salmo spp., Gill, Liver, Pancreas, Brain, Hepatic lesions, Degenerative syndrome, Pancreatic islets, Oocytes, Literature review.

Pathological conditions associated with exposure to endrin were found in the gill, liver, pancreas, brain and gonad of cutthroat trout. Edema, hemorrhage and possible intracapillary congestion characterized gill damage after exposure to the highest level of endrin in the bath. Hepatic lesions in young trout were of a type frequently described as preceding the development of hepatomas in nutritionally deficient fish. The increased incidence and severity of hepatic degenerative changes observed in fish exposed to high levels of endrin suggested nutritional deficiency enhanced by exposure to endrin. Marked hyperplasia of pancreatic islets and irregular, atypical oocytes were observed after exposure to high endrin levels. (Katz-Washington)
W72-12267

POLYCHLORINATED BIPHENYLS: EFFECT OF LONG-TERM EXPOSURE ON ATPASE ACTIVITY IN FISH, PIMEPHALES PROMELAS,
Minnesota Univ., St. Paul.
R. B. Koch, D. Desaiah, H. H. Yap, and L. K. Cutkomp.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 2/3, p 87-92, 1972. 2 tab, 14 ref. FWPCA 16030 ELZ.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Enzymes, Laboratory tests, Metabolism, Animal metabolism, Inhibition, Pathology.
Identifiers: *ATPase activity, *Brain tissue, *Kidney tissue, *Liver tissue, Long term exposure, Chronic exposure, Pimephales spp., Oligomycin, Enzyme inhibition, Fish tissue, Target tissue, Target organ, Tissue degeneration.

Fathead minnows were exposed to polychlorinated biphenyls, Aroclor 1242 and 1254, for several months. All fish showed responses of ATPase after exposure to Aroclors. Both inhibition and stimulation responses were observed for the different tissues tested. Brain was the only tissue that showed only inhibition of oligomycin sensitive Mg (2+) ATPase after exposure to both Aroclors. Maximum inhibitory effect on the ATPases occurred with ARoclor 1242 on kidney tissue. Evidence indicates that ATPase inhibition may be the specific mechanism of PCB attack on fish tissues. (Katz-Washington)
W72-12268

THE FATE AND EFFECTS OF FRESCON MOLUSCICIDE IN AQUATIC SYSTEMS,
Shell Research Ltd., Sittingbourne (England). Woodtock Agricultural Research Centre.
K. I. Beynon.
Schriftenreihe des Vereins fuer Wasser-, Boden- und Lufthygiene, Vol 34, p 95-107, 1970 (publ. 1971). 17 fig.

Descriptors: *Molluscicides, *Fish, *Bioassay, Pesticides, Aquatic plants, Mammals, Aquatic environment, Aquatic habitats, Aquatic soils, Path of pollutants, Toxicity, Pesticide toxicity, Public health.
Identifiers: *Frescon, *Acute toxicity, *Subacute toxicity, *Toxicity bioassays, Aquatic ecology, Degradation routes, Triphenylcarbinol, Chronic toxicity, Australorbis spp., Bulimus spp., Biomphelaria spp., Rasbora spp.

The side effects of Frescon molluscicide following its application in aquatic systems is described, including its degradation routes in plants, soils, fish and mammals. The effects of Frescon on plants, fish and insects are described. Frescon breaks down readily to form triphenylcarbinol in waters, soils, and plants and these compounds are of a low order of acute and subacute toxicity to mammals. Triphenylcarbinol is the main residue of environmental consequence. While Frescon and triphenylcarbinol are lipophilic they will not be stored in animal fat, since mammals convert them to hydroxylated derivatives, which are readily excreted. Frescon, triphenylcarbinol and morpholine are not toxic to plants. Frescon has some slight effects on some insects, but the other compounds have not. Frescon is toxic to some species of fish, but fishkills can be minimized by careful selection of the dosage rate and application technique. (Katz-Washington)
W72-12269

CHLAMYDOTHECA ARCUATA: AUTORADIOGRAPHIC LOCALIZATION OF C-14-DIELDRIN,
South Dakota Univ., Vermillion.
J. A. Kawatski, and J. C. Schmulbach.
Transactions of the American Microscopical Society, Vol 89, No 3, p 424-427, 1970. 5 fig, 6 ref. OWRR A-015-SDAK (6).

Descriptors: *Dieldrin, *Aldrin, Pesticides, Pesticide residues, Insecticides, Carbon radioisotopes, Crustaceans, Aquatic animals, Absorption, Chlorinated hydrocarbon pesticides, Animal metabolism, Animal physioiogy, Physiology.
Identifiers: *Autoradiography, Sublethal effects, Ostracods, Chlamydotheca spp.

The uptake and storage of two chlorinated hydrocarbon insecticides, aldrin and dieldrin, in freshwater ostracods was studied using autoradiographic technique. Although aldrin and dieldrin uptake occurred over a wide body surface area, absorption was primarily through the body integument and the gut; lesser amounts of either insecticide were taken up through appendages. The shell absorbed or adsorbed only small quantities. The storage of these insecticides was largely in body lipids. (Svensson-Washington)
W72-12271

ACCUMULATION OF INSECTICIDE IN FRESHWATER OSTRACODS EXPOSED CONTINUOUSLY TO SUBLETHAL CONCENTRATIONS OF ALDRIN OR DIELDRIN,
South Dakota Univ., Vermillion.
J. A. Kawatski, and J. C. Schmulbach.
Transactions of the American Fisheries Society, Vol 100, No 3, p 565-567, July 1971. 1 tab, 3 ref. OWRR A-015-SDAK (7).

Descriptors: *Aldrin, *Dieldrin, *Pesticide residues, *Pesticide kinetics, *Path of pollutants, Pesticides, Insecticides, Pesticide toxicity, Bioassay, Crustaceans, Chlorinated hydrocarbon pesticides, Aquatic animals.

Identifiers: *Sublethal effects, Ostracods, Chlamydotheca spp., Biological concentration, Accumulation of insecticides.

Since they are essentially primary consumers of both dead and living organic matter, ostracods potentially have the capacity to concentrate insecticide residues from the substrate and water and to introduce or reintroduce the residues to organisms at higher trophic levels. Sublethal, long-term, laboratory exposures of ostracods to two chlorinated hydrocarbon insecticides (aldrin and dieldrin) have demonstrated that these animals can innocuously accumulate and store quantities of insecticides in excess of amounts which would be toxic if accumulated within shorter periods of time. (Svensson-Washington)
W72-12272

SAFETY CONSIDERATIONS FOR DETERGENTS,
Proctor Gamble Co., Cincinnati, Ohio. Miami Valley Labs.
For primary bibliographic entry see Field 05G.
W72-12290

5D. Waste Treatment Processes

GROWTH RATE OF ASPIDISCIDAE ISOLATED FROM ACTIVATED SLUDGE,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
For primary bibliographic entry see Field 05C.
W72-11796

ACCUMULATION OF METHANOGENIC SUBSTRATES IN CC14 INHIBITED ANAEROBIC SEWAGE SLUDGE DIGESTER CULTURES,
Union Coll., Schenectady, N.Y.
For primary bibliographic entry see Field 05C.
W72-11816

FLOC-FORMING BACTERIA ISOLATED FROM ACTIVATED SLUDGE,
Tohoku Univ., Sendai (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 05A.
W72-11827

THE FLOCCULATION OF ALGAE WITH SYNTHETIC POLYMERIC FLOCCULANTS,
Connecticut Univ., Hartford. School of Medicine.
R. C. Tilton, J. Murphy, and J. K. Dixon.
Water Research, Vol 6, No 2, p 155-164, February 1972. 3 fig, 26 ref.

Descriptors: *Algae, *Flocculation, Water pollution treatment, Colloids, *Polymers, Anions, Cations, Organic compounds, Separation techniques, Calcium, Magnesium, E. coli, Silica, *Filtration, Light pentration, Physical properties, Electrophoresis, Chemical properties, Hydrogen ion concentration, *Waste water treatment.
Identifiers: Polyacrylamides, Polystyrene sulfonate, Polyethyleneimine, *Chlorella ellipsoidia.

Samples of a pure algal culture of Chlorella ellipsoidia, at concentrations of 50-3000 mg/l, were subjected to polymer concentrations of 0.01-1000 mg/l at pH 4-7. A number of analytical methods were used in order to measure the flocculation of the algal culture by the synthetic polymeric flocculants. By employing a 9.6 sq cm Millipore membrane filter, the upper limit of polymer concentration above which filter blockage occurred was determined. In another test the degree of flocculation was measured by measuring the light transmitted by algal dispersion after polymer addition and settling. The flocculation efficiency was further analyzed by measurement of the electrophoretic mobilities of algal dispersions in a modified Briggs-type cell. A brief discussion was also presented on a comparison of results on algae with those of other colloids, it being especially significant that at the same concentration of biocolloid the algae need about 100 times higher concentration of polymer than does E. coli. (Mackan-Battelle)
W72-11833

INDUSTRIAL WASTES AND WATER SUPPLIES,
Illinois State Water Survey, Urbana.
R. Evans.
Journal of the American Water Works Association, Vol 57, No 4, p 625-628, May 1965. 4 ref.

Descriptors: *Industrial wastes, *Water pollution sources, *Groundwater, *Waste disposal wells, *Water supply, *Lagoons, *Watershed management, *Water pollution sources, Monitoring, Illinois, Technology, Industries, Water quality control, Canneries, Sewage treatment, Accidents, Waste water treatment.
Identifiers: *Accidental spills, Technologic advances, Carbon chloroform extract, Petrochemical processors.

While most industries adequately treat their wastes, water utilities should recognize that the probability of breakdown of industrial treatment facilities is much greater than in the water industry. Safeguards may be too costly or be lacking due to management disinterest. Water utilities should be aware of deep-well disposal or lagoon systems which may affect the public water supply source. Technologic advances may affect industrial discharges through municipal waste treatment facilities because of the diverse nature of industrial waste products. The water utility must be responsible for watershed management that includes monitoring of industrial wastes. (Flack-AWWARF)
W72-11903

RELATION OF RIVER POLLUTION TO PUBLIC WATER SUPPLY IN EUROPE AND THE UNITED STATES,
Amsterdam Water Works (Netherlands).
For primary bibliographic entry see Field 05F.
W72-11918

EFFECT OF FEED PROCESSING ON DIGESTIBILITY OF ANIMAL FEEDS,
Kansas State Univ., Manhattan.
H. B. Pfost.
(1970) 21 p, 22 tab, 20 ref.

Descriptors: *Farm wastes, Feeds, Feed lots, Cattle, Microorganisms, Ammonia, Hogs.
Identifiers: *Daily gain, Daily feed, Starch.

Some degree of starch gelatinization improves the feed efficiency for beef, swine and broiler feeding enough to be economically feasible under typical conditions in the United States. The utilization of urea in ruminant rations can be improved by use in combination with gelatinized starch. The results of using a highly gelatinized product for feeding swine appear interesting from a research standpoint and may prove to be practical later. Much of the past research which involved grain processing is difficult to interpret because of the failure to measure and report chemical and physical changes which occurred during processing. Standardized methods which are correlated with animal performance need to be developed. Protein availability must be considered as well as starch availability. Future developments in equipment for processing must consider the economic costs required to obtain desired levels or product change. (Bundy-Iowa State)
W72-11936

REGIONAL SEWAGE DISPOSAL PLANNING ACT.
For primary bibliographic entry see Field 06E.
W72-11945

WATER POLLUTION CONTROL–SEWER AND DISPOSAL PLANT PROJECTS.
For primary bibliographic entry see Field 06E.
W72-11946

PROPOSED SEWAGE TREATMENT FACILITIES, SOLDOTNA, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Seattle, Wash. Region X.

Available from the National Technical Information Service as PB-204 662F, $3.00 in paper copy, $0.95 in microfiche. February 25, 1972. 50 p, 2 map.

Descriptors: *Alaska, *Environmental effects, *Sewage treatment, *Water quality control, Alternate planning, Sewage effluents, Facilities, Administrative agencies, Governmental interrelations, Domestic water, Water management (Applied), Project planning, Sewage disposal, Aeration, Chlorination, Waste water disposal, Waste water treatment.
Identifiers: *Environmental Impact Statements, *Soldotna (Alas).

The project would consist of the construction of a sewage collection system in Soldotna, Alaska, including interceptor sewers, a sewage lift station, a new sewage treatment plant of extended aeration process design, and chlorination. Effluent will be discharged after disinfection into the Kenai River via an outfall approximately 21 miles upstream from the river's mouth. The only significant impact of the project is the effect on the quality of the waters receiving the treated discharge. The principal concern is for the potential public health hazard to the downstream city of Kenai in the withdrawal of water for drinking purposes, and the potential effect on present and future recreation and other related uses of the Kenai River. Alternatives considered include a regional system, various methods of ground water recharge for treated effluent disposal, discharge of treated effluent into Soldotna Creek, several different treatment processes at the selected site, provision of individual treatment units and small package plans, and no action. Included are problems and objections raised by federal, state, and local agencies and by private organizations in the review process and disposition of the issues involved. (Widman-Florida)
W72-11957

BIOMASS DETERMINATION - A NEW TECHNIQUE FOR ACTIVATED SLUDGE CONTROL.
Biospherics Inc., Rockville, Md.

Copy available from GPO Sup Doc EPA 17050 EOY 01/72, $1.25; microfiche from NTIS as PB-211 127, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, No 17050 EOY, January 1972, 116 p, 53 fig, 22 tab, 18 ref. EPA Program 17050 EOY 01/72.

Descriptors: *Activated sludge, *Analytical techniques, *Water quality, *Control, Monitoring, Suspended solids, *Biomass, Separation techniques, Laboratory tests, Pilot plants, On-site investigations, *Waste water treatment.
Identifiers: *ATP, *Process control, *Adenosine triphosphate.

Research was conducted to determine the feasibility of using adenosine triphosphate (ATP) as a measure of viable biomass in activated sludge. Methods were developed for the extraction of

ATP from sludge and mixed liquor, and for the determination of ATP using the firefly bioluminescent procedure. Measurements of ATP were conducted on various pure cultures, pilot plant and full-scale activated sludge treatment plants. Additional parameters including BOD, TOC, oxygen uptake rate, and suspended solids were measured to provide comparative and supportive information. Preliminary tests in which ATP measurements of biomass were used to control the percent sludge return were conducted at two full-scale municipal sewage treatment plants. Lowered return sludge rates were found to produce effective treatment and increase the biological activity of the sludge. Changes in the rate of return sludge resulted in changes in ATP concentration of mixed liquor which preceded changes in suspended solids by as much as 24 hours. The assay was found to be reproducible and rapid. Results can be obtained within approximately ten minutes. (Lowry-Texas)
W72-12006

THE PESTICIDE MANUFACTURING INDUSTRY-CURRENT WASTE TREATMENT AND IDISPOSAL PRACTICES,
Texas Univ., Austin. Dept. of Civil Engineering.
R. Atkins.
Copy available from GPO Sup Doc EPA 12020 FYE 01/72, $1.50; microfiche from NTIS as PB-211 129, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1972. 185 p, 35 fig, 25 tab, 86 ref. EPA Program 12020 FYE 01/72.

Descriptors: *Pesticides, *Industrial wastes, *Chemical wastes, Air pollution, Solid wastes, Landfills, Toxicity, Biodegradation, Cost analysis, *Waste water treatment, *Waste disposal, *Reviews.
Identifiers: *Pesticide chemistry, *Pesticide production, *Literature review.

An in-depth review of the literature, including government information documents, technical reports, the technical journals, industrial publications, and twenty plant interviews with plant managers and operators were used as the data base for studying the 'state of the art' of pesticide manufacturing waste treatment and disposal practices. No attempts were made to prove or disprove statements made in the literature or statements made in the interviews. The report contains chapters dealing with: (a) the present and projected pesticide demands in the United States, (b) the chemistry of pesticides including production processes and waste generation, (c) waste treatment possibilities discussed in the literature, (d) pesticide waste treatment systems that have been or currently are in full scale operation, and (e) the cost of pesticide waste treatment system. (Lowry-Texas)
W72-12009

ANAEROBIC TREATMENT OF SYNTHETIC ORGANIC WASTES,
Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
J. C. Hovius, J. A. Fisher, and R. A. Conway.
Copy available from GPO Sup Doc EPA 12020 DIS 01/72, $1.75; microfiche from NTIS as PB-211 130, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1972. 202 p, 42 fig, 46 tab, 22 ref. EPA Program 12020 DIS 01/72.

Descriptors: *Anaerobic digestion, *Chemical wastes, *Lagoons, Performance, Cost analysis, Sludge disposal, Industrial wastes, Aerobic conditions, Pilot plants, *Waste water treatment, *Organic wastes.
Identifiers: *Petrochemical refinery wastes, *Anaerobic lagoons, *Anaerobic filters, Contact digester.

Bench, semi-pilot, and pilot-scale studies of three anaerobic treatment processes have shown the anaerobic lagoon to be both the performance and economic choice for pretreatment of petrochemical wastes in warm, spacious locations. Semi-pilot scale studies of anaerobic contact digesters and packed-bed reactors indicated performance problems when treating actual petrochemical wastes. Experimental data from several sources were combined to prepare a design procedure for anaerobic lagoon pretreatment systems. Operation of a large (30 gpm) pilot plant consisting of anaerobic lagoons followed by aerated stabilization and facultative ponds provided a BOD removal from the petrochemical wastes of greater than 90% and a resistance to both organic-loading and pH shocks. Comparison of an anaerobic-aerobic system with a strictly aerobic system pointed out an economic advantage with the series system due to lower sludge-disposal and oxygen requirements. (Lowry-Texas)
W72-12010

BIOLOGICAL CONCEPTS FOR DESIGN AND OPERATION OF THE ACTIVATED SLUDGE PROCESS,
Oklahoma State Univ., Stillwater. Bioenvironmental ENGINEERING Labs.
F. Gaudy, Jr., and T. Gaudy.
Copy available from GPO Sup Doc as EP 2.10: 17090 FQJ 09/71, $1.25; microfiche from NTIS as PB-211 131, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, September 1971. 154 p, 36 fig, 3 tab, 69 ref. EPA Program 17090 FQJ 09/71.

Descriptors: *Activated sludge, *Design criteria, *Kinetics, Ultimate disposal, Oxidation, Nutrient requirements, Metabolism, Aeration, Mathematical models, Biochemical oxygen demand, Sludge disposal, *Waste water treatment, Biological treatment.
Identifiers: *Shock loads, *Purification mechanisms, Endogenous phase, Oxidative assimilation.

Generalized concepts of BOD exertion, the use of COD the measure of biologically available organic matter in a waste sample as a design and operational tool, the stoichiometry and mass balance concepts of treatment, and kinetics equations for microbial growth are presented. Design models are discussed, and a model for completely mixed reactors holding recycle solids, XR, constant is recommended. Some guidelines for accommodation of various types of shock loadings are included. Concepts of oxidative assimilation and the multiple effects of solids concentration, nitrogen concentration, and detention time are related; a new activated sludge process (continuous oxidative assimilation) for nitrogen deficient wastes is presented. Data supporting the concept of total oxidation are presented, and a modification of the extended aeration process incorporating chemical hydrolysis of portions of sludge is recommended. Some possible flow diagrams for complete aerobic treatment (purification and sludge disposal) of metabolizable organic wastes are presented. (Lowry-Texas)
W72-12011

ESTIMATING COSTS AND MANPOWER REQUIREMENTS FOR CONVENTIONAL WASTEWATER TREATMENT FACILITIES,
Black and Veatch, Kansas City, Mo.
W. L. Patterson, and R. F. Banker.
Copy available from GPO Sup Doc EPA 17090 DAN 10/71, $2.00; microfiche from NTIS as PB-211 132, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, October 1971. 250 p, 78 fig, 20 tab. EPA Program 17090 DAN 10/71. Contract 14-12-462.

Descriptors: *Construction costs, *Operating costs, *Maintenance costs, Cost analysis, Cost comparisons, Management, *Manpower, Waste water treatment, *Treatment facilities.
Identifiers: *Occupation descriptions, *Process costs, Staffing requirements.

Data for estimating average construction costs, operation and maintenance costs, and manpower staffing requirements, are presented for conventional wastewater treatment plants ranging from 1 to 100 mgd in capacity, and for stabilization ponds ranging from 0.1 to 10 mgd in capacity. Estimating data are included for 21 separate components of conventional plants and 6 separate components of stabilization ponds. Examples of use of the data are given. Estimated average construction costs and operation and maintenance costs are related graphically to appropriate single parameters for respective plant components. Occupation descriptions for 24 job titles related to wastewater treatment, developed in accordance with standards of the Dictionary of Occupational Titles, are included. The data presented provide means of estimating costs and staffing requirements for a variety of conventional wastewater treatment facilities on an average basis, but do not supplant the need for detailed study of local conditions or recognition of changing design requirements in preparing estimates for specific application. (Lowry-Texas)
W72-12012

SELF PURIFICATION IN SEWERS,
Los Angeles County Sanitation Districts, Calif.
For primary bibliographic entry see Field 05G.
W72-12047

BIOLOGICALLY-EXTENDED PHYSIOCHEMICAL TREATMENT,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
W. J. Weber, Jr., R. Bloom, Jr., and L. D. Friedman.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 12, Hall C, Paper No. 25, June 22, 1972, 9 p, 3 fig, 5 ref.

Descriptors: *Adsorption, *Activated carbon, *Biodegradation, *Pilot plants, *Aerobic conditions, Anaerobic conditions, Sampling, Dissolved oxygen, Suspended solids, Turbidity, Cost analysis, *Waste water treatment.

Pilot plant investigations were conducted on expended bed carbon adsorption columns to determine whether or not maintaining the bacteria, which attach to the carbon particles, in an aerobic state significantly affects either the organic matter reductions or the extended operating capacities observed as a result of bacterial removal and assimilation of organics from the carbon pores. Feed for the adsorbers was treated by chemical coagulation, upflow clarification and dual media filtration. Daily samples were analyzed for TOC, SOC, SS, turbidity, and dissolved oxygen. In examining aerobic versus anaerobic operation, two parallel adsorption systems were operated with a common feed under identical conditions, except that oxygen was introduced to one, maintaining a 6-10 mg/l DO level throughout the system. In explaining the observed phenomena, it was theorized that incomplete anaerobic degradation takes place at the carbon surface and the degradation products, not readily held by the carbon, diffuse outward to be degraded by aerobic bacteria. Treatment costs, based on a carbon exhaustion rate of 250 lbs/million gallons (the rate achieved in the aerated expended-bed pilot plant) for combined physiochemical treatment operation would be less than 19 cents/1000 gallons, with further savings possible in reduced capital costs may be realized through decreased regeneration equipment requirements. (Lowry-Texas)
W72-12048

THE CURRENT STATUS OF TECHNOLOGICAL DEVELOPMENT IN WATER RECLAMATION,

National Inst. for Water Research, Pretoria (South Africa).
M. R. Henzen, L. R. J. Van Vuuren, and G. J. Stander.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 12, Hall B, Paper No. 23, June 22, 1972, 12 p, 1 fig, 1 tab, 30 ref.

Descriptors: *Water reuse, *Water purification, *Waste water treatment, *Separation techniques, *Phosphorus, *Nitrogen, Ammonia, Ion exchange, Lime, Chemical precipitation, Activated carbon, Adsorption, Chemical oxygen demand, Chlorination, Filtration, Sludge disposal.

Wastewater represents a potential source of pollution to the wetter climates and a potential source of water to the more arid regions. In converting wastewater from a contaminated state to a state suitable for various purposes, including direct reuse as a potable water supply, numerous techniques have been developed. The major problems to be handled by water purification systems are nitrogen removal, phosphorus removal, organics and inorganics removal and disinfection. Nitrogen removal methods discussed include pH elevation, ammonia stripping, biological denitrification, selective ion exchange, and chlorination of ammonia. Phosphorus can best be removed by excess lime precipitation, while the various heavy metals require individual solutions. Current organics removal schemes discussed include flocculation, adsorption, and biological oxidation, while inorganics removals may be accomplished by ion exchange, reverse osmosis, distillation, and electrodialysis. Pathogenic organism elimination has been accomplished by disinfection by chlorine and other gases, as well as by sand filtration. Sludge handling, however, remains a difficult problem. (Lowry-Texas)
W72-12049

SURVIVAL OF ENTEROVIRUSES DURING ANAEROBIC SLUDGE DIGESTION,

National Inst. of Public Health, Budapest (Hungary).
A. Palfi.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 13, Hall A, Paper No. 26, June 22, 1972, 6 p, 4 tab, 10 ref.

Descriptors: *Sludge digestion, *Anaerobic digestion, *Virus, Bacteriophage, Biocontrol, Microbiology, Analytical techniques, Public health, Sampling, *Waste water treatment.
Identifiers: *Detention time.

Quantitative virological examinations were carried out on 74 digested sludge samples from anaerobic equipment operating in Budapest, Hungary in 1969. In 1970, after modification of the digestion procedure, 82 further samples were examined for enterovirus density. The effects on virus survival of various conditions of digestion (temperature, detention time) were compared. These comparisons demonstrated that the modifications made to the anaerobic digestion equipment, namely Conger detention time, higher temperature, and addition of an unmixed secondary digester, caused a virus density decrease of 60% in the digested sludge, and compared with the raw sludge an overall reduction of 80% was recorded. Number of viral strains isolated in one sample was also lower, and the number of viruses types also fell from eight to three. As quantitative determinations show, the virus concentration of the digested sludge is 0.85 virus unit per 100 ml (MPNCU) while that of raw sludge is 17.9 MPNCU, or a 95% reduction. However, it should not be overlooked that digested sludge treated by the modified technology remains a potential source of infection and should be handled as such. (Lowry-Texas)
W72-12050

THE VIRUS PROBLEM IN THE WINDHOEK WASTEWATER RECLAMATION PROJECT,

National Inst. for Water Research, Pretoria (South Africa).
E. M. Nupen, and G. J. Stander.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 4, Hall C, Paper No. 8, June 20, 1972, p C/4/8/1-C/4/8/10, 2 fig, 1 tab, 26 ref.

Descriptors: *Viruses, *Water reuse, *Disinfection, *Chlorination, *Waste water treatment, Reclaimed water, Surveys, Hydrogen ion concentration, Analytical techniques, Epidemiology, Salmonella, E. Coli.
Identifiers: Free residual chlorine, Virus concentration, Ultrafiltration, Concentration method, Enteroviruses, Reoviruses, Total plate counts.

On routine monitoring no virus was isolated from the final effluent of the Windhoek Wastewater Reclamation Plant. Virus was isolated from the mixed conventionally purified Goreangab Dam and reclaimed waters. Intensive testing of all other sources of water supply to the Windhoek area resulted in the isolation of viruses from natural water supplies and also from conventionally purified Goreangab Dam Water. An ultrafiltration method utilized for virus concentration was described. This method gave an average of 70% recovery of virus and has the advantage of allowing 10 liters or more of clear water or even slightly turbid samples to be processed in a matter of hours. In order to ensure virus inactivation, break-point chlorination should be applied to guarantee a free available residual chlorine, subject always to the reservation of a low enough pH to provide the hypochlorous acid concentration. In the Windhoek Wastewater Reclamation Plant break-point chlorination with a resultant free residual chlorine of 0.5 mg/l has been the standard requirement for disinfection. (Galwardi-Texas)
W72-12051

ACTIVATED SLUDGE TREATMENT OF SMALL WASTE VOLUMES,

Ecodyne Corp., Lenexa, Kans. Smith and Loveless Div.
B. L. Goodman.

Preprint, presented at Sixth International Water Pollution Research Conference, Session 14, Hall C, Paper No. 28, June 22, 1972, 12 p, 5 fig, 5 tab, 10 ref.

Descriptors: *Activated sludge, *Design criteria, *Mathematical models, Organic loading, Aeration, Metabolism, Oxidation, Operation costs, Cost analysis, On-site investigations, Sludge disposal, *Waste water treatment, *Sludge treatment.
Identifiers: Small waste volumes, Hydraulic loading, Detention time.

Although thousands of small scale (<1.0 mgd) activated sludge plants are currently in operation, highly conservative design constraints have been imposed, first by custom and later by regulation, which seriously limit the capabilities of these plants. Mathematical models for the activated sludge process were derived and tested in 8 full scale plants. Each treatment plant was operated at the specified sludge age and aeration period for a minimum of 30 days. Predicted performance, at a sludge loading rate some 3 times that commonly employed in the U. S. in connection with small activated sludge systems, was closely approximated by the observed values. Solids accumulation increased by only 9% in decreasing the aeration period from 24 to 4 hours, while aeration requirements decreased by 60%, all at no sacrifice in process efficiency. Since no efficiency loss occurred, the favorable economics alone should be reason enough for a thorough review of package plant design criteria. (Lowry-Texas)
W72-12052

EFFECT OF BIOLOGICAL CONDITIONING ON REQUIRED POLYMER DOSAGES FOR SLUDGE DEWATERING,

Virginia Polytechnic Inst. and State Univ., Blacksburg.
O. M. Kassem.

Master's Thesis, March 1972, 53 p, 14 fig, 2 tab, 28 ref.

Descriptors: *Municipal wastes, Sludge, *Filtration, *Sludge digestion, *Anaerobic conditions, *Aerobic conditions, Chlorination, Polymers, Analytical techniques, Laboratory tests, Activated sludge, *Waste water treatment.
Identifiers: Specific resistance, Buchner funnel.

The effects of aerobic digestion, heavy chlorination, and anaerobic storage on polymer conditioning requirements for activated sludge were determined using Buchner funnel filtration rates and specific resistances in laboratory scale tests. Waste sludges from two extended aeration units, and an overloaded conventional activated sludge plant were used. All three plants were treating municipal wastes. Two anionic and two cationic polymers were used. The optimum polymer dose for the sludge prior to processing was added to the samples taken from the various processes and compared with samples which had no polymer added. Polymer addition generally prevented the extreme filtration times that occur after long periods of aerobic digestion. When the initial optimum polymer dose is used throughout the digestion period, virtually no improvement in filterability can be obtained with aerobic digestion, and a worsening of the filtration rate occurs. Aerobic digestion can produce a considerable decrease in the optimum polymer dose for sludge conditioning. In general, chlorination prior to polymer conditioning is detrimental, however, with a difficult, poorly stabilized sludge, HTH addition of 250 mg/l or less improved filterability. A 750 mg/l dose to the same sludge worsened filterability. Short periods of anaerobiosis (3 hours) are detrimental to polymer conditioning, while periods of a day or more tended to improve polymer conditioning. It was further noted that anaerobiosis produces a shift in optimum polymer dose. (Lowry-Texas)
W72-12053

CENTRALIZED SEWAGE TREATMENT AT DUNMOW.

Effluent and Water Treatment Journal, Vol 9, No 5, May 1969, p 273-274, 2 fig.

Descriptors: *Municipal wastes, *Waste water treatment, *Treatment facilities, River basin development, Total costs, Settling basins, Trickling filters, Digestion tanks, Anaerobic digestion, Size.
Identifiers: *Dunmow (England), Humus tanks.

A new sewage treatment works representing the first stage in the development of the Lower Chelmer Valley sewerage scheme was described. The scheme has provided for centralization of sewage treatment facilities serving a number of drainage areas and includes construction of additional sewers to relieve existing systems and to accomodate new flows from development areas. The new treatment works, serving a population of 4,000, has a capacity of 200,000 gpd and can be expanded to serve a population of 12,000. Main features of the new treatment works were two 30-ft. diameter upflow sedimentation tanks, two 85-ft. diameter bio-filters, and two 30-ft. diameter humus tanks. Total cost of the first stage construction amounted to 291,579 pounds. (Galwardi-Texas)
W72-12054

REGIONAL WASTEWATER MANAGEMENT SYSTEMS FOR THE CHICAGO METROPOLITAN AREA-SUMMARY REPORT,
Office of the Chief of Engineers (Army), Washington, D.C.
F. J. Clarke.
Department of the Army, Office of the Chief of Engineers, Summary Report, March 1972, 20 p, 4 fig, 6 tab.

Descriptors: *Alternate planning, *Water quality control, *Tertiary treatment, Aerated lagoons, Irrigation, Domestic wastes, Performance, Reliability, Storm runoff, Storage, Water reuse, Cost analysis, Waste water treatment, Indiana, Illinois.
Identifiers: *Physical-chemical treatment, *Chicago.

Three wastewater management alternatives and their associated capital and annual costs were assembled for the greater Chicago Metropolitan Area. The first alternative involved addition of advanced biological waste treatment to the three largest existing secondary plants. The second alternative investigated was the abandonment of all biological plants in favor of new physical chemical treatment plants. Finally, a scheme of aerated lagoons, sedimentation, and irrigation on agricultural lands was proposed. Systems were designed on two bases: (1) 2376 mgd wastewater flow with 300 mgd of the expected 600 mgd urban runoff; and (2) 2376 mgd wastewater flow with 600 mgd urban runoff and 600 mgd agricultural runoff. The land treatment scheme, at a cost of $21.80/capita/year for the municipal plus half the urban storm flow and $47.10/capita/year for the inclusion of both urban and agricultural storm flow, was also shown to be the most reliable scheme because of its inherently large storage volumes. In addition, the elimination of urban area treatment plants, provision of cooling water for power generation, and possible utility in creating greenbelt areas are all potential advantages of the system, leading to its recommendation. (Lowry-Texas)
W72-12055

COLOUR REMOVAL FROM BLEACHED KRAFT-PULP WASTEWATERS,
J. Bebin, P. Boulenger, and J. C. Bourdelot.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 12, Hall C, Paper No. 24, June 22, 1972, 8 p, 4 fig, 7 tab, 7 ref.

Descriptors: *Pulp and paper industry, *Bleaching wastes, *Chemical precipitation, Color, Chemical oxygen demand, Separation techniques, Hydrogen ion concentration, Lime, Sludge, Centrifugation, Polyelectrolytes, Incineration, Cost analysis, *Waste water treatment.

The aluminum sulphate precipitation process has been developed as a substitute for the lime precipitation process in the treatment of highly colored bleach plant wastes. A laboratory scale study of the process extended over many months on site at a modern bleached kraft pulp mill. The reaction involves pH adjustment to the desired value, close to pH 4.1, and precipitation of an aluminum organic precipitate as well as the excess aluminum ions. After 2 hours of settlement and polyelectrolyte addition, a volume of 0.2 m3 containing 3 kg dry matter/m3 of waste treated is obtained. After thickening, centrifugation and conditioning by anionic polyelectrolyte, the 18 to 23% dry matter sludge is incinerated. The white powder residue remaining contains mainly Al2O3 which can be redissolved in sulfuric acid to form aluminum sulphate, with very little insoluble residue remaining. Operation of both precipitation methods on a waste of pH 10.2, 3700 mg/P+/l of colour and 2300 mg/l of COD, 93% colour removals and 77% COD removals were achieved by the aluminum sulphate method as opposed to 88% colour and 69.5% COD removals achieved by the lime method. Costs per ton of pulp in dollars were 2.175 and 2.42 for the aluminum sulphate and lime processes respectively. (Lowry-Texas)
W72-12056

MESOPHILIC DIGESTION OF BEET MOLASSES DISTILLERY WASTEWATER,
Central Public Health Engineering Research Inst., Calcutta (India). Zonal Lab.
A. K. Basu, and E. Leclerc.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 15, Hall C, Paper No 30, June 23, 1972. 10 p, 8 fig, 5 tab, 12 ref.

Descriptors: *Sugar beets, *Sludge digestion, *Organic loading, Distillation, Toxicity, Performance, Hydrogen ion concentration, Alkalinity, Temperature, Methane, Industrial wastes, Laboratory tests, *Waste water treatment.
Identifiers: *Distillery waste water, *Molasses, Sludge return, Detention time.

Laboratory scale digestors were operated on beet molasses distillery waste water at 35C. Samples taken after acclimatization were analyzed by polarographic methods for copper, lead, and zinc. Three methods of operation were used, including batch, conventional, and high-rate digestion. Results showed that: (1) an optimum BOD reduction of 95.9% from an initial 32,013 mg/l to 1299 mg/l, was achieved with a 3.2 kg/m3-day organic loading and a 10 day detention time; (2) retarded digestion occurred at a 3.5 kg/m3-day organic loading at a 10 day detention time; (3) gas production is related to detention, with little bearing on the organic loading rate up to a certain limit; (4) volatile acid concentrations much higher than 2,000 mg/l could be tolerated provided the digester buffering capacity is not lost; (5) sludge return was necessary for successful digestion; and (6) batch digestion was unacceptable owing to the long lag period. Conventional digestion did not merit consideration because of the high efficiency of BOD loading and removal at high rate digestion. (Lowry-Texas)
W72-12059

ON THE TREATMENT OF POLYCHLORINATED BIPHENYL IN WATER BY IONIZING RADIATION,
Radiation Center of Osaka Prefecture, Osaka (Japan).
S. Kinoshita, and T. Sunada.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 13, Hall C, Paper No 26, June 22, 1972. 6 p, 1 fig, 5 tab, 7 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Gamma rays, *Cobalt, Colloids, Coagulation, Sedimentation, Filtration, Chemical wastes, Separation techniques, Activated carbon, Toxicity, *Waste water treatment, *Polychlorinated biphenyls, *Radiation, Ionization.

Colloidal aqueous solutions of Polychlorinated Biphenyl (PCB) at 50 and 100 ppb, were exposed to .01, 0.1, and 10.0 M rad of gamma rays from Cobalt-60 at a rate of 2 x 105 r/hr respectively. The bottles were rotated to maintain as uniform a dose rate as possible. The PCB in aqueous solution was destroyed by ionizing radiation, but its resistance to radiation was far more than other chlorinated hydrocarbons such as pentachlorophenol or DDT and other pesticides such as parathion. Although this may seem to present a difficult problem, proposed radiation treatment generally consists of several procedures such as sedimentation by coagulation, filtration, and postchlorination. Conventional treatment by sedimentation with coagulation was so effective in treating PCB that the proposed radiation treatment would result in thorough removal. Acute toxicity of irradiated PCB solution is found to be far less than the non-irradiated solution for striped shrimps, and the irradiation products show reduced toxicity. (Lowry-Texas)
W72-12060

REASSESSMENT OF THE VIRUS PROBLEM IN SEWAGE AND IN SURFACE AND RENOVATED WATERS,
National Environmental Research Center, Cincinnati, Ohio.
G. Berg.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 14, Hall B, Paper No 28, June 22, 1972. 8 p, 1 fig, 6 tab, 10 ref.

Descriptors: *Viruses, *Bacteria, *Disinfection, Separation techniques, Analytical techniques, Polyelectrolytes, Public health, Filtration, Coagulation, Water renovation, *Waste water treatment.

Detectable virus levels have been discovered in both sewage and natural waters. Although large numbers of bacteria must usually be present to cause infection, such is not the case for viruses, since even very small amounts may cause infections which generate large amounts of viruses to be passed on to other organisms. Present techniques for determining viral concentrations in both sewage and natural waters include: (1) the two-phase separation technique; (2) the Al (OH)3-protamine sulfate method; and (3) the polyelectrolyte-silt method. Viral recovery in the laboratory has been erratic with all three methods, suggesting that when viruses are detected, many more are present that are not detected. Virus removals from surface and sewage waters are accomplished in part by activated sludge (providing the best removals of all biological processes but with erratic results), rapid filtration following coagulation, carbon adsorption and other physical-chemical treatment processes. However, disinfection is still mandatory to ensure a safe effluent. Because of the development of better viral detection techniques and better removal methods, renovated potable water produced directly from sewage may soon be a lesser hazard than the increasingly contaminated natural supply because of the extreme care taken in quality control. (Lowry-Texas)
W72-12061

DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE,
Engineering-Science, Inc., Oakland, Calif.
J. Scherig, and H. F. Ludwig.
Third International Water Pollution Research Conference, Munich, Germany, Advances in Water Pollution Research, Vol 3, 1966. p 217-237, 6 fig, 10 tab, 10 ref.

Descriptors: *Analytical techniques, *Sewage sludge, *Flotation, *Seawater, Efficiencies, Laboratory tests, Laboratory equipment, Statistical methods, Skimmings, Soaps, *Waste water treatment.
Identifiers: *Floatable matter, *Hexane extractable matter, Gravity flotation, Vacuum flotation, Fats.

A special teflon-coated funnel was developed to measure the flotables content, including those solids which floated only after immersion in seawater, of domestic sewage. The effects of mixing time, flotation time and seawater addition were investigated. The coefficient of variation of the test ranged from 5.7% and 96% recovery for a sewage containing 49 mg/l floatable material, to a coefficient of variation of 20% and 92% recovery for a sewage containing 1.0 mg/l floatable material. Seawater addition resulted in a 0.7 mg/l increase in floatable material in a freshwater sewage containing 1.1 mg/l floatable material. A liquid-extraction method for the determination of hexane-extractable material (HEM) in sewage was developed using direct extraction of a one-liter sample. Extraction of fat and fatty acid standards showed an

average recovery of 98.5% for samples containing from 6 to 100 mg/l fat. The most reliable extraction results were obtained when samples were acidified and preheated at 72-75C for 1 hour followed by 3 hr. of extraction. Solvent evaporation consisted of evaporation to dryness at room temperature followed by drying for 5 min at 85C. The average concentrations of floatable material in primary effluent were 2.2 plus or minus 1.4 mg/l and 1.5 plus or minus 0.7 mg/l, respectively, for 2 plants employing gravity flotation and 0.6 plus or minus 0.5 mg/l for 1 plant employing vacuum flotation. The skimmings collected by gravity flotation contained 93-98% HEM, whereas the skimmings collected by vacuum flotation contained only between 33 and 41% HEM. (See W72-12063 and W72-12064) (Galwardi-Texas)
W72-12062

FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE'.
Los Angeles County, Calif.
J. A. Lambie.
Third International Water Pollution Research Conference, Munich, Germany, Advances in Water Pollution Research, Vol 3, 1966. p 240-241.

Descriptors: *Analytical techniques, *Sewage sludge, *Temperature, Wind, Currents, Oil, Oceans, Waste water treatment.
Identifiers: Floatable matter, Hexane extractable matter, Grease.

A satisfactory method of varying stirring and quiescent periods to simulate wave and current action and of bringing the sample to infinite saline dilution to evaluate density and ionic changes in the determination of floatables in sewage was reported by Scherig and Ludwig. However, it was pointed out that temperature should be taken into consideration. Refinements of the tentative wet-extraction method for the determination of grease published in Standard Methods for the Examination of Water and Wastewater was presented. With the simple and reliable method which was developed it may be possible to establish criteria for the maximum allowable grease and oil content as a guide in the prevention of a nuisance in the receiving waters. (See also W72-12062) (Galwardi-Texas)
W72-12063

FORMAL DISCUSSION OF 'DETERMINATION OF FLOATABLES AND HEXANE EXTRACTABLES IN SEWAGE,'
California State Water Resources Control Board, Sacramento.
P. R. Bonderson, and G. Gribkoff.
Third International Water Pollution Research Conf., Munich, Germany, Advances in Water Pollution Research, Vol 3, 1966. p 237-240, 3 ref.

Descriptors: *Analytical techniques, *Oceans, *Sewage sludge, Currents, Temperature, Winds, Soaps, Hydrolysis, Efficiencies, Laboratory tests, Waste water treatment.
Identifiers: Floatable matter, Hexane extractable matter.

Under laboratory conditions using the method of Scherig and Ludwig, the recovery of particulate floatables in low concentrations increased in denser waters. It was pointed out that different conditions may exist in ocean waters because of currents, temperature and winds, and that these will affect the amount of particulate materials near the surface. The increased efficiency and percentage of recoveries in the determination of hexane-extractables were due to more complete hydrolysis of the soaps. It was recommended that further investigations be conducted in order to correlate particulate floatables and hexane-extractable concentrations in an effluent with physical or visual conditions of the receiving waters. A sampling technique for floatables and hexane-extractables in large bodies of waters such as oceans and lakes should be developed but may prove to be a difficult achievement. (See also W72-12062) (Galwardi-Texas)
W72-12064

A LOW COST OPEN TANK PURE OXYGEN SYSTEM FOR HIGH RATE TOTAL OXIDATION,
Metropolitan Denver Sewage Disposal, Colo.
D. B. Cohen.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 5, Hall B, Paper No 9, June 20, 1972. p B/5/9/1-B/5/9/10, 2 fig, 4 tab, 6 ref.

Descriptors: *Sludge digestion, Oxygen, *Ozone, *Sludge treatment, Activated sludge, Municipal wastes, Pilot plant studies, Cost comparison, Flotation, Efficiencies, Performance, Design data, Bubbles, Size, *Waste water treatment, *Oxidation, *Colorado.
Identifiers: *Diffusers, Open tanks, Aerobic digestion, Solids stabilization, Volatile solids, Thickened sludge, *Denver (Colorado).

Pilot plant studies conducted by the Metropolitan Denver Sewage Disposal District using an open tank pure oxygen system for total oxidation of sludge were described. A high efficiency diffuser developed by Martin Marretta Company, was utilized because of its ability to create gas bubbles having less than a 0.2 mm diameter. The high gas transfer efficiencies led to an investigation of the possibility of increasing the sludge stabilization rate by substituting ozone for part of the oxygen in the gas stream. Results showed that the % volatile solids in the return sludge could be reduced in six hours from 75 to 50% using very small quantities of ozone. Aerobic digestion of waste activated sludge, thickened to 4.5% solids by air flotation, resulted in a 61.3% mass reduction during ten days, and represented a doubling of the digestion rate normally maintained with 0.8% return activated sludge. Results from a comparison of pilot plant data using the high efficiency diffuser with average operations parameters for the Metro. Denver system were presented in tabular form. Plant expansion costs based on conventional design parameters were compared with cost estimates for full scale pure oxygen systems using O2/O3 digestion of excess sludge in place of the present method of aerobic digestion. (Galwardi-Texas)
W72-12065

THE INTERRELATIONSHIP OF BIOLOGICAL--CARBON ADSORPTION SYSTEMS FOR THE TREATMENT OF REFINERY AND PETROCHEMICAL WASTEWATERS,
Engineering-Science, Inc./Texas, Austin.
D. L. Ford, and M. A. Buercklin.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 11, Hall C, Paper No 23, June 22, 1972. 9 p, 5 fig, 1 tab, 9 ref.

Descriptors: *Activated sludge, *Activated carbon, *Pilot plants, Adsorption, Industrial wastes, Color, Toxicity, Heavy metals, *Oils, Chemical oxygen demand, Cost analysis, *Waste water treatment.

One of the major obstacles involved in both designing carbon contact plants for treatment of refinery waste waters, and estimating costs for such treatment, is the lack of previous full-scale plant experience. Therefore both technical and economic justification must be predicted based on comprehensive pilot plant evaluations. Investigations have indicated that adsorption theory described by rate equations and the distinct breakthrough curve geometry seldom apply to complex industrial waste waters. The presence of persistent BOD organics leakage, discovered in recent pilot plant tests of total carbon systems, indicates that the series biological-carbon system will probably become increasingly prevalent. A more pronounced breakthrough curve and smaller adsorption zone depth were observed for carbon adsorption removal of TOC and COD when biologically treated effluent was used as column feed as compared to primary (oil separator) effluent feed. Although significant economies of scale exist for both activated sludge and carbon adsorption, cumulative cost curves for series biological carbon systems have indicated little incentive to design for more than 70% or less than 40% COD removal in the activated sludge unit. (Lowry-Texas)
W72-12066

AN ATTEMPT TO TAKE ACCOUNT OF BIOLOGICAL STORAGE IN THE MATHEMATICAL ANALYSIS OF ACTIVATED SLUDGE BEHAVIOR,
J. C. Jacquart, J. M. Rovel, and D. Lefort.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 4, Hall B, Paper No 8, June 20, 1972. p B/4/8/1-B/4/8/6, 3 fig, 5 ref.

Descriptors: *Activated sludge, *Mathematical models, *Organic loading, *Respiration, *Biochemical oxygen demand, Simulation analysis, Time, Bacteria, Storage capacity, *Waste water treatment.
Identifiers: Respiratory activity, Warburg respirometer, Field measurements, Food storage.

Measurements at different activated sludge treatment plants showed that an important aspect of the behavior of activated sludge has not been covered in mathematical models of the activated sludge process reported in the literature. The delay between the occurrence of peak BOD5 loads and peak respiratory activity has been omitted. Delays of 3 to 4 hours were noted for the respiratory activity behind the organic load. A mathematical model was developed to calculate the respiratory activity taking into account the ability of bacterial cells to store externally or internally part of the organic load. A favorable comparison of calculated and observed values of respiratory activity was obtained. Field measurements were conducted over a 36 hour period. A Warburg respirometer was used to measure respiratory activity. (Galwardi-Texas)
W72-12068

RENOVATING SECONDARY SEWAGE BY GROUNDWATER RECHARGE WITH INFILTRATION BASINS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer, E. D. Escarcega, R. C. Rice, and M. F. Riggs.
Copy available from GPO Sup Doc EPA 16060 DRV 03/72, $1.00; microfiche from NTIS as PB-211 164, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1972. 102 p, 33 fig, 15 tab, 13 ref. EPA Program 16060 DRV 03/72.

Descriptors: *Water reuse, *Tertiary treatment, *Groundwater recharge, Design criteria, *Infiltration, Water spreading, Cost analysis, Water table, Nitrogen, Denitrification, Phosphates, Fluorides, Boron, Coliforms, Waste water treatment.

A field project demonstrated the feasibility of renovating secondary sewage effluent by groundwater recharge with infiltration basins. Maximum loading rates were obtained with cycles of 20 days flooding rotated with dry periods of 10 days in the summer and 20 days in winter. With these schedules the system could infiltrate 300-400 ft/year using a water depth of 1 ft. Grassed basins had higher infiltration rates, and a gravel covered

basin had a lower infiltration rate than a bare soil basin. Essentially complete removal of BOD and fecal coliform, and significant removal of phosphorus, nitrogen and fluoride were obtained. Hydraulic properties of the aquifer were evaluated by analog from the response of piezometric heads in the groundwater system to infiltration. These properties were then used in the design of a prototype system, which would yield renovated water at an estimated total cost of about $5 per acre-foot at the pump. (Lowry-Texas)
W72-12071

FULL SCALE RAW WASTE WATER FLOCCULATION WITH POLYMERS,
District of Columbia Dept. of Sanitary Engineering, Washington.
P. V. Freese, and E. Hicks.
Copy available from GPO Sup Doc EPA 17050 EJB 11/70, $0.60; microfiche from NTIS as PB-211 240, $0.95; paper copy $2.60. Environmental Protection Agency, Water Pollution Control Research Series, November 1970. 49 p, 5 fig, 16 tab, 5 ref. EPA Program 17050 EJB 11/70.

Descriptors: *Flocculation, *Sedimentation, *Sludge disposal, Suspended solids, Polymers, Filtration, Biochemical oxygen demand, *Waste water treatment, *District of Columbia.
Identifiers: *Elutriation, *Raw waste water flocculation.

Three polymers, Dow's anionic A-21 modified with cationic C-31, Hercules' cationic Reten 210, and Calgon's anionic ST 269 with a clay builder, were added to the District of Columbia's raw waste water in 240 MGD tests of raw waste water flocculation. The objectives of polymer flocculation of the raw waste water were to increase solid capture in the primary tanks, reduce the BOD load to aeration, and permit recycle of the elutriate to the plant's influent. A-21 increased the amounts of raw and thickener overflow solids captured within the primary basins by 25%. With recycle of the solids in the elutriate, the amount of captured solids increased by 50%, compared to elutriate recycled without polymer treatment. ST 269 did not increase the capture of the raw and thickener overflow solids. Later, with reduced ST 269 dosage and recycled elutriate, the solids captured increased by 40% compared to the elutriate recycle without polymer treatment. Reten 210 increased amounts of the captured solids (by 19%) only when the elutriate solids were recycled. Polymer treatment of raw waste water did not improve the solids capture in elutriation or permit continuous elutriate recycle. (Lowry-Texas)
W72-12073

EFFECT OF CHLORINATION ON SELECTED ORGANIC CHEMICALS,
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 05B.
W72-12074

FLUIDIZED-BED INCINERATION OF SELECTED CARBONACEOUS INDUSTRIAL WASTES.
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.

Copy available from GPO Sup Doc EPA 12120 FYF 03/72, $1.00; microfiche from NTIS as PB-211 161, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1970. 88 p, 4 fig, 33 tab, 155 ref. EPA Program 12120 FYF 03/72.

Descriptors: *Industrial wastes, *Incineration, *Chemical wastes, Flotation, Sludge, Water pollution control, Textiles, Suspended solids, Hydrogen ion concentration, Waste water treatment.
Identifiers: *Carbonaceous wastes, *Fluidized-bed operation.

The feasibility of fluidized-bed incineration for selected carbonaceous industrial wastes was evaluated. The two-phase program consisted of an initial phase in which wastes from the paint, plastics, rubber, and textile industries in Ohio were characterized, and a second phase in which various waste samples were obtained, analyzed, and experimentally incinerated in a 10 inch diameter fluidized-bed system. Results indicate that sludges from solvent recovery operations in the paint industry, sludges from primary treatment of process wastes from plastic manufacturing, flotation sludges from primary treatment of synthetic rubber manufacture, and the waste from the viscose process of the textile industry can be incinerated in a fluidized-bed system without the production of noxious or toxic exhaust gases. The program also indicates that incineration of the various wastes significantly reduces their potential impact on stream pollution. It is recommended that a demonstration plant be constructed and operated at a site close to the source of several types of industrial wastes. (Lowry-Texas)
W72-12075

THE EFFICACY OF THE COMPLETE MIX ACTIVATED SLUDGE PROCESS IN MODULAR MODE,
Mississippi State Univ., State College. Water Resources Research Inst.
E. C. McGriff, Jr.
Available from the National Technical Information Service as PB-211 156, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, July 1972, 115 p, 8 fig, 41 tab, 31 ref, 4 append. OWRR A-055-MISS (1).

Descriptors: *Activated sludge, *Waste water treatment, *Mixing, Organic loading, Retention, Performance, Efficiencies, *Quality control.
Identifiers: *Modular system.

The complete mix activated sludge (CMAS) process in modular mode produces an effluent quality equal to that produced by an equivalent CMAS single-reactor system as evaluated during this research. Furthermore, the modular system maintained a lower sludge production but a greater oxygen demand than the control or single-reactor system. The control and study systems demonstrated ability of the CMAS process to produce good treatment efficiency at various organic loadings with a hydraulic retention time of four (4) hours. The practical value of this study is an indication that the capacity of the CMAS process can be modified, without loss of performance efficiency, through the use of a modular system.
W72-12102

THE EFFECT OF ORGANIC AMENDMENTS FROM GARBAGE GRINDING ON A BIOLOGICAL TREATMENT SYSTEM,
Mississippi State Univ., State College. Water Resources Research Inst.
J. L. Mahloch.
Available from the National Technical Information Service as PB-211 149, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, June 1972, 47 p, 11 fig, 12 tab, 16 ref, append. OWRR A-054-MISS (1).

Descriptors: *Garbage, *Biological treatment, *Waste water treatment, *Activated sludge, *Organic wastes, *Domestic wastes, Sewage, Statistical analysis.
Identifiers: Microbiological analysis.

A comparison was made between two activated sludge treatment systems, one receiving a mixture of garbage grinder waste effluents and settled domestic sewage at different loadings of garbage wastes, and the other receiving only settled domestic sewage. An evaluation of the two systems was made by utilizing process performance factors, which reflect process response and treatment efficiency, and microscopic examinations of the mixed liquor from both systems. Normal procedures for making a comparison between the two systems were reinforced by a statistical comparison of the two data sets obtained. The results indicate that the addition of waste effluents from garbage grinders has no detrimental effect on the performance of the activated sludge treatment systems and that the process is capable of adjusting to a wide range of garbage waste loadings.
W72-12105

AN ENZYMATIC TECHNIQUE TO DETECT SURPLUS PHOSPHORUS UPTAKE BY ACTIVATED SLUDGE,
Texas Univ., Austin. Environmental Health Engineering Research Lab.
E. G. Fruh, W. E. Morgan, H. G. Moore, Jr., R. B. Higgins, and M. L. Shahan.
Presented at Fifth International Water Pollution Research Conference, July-August 1970, p II-2/1-II2/14, 11 fig, 6 tab, 14 ref. EPA Program 17010 DUX 08/70.

Descriptors: *Waste water treatment, *Nutrients, *Phosphorus, *Bioassay, *Activated sludge, Eutrophication, Bacteria, *Enzymes.
Identifiers: *Alkaline phosphatase, Phosphorus uptake.

An alkaline phosphatase bioassay was evaluated for use in detecting surplus phosphorus uptake by activated sludge cultures. Using batch experiments a general correlation between percent phosphorus in the suspended solids and the degree of alkaline phosphatase activity was observed; however, abnormally high cellular phosphorus was found only during the lag phase of initially 'phosphorus starved' bacteria. Using continuous flow experiments a similar relationship between percent phosphorus and alkaline phosphatase activity was observed in short term, 3 days; however, long term, 5 days to 2 months, experiments did not establish any definite correlation between alkaline phosphatase activity, cellular phosphorus and growth. All of the experiments conducted indicate a general relationship existing between alkaline phosphatase activity and cellular phosphorus. High enzymatic activities and low cellular phosphorus are associated with low influent phosphorus concentrations; low enzymatic activities and high cellular phosphorus are associated with intermediate and high influent phosphorus concentrations. However, no quantitative relationship was found during the experiments relating enzymatic activity to cellular phosphorus. These experiments did not indicate a practical, quantitative relationship between alkaline phosphatase and cellular phosphorus for evaluating surplus uptake of phosphorus by mixed bacterial cultures; i.e., activated sludge.
W72-12116

EVALUATION OF PROCESSES AVAILABLE FOR REMOVAL OF PHOSPHORUS FROM WASTEWATER,
L. K. Cecil.
Available from the National Technical Information Service as PB-211 191, $3.75 in paper copy, $0.95 in microfiche. Environmental Protection Agency Report No. EPA-R2-72-034, October 1971, 40 p, 39 ref. EPA Program 17010 DRF Contract 14-12-581.

Descriptors: *Sewage treatment, *Phosphates, Biological treatment, Chemical precipitation, Activated sludge, Physical processes, Tertiary treatment, *Waste water treatment, Costs, *Treatment facilities, *Sludge disposal.
Identifiers: Sludge production, Lime, Alum, Iron, Aluminate, *Biological-chemical treatment.

The more important treatment processes for removal of phosphorus compounds from municipal wastewater are evaluated for practicality, cost, and impact on the quality of the treated effluent. The numerous options for the designer in the selection of treating processes, chemicals to be used, and the point or points of chemical application are discussed. A detailed list of phosphorus removal projects of one consulting engineer is given as an example of phosphorus removal projects under design. A list of full-scale phosphorus removal plants, already in operation or planned, shows the type of treatment selected and the operating results expected. Various methods of ultimate sludge disposal are discussed.
W72-12121

PURIFICATION OF FLUORINE-CONTAINING INDUSTRIAL WASTE WATERS,
International Minerals and Chemical Corp. Skokie, Ill.
R. E. Bird.
U.S. Patent No. 3,551,332, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 5, p. 2027, December 29, 1970.

Descriptors: *Patents, *Fluorine, *Industrial wastes, *Waste water treatment, Water treatment, Water purification, Pollution abatement, Treatment, Water pollution, Water pollution treatment, Chemical wastes, Separation techniques.
Identifiers: *Chemical treatment.

Finely divided calcium carbonate, e.g. limestone, is added to the solution in an amount to produce a pH from 3.0 to about 3.3 and to precipitate calcium fluoride. The calcium fluoride is removed by filtration. The amount of calcium fluoride precipitated may be increased by adding soluble phosphate and/or sulfate to the waste water before adding the limestone. (Sinha-OEIS)
W72-12126

METHOD AND APPARATUS FOR WASTE WATER PURIFICATION,
Kurita Water Industries Ltd., Yokohoma (Japan),
T. Horiguchi, A. Matsuo, and T. Ishika.
U.S. Patent No. 3,547,816, 3p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1127, December 15, 1970.

Descriptors: *Patents, *Waste water treatment, Water purification, Oxygen, *Aeration, *Filtration, Separation techniques, Equipment, Treatment, Pollution abatement, Water pollution, Water pollution treatment, *Aerobic conditions.

Waste waters are kept in an aerobic condition as they are fed to the filter medium. An upright rotatable shaft, in the filtration tank has the capability to keep the filter medium scraped clean to avoid interruptions during the procedure. A scraper blade cleans the filter bed and the sludge is directed to a hollow portion of the shaft. The hollow portion is coupled to a sludge discharge pipe which extends to the exterior of the tank. (Sinha-OEIS)
W72-12130

STAGED OXYGENATION OF BOD-CONTAINING WATER,
Union Carbide Corp., New York.
J. R. McWhirter.
U.S. Patent No. 3,547,815, 11 p, 10 fig, 5 tab, 13 ref; Official Gazette of the Unites States Patent Office, Vol. 881, No. 3, p. 1127, December 15, 1970.

Descriptors: *Patents, *Biochemical oxygen demand, *Oxygenation, *Lagoons, Tanks, Domestic wastes, Municipal wastes, Pollution abatement, Treatment, Equipment, Separation techniques, *Waste water treatment, Water pollution, Water pollution treatment.

BOD-containing water and an active biomass and a feed gas of at least 50% by volume of oxygen are mixed. These form an oxygenated liquid-solid and an unconsumed oxygen-containing gas which is at least 35% oxygen. The latter gas is discharged from the first stage and recirculated against the other fluids with liquid-solid. The gas remaining after this second stage may be discharged to the atmosphere. The waste liquor storage enclosure may be a fabricated tank or a lagoon. Waste liquor enters through a conduit. At least two separate oxygenation chambers float in the lagoon. The liquor is stirred by a mechanical agitator or propeller. (Sinha-OEIS)
W72-12131

BIOCHEMICAL OXIDATION WITH LOW SLUDGE RECYCLE,
Union Carbide Corp. New York.
E. K. Robinson, and J. R. McWhirter.
U.S. Patent No. 3,547,813, 8 p, 6 fig, 2 tab, 10 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1126, December 15, 1970.

Descriptors: *Patents, Sewage treatment, Municipal wastes, Waste water, *Waste water treatment, *Oxygenation, *Biological treatment, *Biochemical oxygen demand, *Aeration, Sludge treatment.
Identifiers: *Biochemical treatment.

BOD-containing waste water, sludge having 12,000 to 50,000 parts per million total suspended solids content and feed gas (50% by volume oxygen) are mixed in an oxygenation zone to provide mixed liquor of 4000 to 12,000 parts per million total suspended solids content. The gas above the mixed liquor has an oxygen partial pressure of at least 300 millimeters Hg, for a residence time of 20 to 180 minutes to form oxygenated liquor having DO content of at least 3 parts per million. The sludge and clarified effluent are separated and part of the sludge recycled to the oxygenation zone. (Sinha-OEIS)
W72-12132

HIGH OXYGEN UTILIZATION IN BOD-CONTAINING WATER TREATMENT,
Union Carbide Corp., New York. (assignee).
J. R. McWhirter.
U.S. Patent No. 3,547,812, 7 p, 11 fig, 2 tab, 16 ref, Official Gazette of the United States Patent Office, Vol. 881, No. 3, p. 1126, December 15, 1970.

Descriptors: *Patents, *Biochemical oxygen demand, *Pulp wastes, *Oxygenation, *Aeration, Water treatment, *Waste water treatment, Municipal wastes, Chemical wastes, Industrial wastes, Water pollution, Water pollution treatment, Pollution abatement.
Identifiers: *Petrochemical wastes, *Fermentation liquor.

BOD-containing water, biomass and feed gas (60% by volume oxygen) are mixed in an aeration zone to form liquor. The mixing continues while maintaining the oxygen feed gas to mixing plus gas-liquor contact energy ratio at 0.03-0.04 lb moles oxygen per horsepower hour of energy supplied. At the same time the aeration gas above the liquor is held at oxygen partial pressure of at least 300 millimeters Hg but below 80% oxygen while consuming at least 50% of the feed gas oxygen in the liquor. The dissolved concentration of the liquor is held below 70% of saturation with oxygen but above about 2 parts per million. Meanwhile there is recirculation of one of the aeration gas and liquor fluids in contact with the other fluids in the aeration zone. Finally oxygenated liquor is withdrawn from the aeration zone. (Sinha-OEIS)
W72-12133

CYCLIC OXYGENATION OF BOD-CONTAINING WATER,
Union Carbide Corp., New York, (Assignee).
J. R. McWhirter.
U.S. Patent No. 3,547,811, 8 p, 6 fig, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol. 811, No. 3, p. 1126, December 15, 1970.

Descriptors: *Patents, *Biochemical oxygen demand, Waste treatment, Municipal wastes, Industrial wastes, Sewage treatment, Chemical wastes, *Oxygenation, Pollution abatement, Water pollution, Water pollution treatment, Treatment, Treatment facilities, *Biological treatment, *Oxygen.

A method and apparatus are provided for the treatment of BOD-containing water by cyclic biochemical oxygenation in contact with biomass. The invention effectively utilizes the relative component equilibrium solubilities and stoichiometry to create a highly efficient system characterized by high percentage oxygen absorption while maintaining a high oxygen partial pressure in the aerating gas system. (Sinha-OEIS)
W72-12134

OZONATION OF INDUSTRIAL WASTE WATER,
Gerber Products Co., Fremont, Mich.
M. R. Dietz, and C. R. Moller, Jr.
U.S. Patent No. 3,546,114, 2 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p. 705, December 8, 1970.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Ozone, Pollution abatement, Water pollution, Water pollution treatment, Water treatment, Treatment, Water quality, *Alkaline water.

A method is presented for treating hot alkaline industrial waste water with ozone to make the water suitable for subsequent reuse. After filtering, ozone in concentrations of about 15 parts per million is introduced into the water which is at a temperature higher than 160 degrees F. (Sinha-OEIS)
W72-12136

METHOD FOR PURIFYING FRESH AND WASTE WATERS BY FLOCCULATION IN AN AMPHOTERIC PHASE,
R. R. Seiler.
U.S. Patent No. 3,546,113, 4 p, 7 tab, 7 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p. 705, December 8, 1970.

Descriptors: *Patents, *Hydrogen-ion concentration, Water purification, Water treatment, *Waste water treatment, *Flocculation, Water pollution, Water pollution treatment, Pollution abatement, *Chemical reactions.
Identifiers: Zinc chloride, Metal salts, Boric acid, Zinc salts, Buffering.

A method is described for the purification of waste waters by flocculation in an amphoteric medium with the use of a water-soluble zinc salt, e.g. zinc chloride, in an environment whose pH is adjusted within the range 7.8-8.5 by employing a buffering solution of alkali metal salts of boric acid. Sodium tetraborate and sodium metaborate are preferred. The preliminary pH adjustment can be made with a strong alkali, this is the case with slightly acidic waters. (Sinha-OEIS)
W72-12137

WASTE WATER TREATMENT PLANT,
Passavant-Werke (Germany).
E. R. Thorn.
U. S. Patent No. 3,545,620, 5 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 881, No 2, p 594, December 8, 1970.

Descriptors: *Patents, *Waste water treatment, *Treatment facilities, Pollution abatement, Water pollution, Water pollution treatment, *Flocculation, *Sedimentation.

The waste water treatment plant consists of a central mixing chamber surrounded by a flocculation reaction chamber. Both chambers are located in a rectangular sedimentation basin. A chain scraper may be placed on the bottom of the basin to move settled sludge to a sump. An adjustable scum remover is provided above the sedimentation zone. (Sinha-OEIS)
W72-12139

WATER TREATMENT PLANT,
Neptune Microfloc, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 05F.
W72-12140

PROCESS AND APPARATUS FOR SEPARATING LIQUIDS AND SOLIDS,
American Machine and Foundry Co., New York.
P. Karter.
U. S. Patent No. 3,543,933, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 1, p 177, December 1, 1970.

Descriptors: *Patents, Separation techniques, Pollution abatement, Gravity, *Filtration, Sedimentation, *Flocculation, *Waste water treatment, *Liquid wastes, Solid wastes, Sewage treatment.

An aqueous sludge is introduced into a collection zone, then the material is passed through a filtering zone. The solids are retained as water passes through. The process is carried out at ambient conditions of pressure and temperature, the separation depending only on gravity. (Sinha-OEIS)
W72-12141

APPARATUS FOR THE PURIFICATION OF POLLUTED WATER,
Societe Nouvelle Seta S.A. (France) (assignee).
J. M. Boris.
U. S. Patent No. 3,540,589, 3 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 887, November 17, 1970.

Descriptors: *Patents, *Air, Water pollution, Water pollution treatment, Pollution abatement, Equipment, *Bacteria, *Aerobic bacteria, *Aerobic treatment, *Bubbles, *Waste water treatment, Liquid wastes, Treatment, Water treatment.

The apparatus consists of a horizontal tank filled with water to be treated and in which a cylindrical drum rotates. Water is introduced into the tank from which it is evacuated after treatment. Bacteria which are attached to the packing elements of the rotating drum are brought into contact with air and with water. Some water flows inside the packing elements. Some air is also entrapped in the packing element and the air eventually rises to the surface of the water as bubbles. (Sinha-OEIS)
W72-12142

WATER TREATMENT,
Combustion Engineering, Inc., New York.
For primary bibliographic entry see Field 05F.
W72-12143

REVERSE OSMOSIS WATER PURIFICATION UNIT,
For primary bibliographic entry see Field 03A.
W72-12146

METHOD AND APPARATUS FOR NEUTRALIZING ACID WASTE WATER,
United States Steel Corp., Pittsburgh, Pa.
A. A. Spinola.
U. S. Patent No. 3,541,008, 2 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 984, November 17, 1970.

Descriptors: *Patents, *Waste water treatment, *Acidic water, *Acids, Air, Bubbles, pH, Pollution abatement, Acidity, *Neutralization, Treatment, Water treatment, *Aeration, *Oxidation.

An apparatus is provided for neutralizing acid waste water. It comprises a reaction chamber with a porous plate spaced above the bottom defining an air plenum. Air under pressure is supplied to the plenum and a neutralizer-inlet pipe. Solids removed from the effluent gas leaving a cement kiln are introduced into the air flowing through the neutralizer and are entrained therewith. The input of neutralizer is controlled according to the pH of the treated water which overflows from the chamber into a settling tank. (Sinha-OEIS)
W72-12147

WASTE TREATMENT APPARATUS,
Tesco Chemicals, Inc., Atlanta, Ga.
T. E. Schneider, Jr., and W. E. Bradley, Jr.
U. S. Patent No. 3,540,590, 4 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 888, November 17, 1970.

Descriptors: *Patents, *Waste treatment, Equipment, Pollution abatement, Ships, Sea water, Water pollution, Water pollution treatment.

A solid form of soluble chemical compound is eroded or dissipated by the flow of purging liquid toward the waste receptacle. The method includes flowing liquid into the upper portion of a waste receptacle, washing the waste in a downward direction within the receptacle, grinding the waste into small particles, and discharging the waste and the liquid. (Sinha-OEIS)
W72-12149

WASTE TREATMENT PROCESS,
Energy Systems, Inc., Melbourne, Fla.
D. D. Woodbridge, T. A. Nevin, and W. R. Garrett.
U. S. Patent No. 3,539,507, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 593, November 10, 1970.

Descriptors: *Patents, *Waste treatment, *Liquid wastes, Biological treatment, *Filtration, Waste disposal, *Sewage treatment, *Yeasts, *Bacteria, *Gamma radiation, *Waste water treatment.
Identifiers: *Sterilization.

Wastes are fed into a wet well or mixing container and pumped into biochemical treatment vats. These may be charged with a specific culture of yeasts. The treated wastes pass into a second set of biochemical vats for the same or modification of the same treatment. The liquid leaving the second vats may be filtered prior to entering a junction box where a portion is fed back to the mixing container to keep the waste stirred up. A portion of the liquid after filtration, is fed from the junction box through a sterilizer such as gamma radiation for killing harmful bacteria or other microorganisms. The liquid is filtered again and discharged as needed. (Sinha-OEIS)
W72-12150

PROCESS FOR DESTROYING AMMONIA CONTAINED IN WATERS RESULTING FROM THE OPERATION OF COKE OVENS,
H. Siewers, K. Flasche, A. Stetter, and S. Pfeiff.
U. S. Patent No. 3,540,189, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 789, November 17, 1970.

Descriptors: *Patents, *Coal, *Ammonia, Industrial wastes, Waste treatment, *Waste water treatment, Pollution abatement, Separation techniques, Water pollution, Water quality control, Equipment.

A process is presented for removing ammonia from coke oven gas where it is formed during the degasification of coal. The water to be treated is heated at an elevated temperature to at least 60 degrees C conveying the lean gas charged with ammonia to regenerators of industrial furnaces, and heating it so that ammonia is dissociated to nitrogen and hydrogen. Details are given of a representative example. (Sinha-OEIS)
W72-12151

EVAPORATION-CONDENSATION RECOVERY OF FRESH WATER USING GAS-TRAVERSABLE POROUS BED,
For primary bibliographic entry see Field 03A.
W72-12153

PROCESS AND INSTALLATION FOR CLARIFICATION OF WATER,
Compagnie des Eaux et de l'Ozone (France). (assignee).
J. Guillerd, and C. Valin.
U. S. Patent No. 3,534,855, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 879, No. 3, p. 789, October 20, 1970.

Descriptors: *Patents, Water purification, *Filtration, *Waste water treatment, Pollution abatement, Equipment, Treatment, Separation techniques, Water pollution treatment, Water pollution, Granules, *Sands.

The filters comprise a series of beds of granules (sand) increasing in size from the top to the bottom. The waste water to be cleansed is passed upward through the filter at a velocity less than that at which the particles would be carried upward by the water. When the filter becomes clogged, a water reserve above it is caused to flow downward to clean the filter. (Sinha-OEIS)
W72-12159

REVERSE OSMOSIS CONCENTRATION OF DILUTE PULP AND PAPER EFFLUENTS,
Institute of Paper Chemistry, Appleton, Wis. Div. of Industrial and Environmental Systems; and Pulp Manufactures Research League, Appleton, Wis.
A. J. Wiley, G. A. Dubey, and I. K. Bansal.
Copy available from GPO Sup Doc as EPA 12040 EEL 02/72 for $2.75; microfiche from NTIS as PB-211 184, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, February 1972. 358 p, 68 fig, 105 tab, 29 ref, append. EPA Program 12040 EEL 02/72.

Descriptors: *Reverse osmosis, *Pulp wastes, *Waste water treatment, Water reuse, Economic feasibility, *Membrane processes, Industrial wastes, *Semipermeable membranes, *Desalination, Separation techniques, Water costs.
Identifiers: Chemical recovery, Membrane fouling, Membrane cleaning, Technical feasibility.

Adaptation of reverse osmosis (RO) as a method of concentration for dilute effluents of pulping, bleaching, and paper manufacture was conducted in laboratory, pilot scale, and in large 50,000 gallon per day field demonstrations at pulp mills. Most of these dilute wastes at 1 percent solids contained suspended particles, colloidal suspensoids, large molecular-weight wood derived organics, and/or scale-forming inorganic chemical residues. Tubular membrane systems capable of being operated at self-cleaning velocities increasing beyond 2.0 feet per second, as concentration advanced to 10 percent solids, were apparently best adapted to processing these effluents at sustained high flux rates and relatively free of fouling problems. Capillary fiber and spiral wound sheet membrane systems required expensive clarification treatment before and during concentration. Tubular systems studied were subject to excessive failure rates in terms of life of membrane support structures or to

leakage of internal connections based on the support structure. Feasibility of employing RO for concentration of dilute pulping and bleaching effluents depends on developing routes to substantial improvement in life expectancy of RO equipment to maintain high flux rates and rejections at much lower membrane maintenance and replacement costs than prevailed with equipment available for these studies conducted from 1967 through 1971.
W72-12189

HIGH RATE FILTRATION OF COMBINED SEWER OVERFLOWS,
Hydrotechnic Corp., New York.
R. Nebolsine, P. J. Harvey, and Chi-Yuan Fan.
Copy available from GPO Sup Doc for $2.50; microfiche from NTIS as PB-211 144, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 339 p, 27 fig, 31 tab, 27 ref, 5 append. EPA Program No 11023 EYI 04/72, Contract No 14-12-858.

Descriptors: *Overflow, *Filtration, Anthracite, Sand, Suspended solids, Biochemical oxygen demand, Chemical oxygen demand, Coliforms, Precipitation, Urban runoff, Activated sludge, Cost estimates, *Ohio, *Combined sewers.
Identifiers: *Cleveland, *Deep bed, Dual media, *Drum screens.

Pilot plant studies were conducted at Cleveland's Southerly Wastewater Treatment Plant in 1970 and 1971, to develop and demonstrate the capabilities of the deep bed, dual media, high rate filtrate treatment process for storm caused combined sewer overflows. The treatment system is comprised of a drum screen with a 40 mesh screening element (420 microns opening) followed by a deep bed, dual media, high rate filter of five feet of No. 3 anthracite (effective size 4 mm) over three feet of No. 612 Sand (effective size 2 mm). The results show suspended solids removals of 93 percent, with polyelectrolyte addition, at a filtration rate of 24 gpm/sq ft at an average influent suspended solids of 411 mg/l. Reductions in biochemical oxygen demand averaged 65 percent. Capital costs (ENR=1470) for a high rate filtration plant are about $23,000 per mgd. Total annual treatment costs, including capital and operating charges, range from approx. $90,000 per yr for a 25 MGD plant to approx. $390,000 for a 200 MGD treatment facility. Principal advantages of the proposed system are: high treatment efficiencies, automated operation, and limited space requirements as compared with alternate flotation or sedimentation systems.
W72-12191

THE URBAN WATER SYSTEM--ECONOMIC ASPECTS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W72-12223

UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12236

CASE STUDY ON SENSITIVITY ANALYSIS AND NONLINEAR PROGRAMMING APPLICATIONS TO PROCESS ANALYSIS AND CONTROL,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12237

PACKAGED PLANT HAS NOVEL SCUM REMOVAL SYSTEM.

Effluent and Water Treatment Journal, p 507-510, September 1969. 3 fig, 1 tab, 11 ref.

Descriptors: *Treatment facilities, *Activated sludge, *Settling basins, *Design, Aeration, Scum, Skimming, Biochemical oxygen demand, Efficiencies, Performance, Variability.
Identifiers: Package plant, Biox, Extended aeration, Operating data, Pebble bed clarifier.

A versatile packaged sewage treatment plant, Biox developed by Macleod and Miller Ltd. was described. The units consisted of two aeration sections and a central settling section. The unit can be operated as an extended aeration system, a sludge re-aeration system or a split aeration system simply by altering the entry gates which channel the flow as required. Problems associated with other systems were overcome in the Biox by having a central settling section in which mixed liquor enters part-way down through a full-width inlet and sludge leaves through a full-width outlet. The compressor system consisted of three units which allowed considerable flexibility of operation. Supernatant liquor from the settlement chamber overflows a castellated weir to a pebble-bed clarifier prior to discharge. An unusual feature of the plant was the variable-speed scum-removal device which consisted of a turbine paddle wheel powered by a D. C. motor controlled by a speed regulator. Thus, by turning a dial, scum can be removed at any given rate. Operating data were arranged in tabular form and showed an average BOD reduction of 98.5 percent. (Galwardi-Texas)
W72-12274

INITIAL DEPTH AS A VARIABLE IN ACTIVATED SLUDGE SETTLING TESTS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Science and Engineering.
P. A. Vesilind, and R. I. Dick.
Effluent and Water Treatment Journal, p 263-267, May 1969. 6 fig, 1 tab, 9 ref.

Descriptors: *Activated sludge, *Settling velocity, *Depth, *Sludge, Laboratory tests, Laboratory equipment, Prototype tests, Scaling.
Identifiers: Retardation factor, Batch thickening tests, Initial depth, Thickening, Diameter, Sludge type, Concentration of solids, Cylinder diameter, Stirring rate.

The influence of initial depth of sludge on the settling velocity of sludge in batch thickening tests was investigated. This influence was quantitatively measured in terms of the retardation factor, R, which was defined as the D/V intercept on a D/V versus D plot where D was the initial depth and V the interface velocity. As the settleability of a sludge improved, R decreased and conversely, R was high for bulking sludges. The value of R also depended upon the concentration of activated sludge, being very small for dilute suspensions and increased logarithmically with concentration. Four cylinders, ranging in diameter from 3.5 in. to 36 in. were used to determine the influence of diameter on R, and R was found to increase with cylinder diameter. However, it was suggested that for some large enough diameter, R would no longer increase with diameter. The value of R was not influenced by slow stirring. Prototype thickeners have been found to be overdesigned and the failure to consider the initial depth effect in laboratory studies may be one of the major reasons. (Galwardi-Texas)
W72-12275

RECLAMATION AND RE-USE OF WATER FROM EFFLUENTS AND SEWAGE,
Water Pollution Research Lab., Stevenage (England).
G. E. Eden.
Water Pollution Research Laboratory Reprint No. 582, from The Paper Maker, October 1969. 5 p, 3 tab, 15 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, Sands, Filters, Reverse osmosis, Electrodialysis, Ion exchange, Ozone, *Water reuse. Microstraining.

Approximately 2,400 million gallons of sewage is produced in the British Isles each day. Most of this is treated to a quality of 30:20 and discharged to the receiving waters. Effluents of this quality can be used by industry without further treatment for some industrial purposes. Other uses require further treatment. Polishing by filtration, straining, lagooning, or grass plot irrigation is available. Some plants are currently pumping polished effluents to other areas which need additional water. Chemical coagulation, a standard water works technique, can improve the quality of effluents. Advanced treatment processes, electrodialysis, ion exchange resins and reverse osmosis are currently the subject of extensive study in the U. S. The so-called MD process involving microstraining, ozonation and rapid sand filtration has been the subject of extensive pilot plant trials in England. These all offer great promise for the future in the treatment of sewage effluents. It should be possible, by the use of these processes to alleviate many cases of water shortage by supplying high quality effluents to industry. (Goessling-Texas)
W72-12276

R AND D IN WASTE WATER TREATMENT,
Water Pollution Research Lab., Stevenage (England).
S. Jackson.
Water Pollution Research Laboratory Reprint No. 583, from Process Biochemistry, Vol 5, January 1970. 4 p, 2 fig, 4 tab, 10 ref.

Descriptors: *Waste water treatment, *Trickling filters, *Protozoa, *Tertiary treatment, Sands, Plastic, Activated sludge, Lagoons.
Identifiers: *Multi-stage filters, *Sludge conditioning, Microstrainers.

Comparisons of filters of various dimensions, multi-stage filter, protozoa in activated sludge, sludge conditioning substances, and various methods of polishing sewage effluents were investigated. Laboratory experiments have shown that filters of the same volume using plastic media have essentially the same efficiency regardless of dimensions. A four stage biological filter using plastic media was tested at flow rates of 70 gal/hr for 14 days. Waste water from a pharmaceutical plant provided the influent. The plant produced an effluent of the required quality. Laboratory scale experiments using a septic activated sludge plant have clearly demonstrated the utility of ciliated protozoa in improving the quality of the effluent. A wide variety of substances have been investigated as sludge conditioners. Results to data have been inconclusive due to the large number of variables involved. Sewage effluent standards stricter than 30:20 may require a polishing stage. Grassland irrigation, lagoons, gravity, or upflow sand filters, microstrainers and gravel bed clarifiers have been investigated in collaboration with local authorities and plant manufacturers. Results are reported in tabular form and all can produce effluent of 10:10. (Goessling-Texas)
W72-12277

EVALUATION OF BEEF CATTLE FEEDLOT WASTE MANAGEMENT ALTERNATIVES,
Oklahoma Agricultural Experiment Station, Stillwater.
A. F. Butchbaker, J. E. Garton, G. W. A. Mahoney, and M. D. Paine.
Copy available from GPO Sup Doc EP 2.10:13040 FXG 11/71, $2.50; microfiche from NTIS as PB-211 242, $0.95. Environmental Protection Agency,

Water Pollution Control Research Series, November 1971. 322 p, 61 fig, 51 tab, 94 ref. EPA Program 13040 FXG 11/71.

Descriptors: *Farm wastes, *Feedlots, *Management, *Agricultural runoff, Ultimate disposal, Cost analysis, Water pollution control, Cattle, Operation and maintenance, Separation techniques, Oxidation lagoons, Transportation, *Waste water treatment, *Waste treatment.
Identifiers: *Feedlot waste management alternatives.

Alternative beef waste management systems were examined to determine minimum cost systems for effective waste disposal. Design and cost information was obtained from feedlot visits and the literature. A computer program was developed for use with a Conversational Programming System (CPS) for calculating the sizes of equipment and facilities and for estimating the facility and machinery operating and investment costs. For open feedlots, two waste management systems, solid and runoff-carried, were considered. The total system investment cost for a 20,000 head unpaved feedlot with pollution control was approximately $420,000 with an operating cost of $0.133 per animal day (not including feed mill and storage, office or land costs). The pen facilities were about 65% of the total investment cost, the runoff control system about 10% and the solids handling about 25%. Confinement buildings with slotted floors using slurry handling methods or with solid floors using solid handling methods offer a high potential for completely controlling the animal waste and abating pollution. A promising system for near optimum pollution control is a cable scraper system underneath a slotted floor for daily removal and disposal of the wastes. A manure irrigation system costs about one-half as much as mechanically conveying the slurry to the fields. In semi-arid areas, evaporation lagoons offer another ultimate disposal alternative. (Lowry-Texas)
W72-12278

COMPUTERIZED DESIGN AND COST ESTIMATION FOR MULTIPLE-HEARTH SLUDGE INCINERATORS,
Rocketdyne, Canoga Park, Calif.
W. Unterberg, G. R. Schneider, and R. Sherwood.
Copy available from GPO Sup Doc EP2.10:17070 EBP 07/71. Environmental Protection Agency Water Pollution Control Research Series, July 1971. 166 p, 18 fig, 26 tab, 35 ref. EPA Program 17070 EBP 07/71.

Descriptors: *Computer programs, *Cost analysis, *Incineration, Design criteria, Sludge, Digital computers, Mathematical models, Heat balance, Sludge treatment, *Waste water treatment.

A digital computer program was developed for the preliminary design and cost estimation of an optimum multiple-hearth-furnace system for sewage sludge incineration. The program was primarily based on field data from nine operating plants, each having one to four furnaces. The individual furnaces covered a range in capacity from 200 to 4500 lb dry solids per hours, in number of hearths from 5 to 11, in outer diameter from 6 to 22 feet, and in hearth area from 85 to 2327 square feet. Operating schedules and thermal cycling were considered, the field data were correlated by least-square curve fits, and costs were normalized to 1969 dollars. The computer program provides the number, dimensions and ratings of components; expenditures of labor, fuel and power; and all the cost elements for an incineration system which is to process a given flow of sludge having specified characteristics. Cost breakdowns are calculated for capital, total cost per annum and total cost per ton dry solids incinerated. The computer program may also be used for the thermal analysis (air and fuel requirements, heat balance, and mass balance) of a multiple-hearth furnace incinerator without design and cost features. (Lowry-Texas)
W72-12279

HYPOCHLORITE GENERATOR FOR TREATMENT OF COMBINED SEWER OVERFLOWS.
Ionics, Inc., Watertown, Mass.

Copy available from GPO Sup Doc EP2.10:11023 DAA 03/72, $1.00; microfiche from NTIS as PB-211 243, $0.95. Environmental Protection Agency Water Pollution Control Research Series, March 1972. 89 p, 31 fig, 11 tab, 6 ref. EPA Program 11023 DAA 03/72. Contract 14-12-490.

Descriptors: *Chlorination, *Storm runoff, *Water quality control, Electrochemistry, Design criteria, Combined sewers, Disinfection, Computer models, Brines, Chlorine, *Waste water treatment.
Identifiers: *Electrolytic hypochlorite generator.

An advanced electrolytic generator has been developed for on-site production of sodium hypochlorite for disinfection of overflows from combined sewer systems. In this system an electrochemical cell electrolyzes sodium chloride brine to chlorine gas and sodium hydroxide solution, which are reacted immediately outside the cell to produce a 5 to 10% sodium hypochlorite solution. Significant advances in safety and economy have been realized by use of a hydraulically impermeable cation exchange membrane. The most critical components, the dimensionally stable anode and the ion-exchange membrane, have both operated for over 3000 hours with no deterioration of performance. System operation has been given a first order economic optimization. At a current density of 240 ASF, the cell potential is 3.7 volts. The generator requires 1.6 KWH of electricity and 2.1 pounds of salt per pound of sodium hypochlorite. Salt utilization is over 80%. The operating cost for systems larger than 500 pounds of hypochlorite per day is projected to be 3 to 4 cents per pound of hypochlorite. This cost is significantly below that of truck delivered solution. Such economy of operation should make the generator useful for a wide variety of water treatment applications. The first field unit is scheduled for installation in the Northeast Sanitary District in Somerville, Massachusetts, under Grant 11023 DME. The estimated operating and maintenance cost is estimated to be 3.7 cents per pound of chlorine or 0.13 cents per thousand gallons of overflow. (Lowry-Texas)
W72-12280

FILTRATION OF MUNICIPAL WASTE WITH A MOVING BED CONTACTOR,
Research Triangle Inst., Durham, N.C. Environmental Studies Center.
F. O. Mixon.
Copy available from GPO Sup Doc EP2.10:17030 FWH 01/72, $0.60; microfiche from NTIS as PB-211 244, $0.95. Environmental Protection Agency Water Pollution Control Research Series, January 1972. 51 p, 8 fig, 6 tab, 9 ref. EPA Program 17030 FWH 01/72.

Descriptors: *Filtration, *Suspended solids, *Separation techniques, Porous media, Screens, *Municipal wastes, Trickling filters, Coagulation, Performance, Cost analysis, *Waste water treatment.
Identifiers: *Continuous filtration, *Moving bed contactor.

A novel moving bed contactor has been utilized in filtration studies of municipal waste at various stages within a trickling filter plant. Granular, buoyant filter medium is slurried with process feed and introduced to the bottom of a column equipped with lateral retaining screens and filter medium harvesting machinery, both positioned toward the top of the column. Within the column, filter medium rises by buoyancy and forms a porous plug that traps suspended solids from the feed stream. Filtered liquid is removed from the lateral screen, and soiled filter medium is continuously removed from the column top, washed, and recycled to the column bottom. The process operates stably and dependably on all feeds tested--raw waste water, primary clarifier effluent, and trickling filter effluent. Suspended solids removals of 60 to 80 percent can be achieved at column loadings up to 7.5 gal/min/sq. ft. Filtration of alum-coagulated feed is less effective than that of untreated feed. Costs of the process, including equipment, power, construction, and amortization, were estimated at 2.8 cents/1000 gal for a 1 MGD plant and 1.6 cents/1000 gal for a 5 MGD plant, as opposed to 1.2 cents/1000 and 1.1 cents/1000 gal for a 1 and 5 MGD microstraining plant, respectively, with microstraining being the closest economic competitor to the moving bed contactor. (Lowry-Texas)
W72-12281

WATER POLLUTION REDUCTION THROUGH RECOVERY OF DESIZING WASTES.
North Carolina State Univ., Raleigh. Dept. of Textile Chemistry.

Copy available from GPO Sup Doc EP2.10:12060 EOE 01/72, $0.60; microfiche from NTIS as PB-211 245, $0.95. Environmental Protection Agency Water Pollution Control Research Series, January 1972. 48 p, 9 fig, 10 tab, 23 ref. EPA Program 12090 EOE 01/72.

Descriptors: *Textiles, *Industrial wastes, *Chemical precipitation, Performance, Biodegradation, Acclimatization, Activated sludge, Laboratory tests, Water pollution control, *Waste water treatment, *Water reuse.
Identifiers: *Chemicals recovery and reuse, *Carboxymethyl cellulose, *Polyvinyl alcohol, Alum.

Processes for precipitating from desizing wastes the synthetic warp sizes, carboxymethyl cellulose (CMC) and polyvinyl alcohol (PVA), were investigated. Carboxymethyl cellulose is precipitated quantitatively by certain multivalent metal salts, such as aluminum sulfate and ferric chloride. Aluminum sulfate is the more suitable for size recovery. Cycles of sizing, desizing and size recovery were performed on cottonpolyester (65:35) yarns, starting with commercial CMC, and continuing with only the recovered material. After four cycles, the performance of the recovered CMC on a Callaway slasher was satisfactory and results with the sized yarns on a warp-shed tester were equivalent to results with yarns sized with new CMC. Two copolymers of PVA were prepared, one of which was precipitated from dilute solution by aluminum sulfate and ferric chloride, the other by acidification. Preliminary sizing trials with small samples of materials indicate that these, or similar, copolymers may be effective, recoverable warp sizes. Evidence was obtained that acclimatization of sewage bacteria to CMC and PVA occurs upon prolonged contact in a laboratory activated-sludge unit. (Lowry-Texas)
W72-12282

DEVELOPMENT OF TECHNIQUES FOR ESTIMATING THE BACTERIAL POPULATION OF SEWAGE SLUDGE,
Midwest Research Inst., Kansas City, Mo.
W. J. Spangler, and W. Langston.
Copy available from GPO Sup Doc EP2.10:17070 DRP 12/70, $1.00; microfiche from NTIS as PB-211 246, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1970. 84 p, 5 fig, 34 tab, 22 ref. EPA Program 17070 DRP 12/70.

Descriptors: *Anaerobic digestion, *Methane bacteria, *Anaerobic bacteria, *Sewage sludge, Sludge digestion, *Waste water treatment, Waste treatment, Water pollution control, Biomass.
Identifiers: *Anaerobic techniques, *Roll-tube procedures, *Anaerobic sludge extracts, *Sludge factor assay, Sludge factors, Obligate anaerobes, Anaerobic culture media, Digester failure, Sludge supernatant.

This research program was initiated to develop practical methods for evaluation of the biomass in anaerobic sewage sludge and to determine if predictions could be made concerning digester performance. Sampling and handling methods were improved and standardized to give maximum anaerobic counts. A simplified technique for growing obligate anaerobes that can be safely performed by technicians with minimum training in bacteriology was developed. Anaerobic media were improved to yield as high or higher counts of methanogenic bacteria than heretofore reported. A simple freeze-dry technique was developed for preparation of consistent batches of sludge supernatant used in media as a supplement for growth of obligate sludge anaerobes. The possible relationship between concentration of a growth factor required by Methanobacterium ruminantium (used to evaluate potency of growth factor extracted) and digester efficiency could have important practical implications. Limited data obtained indicated that growth factor concentrations were much higher in 'normal' digesters than in unbalanced or 'upset' digesters. Practical applications of the methods developed can have considerable impact upon future research and development in anaerobic sludge digestion and could lead to improvements in our ability to predict impending digester failure and control of digester performance. (Lowry-Texas)
W72-12283

RECYCLING OF SALINE WASTES,
Montana State Univ., Bozeman.
R. L. Sanks, and W. J. Kaufman.
Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 333-344, 1 fig, 3 tab, 27 ref.

Descriptors: *Ion exchange, *Water reuse, *Municipal waste water, Effluents, Resins, Activated sludge, Dissolved solids, Efficiencies, Pre-treatment (Water), Coagulation, Filtration, Sands, Activated carbon, Total costs, Cost comparisons, Operating costs, Capital costs, Distillation, Electrodialysis, Laboratory tests, *Waste water treatment, *Desalination.
Identifiers: Strong acid resin, Weak-base resins, Fixed-bed ion exchange, Moving-bed ion exchange, *Saline wastes.

A laboratory investigation was conducted in order to determine the optimization of operating variables such as flow rate, regenerant concentration and level of regeneration of an ion exchange system for the partial removal of dissolved minerals from an activated sludge plant effluent. The ion exchange system chosen for evaluation consisted of strong-acid and weak-base resins in fixed beds with a degasifier between the beds to remove carbon dioxide. Several salts were added to the secondary effluent to increase the TDS to 1200 mg/l. The exchange efficiency after pretreatment consisting of coagulation, sand filtration and carbon filtration was 83% for the cation-exchange resin and 86% for the anion-exchange resin. Results of specific ion concentrations were arranged in tabular form. Total costs, including pretreatment, amortization, operating labor, chlorination, and waste disposal were estimated to be about $0.52/1000 gal in a 1 mgd plant and about $0.23/1000 gal in a 10 mgd plant for the removal of a use increment of 350 mg/l. This estimate included the thermal recovery of nitric acid and ammonia. Cost comparisons were made on a 10 mgd basis with a moving-bed, ion exchange system, an electrodialysis system and a split-treatment distillation system. (See also W72-12286 thru W72-12288) (Galwardi-Texas)
W72-12285

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES',
Centre d'Etude de l'Energia Nucleaire, Mol (Belgium).
L. H. Baetsle.
Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 345-347.

Descriptors: *Ion exchange, *Water reuse, *Cost comparison, Costs, Analysis, Quality control, Demineralization, *Desalination, *Waste water treatment.
Identifiers: Acid wastes, Sulfuric acid, Nitric acid, Sodium hydroxide, Belgium.

The paper of Sanks and Kaufman demonstrated the successful application of ion-exchange desalination of brackish water. However, due to the low cost of sulfuric acid it was felt that the technological complications of handling acid sludges by far surpass the gain made by recycling residual amounts of sulfuric acid. Also, the use of NH4OH instead of NaOH as regenerant for the anion exchanger can be justified only if the latter reagent is not available. The ratio between the prices of NH4OH and NaOH equals approximately 15 and the thermal recovery of ammonia mentioned in the paper was not very realistic. An economic comparison between the 1-mgd ion exchange plant and the 10,000 cu m/day water demineralization plant at the Belgian Nuclear Research Center at Mol was presented. Since analysis and quality control were not included in the desalination plant costs it was felt that the production costs were underestimated by about 50%. (See also W72-12285) (Galwardi-Texas)
W72-12286

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES',
Rohm and Haas Co., Philadelphia, Pa.
R. Kunin.
Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 347-349.

Descriptors: *Ion exchange, *Water reuse, *Municipal waste water, Effluents, Resins, Volume, Alkalinity, Salinity, Lime, Efficiencies, Ammonia, Operating costs, Total costs, *Waste water treatment, *Desalination.
Identifiers: Resin makeup, Carboxylic-acid cation exchange resin, Regeneration.

The contribution of ion-exchange resin makeup to the overall cost and the volume of ion-exchange resins required were two aspects reviewed. The value of 5% resin makeup per year as stated by Sanks and Kaufman may be somewhat over optimistic, particularly with respect to the anion exchange. Considering the aggressive nature of the water, a makeup of 100%/year for the anion-exchange resin would be a more realistic value to use. It was felt that the volume of ion-exchange resins required was underestimated in that the capacity may decrease during winter months, particularly at the high flow rates used. In view of the fact that the alkalinity present in most sewage effluents is almost equal to the salinity increment, one might use a carboxylic acid cation-exchange resin in place of, or in addition to, the sulfonic acid cation-exchange resin which would increase the overall ion-exchange capacity and acid-regeneration efficiency. Consideration of the use of lime slurries in place of ammonia for the regeneration of anion exchange resin, thereby lowering the cost of this phase of the regeneration was also mentioned. (See also W72-12285) (Galwardi-Texas)
W72-12287

FORMAL DISCUSSION OF 'RECYCLING OF SALINE WASTES',
Bostock, Hill and Rigby, Birmingham (England).
R. K. Chalmers.
Third International Water Pollution Research Conference, Munich, Germany, 1966. Advances in Water Pollution Research, Vol 3, p 349-352, 2 tab, 12 ref.

Descriptors: *Ion exchange, *Water reuse, *Municipal waste water, Dissolved solids, Lime, Chlorination, Pre-treatment, Bicarbonates, Demineralization, *Waste water treatment, *Desalination.
Identifiers: Lime softening, Use increment, Colony counts, Split elution, Strong-base resins.

The possible use of strong-base resins in place of weak-base resins which were used in the Sanks and Kaufman investigation was mentioned. In some special applications reverse phase demineralization on strong-base resins followed by strong-acid resins has some advantages. Also, split elution with saving of part of the regenerant for reuse, was found useful and economic even in small, fully automatic plants. Prechlorination prolonged the life of activated-carbon filters and kept ion-exchange resins virtually sterile. Typical colony counts were given. Also, the possible use of lime softening for the removal of a use increment of 350 mg/l was suggested especially where bicarbonate concentration was not a limiting factor. Furthermore, it was recommended that reclamation and saving of water start at the point of use. (See also W72-12285) (Galwardi-Texas)
W72-12288

PREDICTION OF PHOTOSYNTHETIC BIOMASS PRODUCTION IN ACCELERATED ALGAL-BACTERIAL WASTEWATER TREATMENT SYSTEMS,
Hebrew Univ., Jerusalem (Israel). Dept. of Medical Ecology.
G. Shelef, M. Schwarz, and H. Schechter.
Preprint, presented at 6th International Water Pollution Research Conference, Session 5, Hall A, Paper No 9, June 20, 1972. p A/5/9/1-A/5/9/10, 6 fig, 2 tab, 23 ref.

Descriptors: *Oxidation lagoons, *Algae, *Waste water treatment, *Mathematical models, Growth rates, Solar radiation, Flotation, Flocculation, Performance, Efficiencies, *Biomass, Organic matter, Nutrients, Photosynthesis.
Identifiers: Alum, Ferric chloride, *Jerusalem (Israel).

The use of specially designed ponds as a controlled waste water treatment with maximized photosynthetic activity of algae was demonstrated. The kinetics of algae production with respect to solar incident irradiance served for the construction of a mathematical model for predicting algae biomass production and the concentration of algae as a function of hydraulic dilution rate under given levels of solar irradiance. The predicted levels of algae production and concentrations were close to actual levels, although in determining the optimal dilution rate, some corrections had to be made. The removal efficiency of organic matter and nutrients in the pond system was relatively high, provided the algae biomass was separated from the effluent. A 1,750 gal/hr rectangular flotator was used for separating the algal biomass from the pond effluent after treatment with alum or ferric chloride. Performance data of the accelerated photosynthetic pond for months June and December were arranged in tabular form. (Galwardi-Texas)
W72-12289

INFLUENCE OF MECHANICAL BLENDING ON AEROBIC DIGESTION OF WASTE ACTIVATED SLUDGE,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
S. D. Bokil, and J. K. Bewtra.
Preprint, presented at 6th International Water Pollution Research Conference, Session 6, Hall B, Paper No 11, June 20, 1972. p B/6/11/1-B/6/11/12, 9 fig, 1 tab, 7 ref.

Descriptors: *Activated sludge, *Sludge digestion, *Aerobic treatment, *Mixing, Hydrogen ion con-

centration, Oxygen demand, Laboratory tests, Performance, Time, *Waste water treatment.
Identifiers: *Mechanical blending, Settleability, Oxygen uptake rates, Total plate counts, Bacterial counts.

Laboratory studies were conducted to determine the influence of mechanical blending on aerobic stabilization of waste activated sludge. Also, the simultaneous influence of blending on settleability, pH, oxygen uptake rate, and total plate count was investigated. Results showed that the rate of auto-oxidation as well as settleability of the sludge were improved significantly following mechanical blending. The rate of auto-oxidation increased linearly with an increase in the value of G theta, where G equals the mean velocity gradient impacted to the fluid mass, and theta equals the blending time, indicating that the higher the input blending energy the more rapid the auto-oxidation. Washing the sludge with 0.05 M phosphate buffer together with blending, further improved the auto-oxidation rate and the settleability. Also, the phosphate buffer prevented the pH from dropping to 5.0 - 6.5 during aerobic digestion. Oxygen uptake rates for blended sludge were higher than those for the control during the first few days. Also, bacterial counts in the supernatant of the control sample were higher than in the supernatant of the blended sludge. The coefficient of plastic viscosity was obtained from the concentration of suspended solids assuming the waste activated sludge as a Bingham plastic. (Galwardi-Texas)
W72-12291

THE MECHANISM AND DESIGN OF THE CONTACT STABILIZATION ACTIVATED SLUDGE PROCESS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
D. Jenkins, and D. Orhon.
Preprint, presented at 6th International Water Pollution Research Conference, Session 5, Hall B, Paper No 10, June 20, 1972. p B/5/10/1-B/5/10/10, 10 fig, 23 ref.

Descriptors: *Activated sludge, *Design criteria, *Mathematical models, Laboratory tests, Microorganisms, Growth rates, Chemical oxygen demand, Performance, Organic loadings, Nitrification, Kinetics, Municipal wastes, *Waste water treatment.
Identifiers: Contact stabilization, Conventional decay rates, Sludge production rate, Sludge mass, Materials balance.

An alternate mechanism for contact stabilization, that of rapid microorganism growth resulting in an increase in the activated sludge viable fraction during the contact period, followed by a death phase during the stabilization period was proposed. A mathematical formulation of a kinetic model based on material balances was presented. Laboratory studies were conducted so as to compare contact stabilization and conventional activated sludge systems. Significant advantages resulted from the ability to operate the contact stabilization system at a lower net growth rate than the conventional system at the same COD removal rate. The basis for this ability was the increase of the sludge mass decay rate at high COD removal rates. Important results observed were that the sludge production rate can be reduced, the loading at which nitrification is achieved can be increased and the sludge mass carried in the plant can be minimized because of its high viable organism content. (Galwardi-Texas)
W72-12292

PERCOLATING FILTERS,
Water Pollution Research Lab., Stevenage (England).
A. M. Bruce.
Water Pollution Research Laboratory Reprint No 565, From Process Biochemistry, Vol 4, April 1969. 19 p, 3 fig, 1 tab, 26 ref.

Descriptors: *Waste water treatment, *Trickling filters, *Aerobic treatment, Bacteria, Fungi, Films, Worms, Biochemical oxygen demand, Nutrient requirements, *Filters, Oxidation.
Identifiers: Flies.

Aerobic oxidation of the organic fraction of sewage is the traditional method of waste water treatment. The purification action is accomplished by zoogleal or filamentous bacteria or by fungi which inhabit the film covering the filter media. Methods of controlling the film, the role of invertebrates in maintaining filter efficiency, seasonal effects, BOD loading and filter media are discussed. A good deal of empirical data has been accumulated over the years; however, the position has not been reached where predictions concerning filter performance can be made. (Goessling-Texas)
W72-12293

RESEARCH DEVELOPMENT IN HIGH RATE BIOLOGICAL FILTRATION,
Water Pollution Research Lab., Stevenage (England).
A. M. Bruce, J. C. Merkens, and S. C. MacMillian.
Water Pollution Research Laboratory Reprint No 615, From Institute of Public Health Engineers Journal, July 1970. p 178-207, 6 fig, 6 tab, 25 ref.

Descriptors: *Trickling filters, *Waste water treatment, Biochemical oxygen demand, Biodegradation, Organic loading, Pilot plants, Flow rate, Nitrification, Coliforms, Temperature, *Filtration, *Biological treatment.
Identifiers: *High rate loadings, *Plastic media, *Mineral media.

A great deal of interest is being shown by public health engineers in the possible advantages of high rate biological filters. The WPRL has constructed and operated six pilot plant filters packed with four plastic and two mineral media. These filters were operated for seven months at loads of 6 cubic meters per cubic meter per day and for five months at 12 cubic meters per cubic meter per day. Average BOD removal was related in a rather simple way to specific surface area. Temperature effects were pronounced and common to all filters. BOD remaining in effluent correlated with the concentration of suspended matter. Some soluble biodegradable components of the sewage were removed rapidly when compared to the overall BOD removal. Film accumulation was moderate throughout with the films on the mineral media being slightly thicker. No evidence of clogging could be detected. Sludge production was quite high compared to the BOD removed. Coliform bacteria removal efficiency was lower than in a low rate filter for the same sewage. Further study is required over a wider range of loadings and with recirculation. (Goessling-Texas)
W72-12294

TREATMENT OF CANNERY WASTES IN CALIFORNIA,
S. H. Jenkins.
Effluent and Water Treatment Journal, p 39-42, January 1969. 4 fig, 3 tab.

Descriptors: *Treatment facilities, *Industrial wastes, *Canneries, *Municipal wastes, Organic loadings, Aeration, Nitrification, Activated sludge, Flotation, Performance, Efficiencies, Anaerobic digestion, Biochemical oxygen demand, Oxygen requirements, *Waste water treatment, *California.
Identifiers: Joint treatment, Kraus process, *San Jose (Calif), Retention periods, Tank volumes, Sludge concentration.

The ability of the San Jose and Santa Clara, California water pollution control plant to deal with an extremely heavy load of cannery waste was described. Influent characteristics compared for non-canning and canning seasons showed an increase in flow from 56 to 77 mgd, an increase of BOD from 210,000 lb/day to 530,000 lb/day and an increase in suspended solids from 230,000 lb/day to 320,000 lb/day. Oxidation of settled sludge has been accomplished by the Kraus nitrified sludge interchange process in which the sewage is treated with activated sludge which has been nitrified in admixture with supernatant liquor from the sludge digestion tanks. Required aeration and nitrification tank volumes, retention periods, total air requirements and BOD loadings were compared for canning and non-canning seasons. Sludge concentration has been accomplished by using a dissolved air flotation principle. Thus, with a retention period of under one hour, a concentrated sludge has been obtained continuously and considerable digester capacity has been saved. Effluent results showed a 90% removal of BOD during the non-canning season and 92% during the canning season. (Galwardi-Texas)
W72-12295

A SIMULATION MODEL OF THE GRAVITY SEPARATION OF CONCENTRATED SOLIDS,
Engineering-Science, Inc., Arcadia, Calif.
A. S. Anderson, and R. C. Hanson.
Preprint, presented at 6th International Water Pollution Research Conference, Session 6, Hall B, Paper No 12, June 20, 1972. p B/6/12/1-B/6/12/15, 10 fig, 6 ref.

Descriptors: *Simulation analysis, *Settling velocity, *Activated sludge, *Mathematical models, Gravity studies, Laboratory tests, Digital computers, Computer models, Computer programs, Time, Depth, Model studies, *Waste water treatment, Separation techniques.
Identifiers: Settling test, Solids separation, Thickener, Sludge blanket.

The simulation model presented was programmed for use with a digital computer and provides an effective means of dynamically simulating the settling test and for predicting the performance of a thickener. The first stage development work resulted in a program for the analysis of the settling test which enabled determination of an additional mathematical contact which relates to some basic properties of the sludge to be separated. This program was then modified in stage two to include the continuous addition and removal of solids and the program is an effective simulation of a typical separator. Both computer programs were presented in detail. The simulation model approximating the behavior of the settling test assumed layers of finite thickness exist and further assures that small real increments of time elapse before changes in layer parameters occur. The position of the solid-liquid interface was computed from the volumetric changes in the layers. The continuous thickener program computes the number of layers in the fixed volume removed and adjusts the layer number to compensate for the removed layers and when the number of layers removed is equal to the number of layers added in one hundred time periods the program halts and the depth of the sludge blanket is pointed out. (Galwardi-Texas)
W72-12296

5E. Ultimate Disposal of Wastes

ALTERNATE DISPOSAL AREA FOR GRAND HAVEN HARBOR, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 05G.
W72-11956

THE PESTICIDE MANUFACTURING INDUSTRY-CURRENT WASTE TREATMENT AND IDISPOSAL PRACTICES,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-12009

WASTE TREATMENT APPARATUS,
Tesco Chemicals, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 05D.
W72-12149

5F. Water Treatment and Quality Alteration

PRACTICAL CONSIDERATIONS IN DEFINING QUALITY WATER,
Saint Louis County Water Co., University City, Mo.
For primary bibliographic entry see Field 05G.
W72-11901

SELECTED DATA ON PUBLIC SUPPLIES OF THE 100 LARGEST CITIES IN THE UNITED STATES, 1962,
Geological Survey, Wash., D.C. Water Resources Div.
For primary bibliographic entry see Field 03D.
W72-11905

INFLUENCE OF SITE CHARACTERISTICS ON QUALITY OF IMPOUNDED WATER,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W72-11906

WATERSHED MANAGEMENT AND RESERVOIR USE-JOINT DISCUSSION,
California State Dept. of Public Health, Berkeley; and Seattle Dept. of Water, Wash.
H. J. Ongerth, E. J. Allen, and W. R. La Due.
Journal of the American Water Works Association, Vol 56, No 2, p 149-168, February 1964. 18 ref.

Descriptors: *Public health, *Recreation wastes, *Diseases, Boating, Recreation demand, Recreation facilities, Forest fires, Swimming, Fishing, Skiing, *California, Bacteria, Viruses, Water supply, Political aspects.
Identifiers: *Gastrointestinal disease, *AWWA Policy Statement, California State Board of Health, Litter, Picnicking, Purveyors.

The public health viewpoint, the purveyor's viewpoint and future trends of recreation use of water supply watersheds are presented. Multiple protection is advocated to prevent human wastes from entering water supply systems. An investigation of 'open' and 'closed' reservoirs in California revealed little difference in coliform organism concentration when reservoirs' are open to the public or are closed. Proper management and control are stressed because of the purveyor's responsibility for a safe water supply. Increasing demands for recreational use of watersheds must be met through management and control and not by arbitrary prohibition. The water utility manager must take an active role in informing the public of the value of pure water and the need for safeguards. (Flack-AWWARF)
W72-11907

RELATION OF RIVER POLLUTION TO PUBLIC WATER SUPPLY IN EUROPE AND THE UNITED STATES,
Amsterdam Water Works (Netherlands).
C. Biemond.
Journal of the American Water Works Association, Vol 55, No 7, p 917-928, July 1963. 5 fig, 3 tab.

Descriptors: Water pollution, *Storage, *Water treatment, Water sources, *Biologic treatment, *Oxygenation, *Oil fields, Artificial recharge, Pathogenic bacteria, Demineralization, Chloride, Salinity, Water supply, United States, Dissolved oxygen, Oil wastes, Mine wastes, Low flow.
Identifiers: *Deoxygenation, *Rhine River, *Arkansas River, Pathogens, Europe, Amsterdam (Holland), European Economic Community, Russia.

Three major sources of public water supply are groundwater, river water in mountains, and river or lake water in the plains. Pollution treatment in the latter faces problems of low flow and high pollution, mine and oil wastes, rapid fluctuations in chemical composition, pathogens and industrial spills. The Rhine and Arkansas Rivers are cited to contrast American treatment which emphasizes rapidity and storage of weeks or months. Long storage alleviates many river pollution problems. Underground storage by artificial recharge may be best. (Flack-AWWARF)
W72-11918

AN ACT RELATING TO WATER PURIFICATION AND WASTE WATER TREATMENT OPERATORS.
For primary bibliographic entry see Field 06E.
W72-11950

REASSESSMENT OF THE VIRUS PROBLEM IN SEWAGE AND IN SURFACE AND RENOVATED WATERS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05D.
W72-12061

WATER TREATMENT PLANT,
Neptune Microfloc, Inc., Corvallis, Oreg.
W. F. Ettlich.
U. S. Patent No. 3,545,619, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 881, No 2, p 594, December 8, 1970.

Descriptors: *Patents, *Water treatment, Treatment, *Filtration, *Flocculation, *Settling basins, Separation techniques, Equipment, Treatment facilities, Waste water treatment, Water pollution treatment, Pollution abatement, Water purification.

The water treatment plant consists of a settling basin, a filtering basin, and a mixing basin. Raw water is fed to the mixing basin and then to the flocculator and thereafter is led into the settling basin. The water is then directed to flow over the filter media and then out to a clearwell. Backwash from the filter may be returned to the settling basin for recirculation. (Sinha-OEIS)
W72-12140

WATER TREATMENT,
Combustion Engineering, Inc., New York.
I. P. Mail, and J. R. Kennett.
U. S. Patent No. 3,542,675, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 880, No 4, p 1422, November 24, 1970.

Descriptors: *Patents, *Water treatment, *Waste water treatment, Pollution abatement, Separation techniques, *Suspended solids, Gases, Bubbles, Aeration.

Contaminated liquid having particles of solid foreign matter suspended therein flows through a container. Liquid saturated with gas passes through a venturi structure which reduces the pressure on the saturated liquid to enable bubbles of gas to form. The flow rate of the gasified liquid is controlled to maintain a predetermined ratio to the flow rate of the contaminated liquid flowing through the container. (Sinha-OEIS)
W72-12143

THE URBAN WATER SYSTEM--ECONOMIC ASPECTS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W72-12223

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND SUPPLY,
Denver Board of Water Commissioners, Colo.
For primary bibliographic entry see Field 06A.
W72-12232

UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12236

5G. Water Quality Control

ECONOMIC AND SOCIAL ASPECTS OF SALINE WATER USE AND MANAGEMENT,
Gutteridge, Haskins and Davey, Melbourne (Australia).
For primary bibliographic entry see Field 03C.
W72-11769

ADMINISTRATIVE AND LEGAL ASPECTS OF SALINE WATER USE AND MANAGEMENT,
Melbourne Univ., Parkville (Australia).
For primary bibliographic entry see Field 03C.
W72-11770

IMPLICATIONS OF THE PRESENT STATE OF SCIENTIFIC KNOWLEDGE FOR TECHNICAL MANAGEMENT,
Water Conservation and Irrigation Commission, Sydney (Australia).
For primary bibliographic entry see Field 03C.
W72-11771

POLLUTION OF SURFACE WATERS AND BIOLOGICAL PURIFICATION: VARIOUS ASPECTS,
State Coll. of Agronomical Science, Gembloux (Belgium).
P. Manil.
Ann Gembloux. Vol. 77, No. 1, p 23-37. 1971.
Identifiers: Bacteria, Biocontrol, *Water purification, *Water pollution.

The reversal of the process of pollution involves the microbial degradation of the pollutants into CO2, ammonia, phosphate and S and a sedimentation of the organic and inorganic particles to the bottom. These mechanisms are of course limited in that there is only so much that bacteria can handle as well as a fixed amount that can be sedimented. The levels of self purification, the speed of the process and the specific activity of the pollutant biomass are all expressed mathematically. The factors involved are the quantity of the biomass, the spacial distribution of the mass, the time that the pollutant substances are exposed to the purification media, the qualities of the pollutant, the temperature, and the O2 tension of the biomass.--Copyright 1972, Biological Abstracts, Inc.
W72-11792

WATER: LIVING MILIEU,
State Coll. of Agronomical Science, Gembloux (Belgium).
R. Baurant.
Ann Gembloux. Vol 77, No 1, p 5-21. 1971.

Identifiers: Wildlife, Flora, Public health, Plants, Pollution, *Water pollution, *Life cycles, *Ecology.

Water is essential for the health of man, as it is a necessary body fluid, and as a biological medium which supports a needed biological system. The life cycle in water involves the transformation of inorganic matter by the plants, with the help of the sun, into organic matter which is then used as a food by the abundant animal life. These water sources include both stagnant bodies such as lakes and flowing entities as rivers and streams. Each of these types has its own characteristic flora and fauna which owes a large measure of its distinction to this quality of movement. Pollution is a great danger as the waste, besides poisoning the animal life, will cause a decrease in the amount of dissolved O2 in the water as the number of unicellular organisms increases.--Copyright 1972, Biological Abstracts, Inc.
W72-11804

AN IMPROVED OPTIMUM CONTROL ALGORITHM FOR A CLASS OF WATER POLLUTION PROBLEMS,
Newark Coll. of Engineering, N.J.
H. J. Perlis, and A. R. Cook.
ISA Transactions, Vol. 10, No. 4, p 333-339, 1971. 5 fig, 22 ref.

Descriptors: *Water quality control, *Algorithms, Mathematical studies, *Model studies, Equations, Mathematical models, Distribution, Control systems, Biochemical oxygen demand, Streams, *Dissolved oxygen, Water pollution, *Aeration, Water pollution control, Effluents, Water management.

A description is presented of a mathematical and computer algorithm based upon the techniques of Pontryagin's Maximum Principle (a tool of modern optimal control theory). The algorithm can be applied to a broad clas of multivariable distributed process, and is especially applicable to a dynamic water pollution problem, i. e., water quality control in a polluted stream. The technique uses a modified Streeter and Phelps dissolved oxygen model along with a two-element control vector: one for artificial aeration control and the other for effluent control. Examples are given which illustrate the overall control management policy. (Mackan-Battelle)
W72-11807

ROTENONE TOLERANCE IN MOSQUITOFISH,
Mississippi State Univ., State College. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-11846

OIL POLLUTION OF WATER SUPPLIES--TASK GROUP REPORT.
American Water Works Association, New York. Committee on Oil Pollution of Water Supplies.

Journal of the American Water Works Association, Vol 58, No 7, p 813-821, July 1966. 13 ref.

Descriptors: *Oil pollution, *Water pollution sources, *Water quality control, *Oily waters, *Oil industry, *Fuel, *Oil wastes, Waste identification, Maps, Industrial wastes, Communication.
Identifiers: *Oil pipelines, Trains, Trucks, Oil tankers, Crude oil, Hydrographic maps.

Task Group findings were: (1) Oil spills may contaminate public water supplies, (2) Large spills most frequently come from oil pipelines, (3) Damage may be avoided or reduced by location of points of possible spills, knowing time of travel to intake and intermediate points of storage, having an early warning system and establishing emergency plans, equipment and treatment. (4) Effective communication and planning among water industry and oil industry are essential. (5) Personnel transporting or storing oil should be better informed on oil pollution hazard. (Flack-AWWARF)
W72-11893

TOMORROW'S METHODS TO PROVIDE TOMORROW'S SERVICE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. A. Okun.
Journal of the American Water Works Association, Vol 58, No 8, p 938-952, August 1966. 2 tab, 32 ref.

Descriptors: *Population, *Water demand, *Water treatment, *Water quality control, *Rates, *Water sources, *Instrumentation, Water reuse, Water Resources Planning Act, Competing uses, Public health, Long term planning, Pilot plants, Economics, Aesthetics.
Identifiers: Water Research Association (British), Comprehensive planning, Regional distribution.

The slow rate of change in the water industry is due to a virtual absence of commitment to research. Several approaches are suggested; (1) research at existing facilities, (2) regulatory agencies encourage inovation, (3) establish an industry research organization, (4) industry sponsored university research. Tomorrow's water needs require comprehensive planning, regional distribution, new sources, aesthetic improvements, improved water quality through new treatment, improved instrumentation and control and new levels of trained leadership in the water industry. (Flack-AWWARF)
W72-11894

RECREATIONAL USE OF WATERSHEDS--JOINT DISCUSSION,
Washington Suburban Sanitary Commission, Hyattsville, Md.; Sport Fishing Inst., Washington, D. C.; Maryland State Dept. of Health, Baltimore; and Public Health Service, Washington, D.C.
For primary bibliographic entry see Field 06D.
W72-11896

NEW LOOK AT RESOURCES POLICY,
Cornell Univ., Ithaca, N.Y. Coll. of Engineering.
For primary bibliographic entry see Field 06B.
W72-11900

PRACTICAL CONSIDERATIONS IN DEFINING QUALITY WATER,
Saint Louis County Water Co., University City, Mo.
H. O. Hartung.
Journal of the American Water Works Association, Vol 57, No 3, p 286-292, March 1965. 1 tab, 10 ref.

Descriptors: *Water pollution, *Standards, *Water quality, Water sources, Water pollution control, Specifications, Taste, Odor, Color, Turbidity.
Identifiers: *USPHS Drinking Water Standards, Chemical stability, Carbon chloroform extract, Consumer demand, Organic content, Bacterial content, AWWA Water Quality Standards.

A quality water is one suited to the needs of the users. A minimum quality for utilities is the USPHS Drinking Water Standards, but these apply only to health aspects. Quality water specifications are related to raw water quality, treatment facilities available, costs of treatment and community preferences. Pollution control of the raw water source is a responsibility of the water utility. A national professional water quality standard serves as a useful guide. The proposed American Water Works Association provisions deal with uniformity of quality, turbidity, carbon chloroform extract, chemical stability, bacterial content and taste and odor. Utilities must be continuously alert to changing conditions of raw water quality and treatment capabilities to provide a true quality water. (Flack-AWWARF)
W72-11901

DUAL WATER SYSTEMS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 03D.
W72-11904

INFLUENCE OF SITE CHARACTERISTICS ON QUALITY OF IMPOUNDED WATER,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. O. Sylvester, and R. W. Seabloom.
Journal of the American Water Works Association, Vol 57, No 12, p 1528-1546, Dec. 1965. 11 fig, 4 tab, 24 ref.

Descriptors: *Reservoir sites, Water resources development, Water quality, Soil investigations, *Impounded waters, Impoundments, *Dissolved oxygen, Biochemical oxygen demand, Algal control, *Color, *Alkalinity, *Nitrates, Nitrogen, *Conductivity, *Leaching, Iron, Temperature, Soil analysis, Taste-producing algae, Hydrogen ion concentration, *Organic soils, Mineralogy.
Identifiers: Wood, Algal count, Green River, Washington, Howard A. Hanson Reservoir, Tacoma (Wash).

Soils at impoundment sites should be tested for their effect on overlying water. Organic soils create the most severe problems but leaching them or covering them with as little as 2 inches of mineral soil may be effective. Tests were performed on Howard A. Hanson Reservoir, near Tacoma, Washington, to ascertain physical, chemical and biologic effects. Based on these studies, recommended water quality tests over soils of impoundments should include DO, color, nitrate, ammonia, algal counts and pH measurements of at least one month duration. Leaching and exchange studies will reveal if site should be abandoned or if cover soil is feasible. Shorelines should be investigated for effect on turbidity. Complete water quality analyses under various flow conditions are needed to evaluate future reservoir quality as related to the underlying soil. (Flack-AWWARF)
W72-11906

WATERSHED MANAGEMENT AND RESERVOIR USE-JOINT DISCUSSION,
California State Dept. of Public Health, Berkeley; and Seattle Dept. of Water, Wash.
For primary bibliographic entry see Field 05F.
W72-11907

DETERMINATION OF STREAM USE,
Philadelphia Water Dept., Pa.
S. S. Baxter.
Journal of the American Water Works Association, Vol 56, No 10, p 1285-1289, October 1964. 1 tab, 3 ref.

Descriptors: *Cost-benefit analysis, *Competing uses, *Mathematical models, *Waste water treatment, *Water pollution treatment, *Water pollution control, Water quality control, Viruses, Delaware River, Standards.
Identifiers: *Stream standards, Ruhr Valley, Torresdale Water Treatment Plant (Philadelphia).

Using the waste assimilation capacity of a stream is economic and realistic. The problem is intensive use of the fixed supply of water. One idea is to allocate different uses to different streams as in the Ruhr Valley. The ability of modern treatment to produce safe water from badly polluted sources should be recognized. Consideration should be

given to removing viruses at the treatment plant rather than at the waste disposal plant but wastes such as pesticides which are difficult to remove in treatment should be controlled at the source. Stream Standards should be based on benefit-cost analysis and flexible requirements for water quality established based on costs. Citizens should be able to compare pollution abatement costs with other community costs to establish relative priorities. (Flack-AWWARF)
W72-11910

DEVELOPMENT AND EFFECT OF THE DELAWARE RIVER BASIN COMPACT,
New York City Board of Water Supply.
For primary bibliographic entry see Field 06E.
W72-11915

MONITORING FOR EFFECTIVE ENVIRONMENTAL MANAGEMENT,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 05A.
W72-11921

A POSTSCRIPT TO CALVERT CLIFFS',
N. J. Landau.
Boston College Industrial and Commercial Law Review, Vol. 13, p. 705-717, (1972). 61 ref.

Descriptors: *Regulation, *Administrative agencies, *Legal review, *Thermal pollution, Judicial decisions, Legal aspects, Legislation, Water quality, Nuclear powerplants, Nuclear energy, Environmental effects, Construction, Nuclear explosions, Nuclear wastes, Permits, Federal government.
Identifiers: *Environmental Protection Agency, *Atomic Energy Commission.

Recently the United States Court of Appeals for the District of Columbia held that the procedures of the Atomic Energy Commission failed to comply with the requirements of the National Environmental Policy Act. Subsequently the Commission filed new procedures for investigating the environmental impact of projects requiring the approval of or undertaken by the Commission. As prescribed by NEPA, the Commission must accumulate and assess environmental information and investigate environmental impacts, including those which may affect thrmal and other water quality standards. Despite the new procedures environmentalists alleged that the Commission's impact statement on the Amchitka nuclear test failed to include relevant data and reports from other agencies and sought to enjoin the blast. The Commission relied on executive privilege by virtue of national defense. The Supreme Court refused to enjoin the blast. This decision failed to give the provisions of NEPA the broad application they had been given in the past. Continued government reliance on the executive privilege in order to avoid compliance with NEPA provisions seems likely. This will consequently reduce the effectiveness of the Act. (Brackins-Florida)
W72-11938

CONTROLLING GREAT LAKES POLLUTION: A STUDY IN UNITED STATES-CANADIAN ENVIRONMENTAL COOPERATION,
Wisconsin Univ., Madison. School of Law.
R. B. Bilder.
Michigan Law Review, Vol. 70, p. 469-556, 1972. 288 ref.

Descriptors: *International Joint Commission, *International commissions, *Great Lakes, *Pollution abatement, Cooperation, United States, Canada, Treaties, Federal government, International law, International waters, Comprehensive planning, Legal aspects, Boundaries (Surfaces), Water quality control, Water quality standards, Environmental control.

The proposed Great Lakes Water Quality Agreement between the U.S. and Canada would establish common water quality objectives, commit the two governments to the development of compatible national water quality standards, and provide for a wide variety of joint and separate pollution control programs and related measures. The development of Great Lakes environmental cooperation is examined in terms of framework, institutions, and history. This includes discussion of the 1909 treaty, the resulting International Joint Commission and its procedures, the Commission's activities regarding pollution, and the proposed Agreement. Some aspects of the U.S.-Canadian experience are discussed, including the need for international cooperation; the role of legal prohibitions and remedies; the institutional structures of the Commission; and the problem of determining objectives, apportioning burdens, coordination, and implementation. Comments on the proposed Agreement's general significance and the long-term prospects for American-Canadian Great Lakes cooperation are included. (Widman-Florida)
W72-11939

ENVIRONMENTAL QUALITY AND THE NEED FOR ELECTRIC POWER--LEGISLATIVE REFORMS TO IMPROVE THE BALANCING PROCESS,
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11940

INTERNATIONAL CONFERENCE ON OCEAN POLLUTION.
For primary bibliographic entry see Field 06E.
W72-11941

WATER POLLUTION--CONTROL OF NUTRIENTS--CLEANING AGENTS--WATER CONDITIONERS.
For primary bibliographic entry see Field 06E.
W72-11942

CONSERVATION OF FISHERIES RESOURCES.
For primary bibliographic entry see Field 06E.
W72-11943

INTERNATIONAL ASPECTS OF THE 1972 ENVIRONMENTAL PROGRAM,
Executive Office of the President, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11947

ALTERNATE DISPOSAL AREA FOR GRAND HAVEN HARBOR, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.

Available from the National Technical Information Service as PB-202 183D, $3.00 in paper copy, $0.95 in microfiche. July 22, 1971. 13 p, 1 fig, 1 plate.

Descriptors: *Michigan, *Environmental effects, *Dredging, *Sediments, *Water pollution sources, *Lake Michigan, Water pollution, Water quality, Water pollution control, Water quality control, Sediment distribution, Channel improvement, Harbors, Great Lakes, Pollution abatement, Project benefits, Project purposes, Dikes, Spoil banks, Aesthetics, Land use, Navigation.
Identifiers: *Environmental Impact Statements, *Grand Haven Harbor (Mich).

This project will remove polluted dredging material from the water of Lake Michigan by disposal in a diked area established to contain the polluted spoil. Channel and harbor improvement in Grand Haven Harbor requires annual maintenance dredging. This project will convert an aquatic/marsh area to a terrestrial condition. The proposed site is not a virgin marsh, since it has been used for spoil and trash disposal in the past. Use of the disposal area for the confinement of polluted dredging material will lessen further pollution of Lake Michigan. Use of the containment site will remove or destroy aquatic animal and plant life now inhabiting the area. Construction of a transmission pipeline, a pump-out station and dikes will have an adverse impact on visual aesthetics in the area. Alternatives include no project, which means acceptance of the detrimental environmental impact; discontinuance of the maintenance and dredging operations; removal of the pollutants from the spoil before disposal; or using alternative spoil disposal sites. (Brackins-Florida)
W72-11956

CONTIGUOUS ZONES FOR POLLUTION CONTROL,
For primary bibliographic entry see Field 06E.
W72-11960

KALLEVIG V. HOLMGREN (SEPTIC TANK EFFLUENT HELD NOT COMMON ENEMY).
For primary bibliographic entry see Field 06E.
W72-11962

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT,
For primary bibliographic entry see Field 06E.
W72-11964

STATE CONSTITUTIONS AND THE ENVIRONMENT,
Virginia Univ., Charlottesville. School of Law.
For primary bibliographic entry see Field 06E.
W72-11971

PUBLIC REGULATION OF WATER QUALITY IN VIRGINIA,
W. Turner, Jr.
William and Mary Law Review, Vol 13, p 424-476, 1971. 292 ref.

Descriptors: *Virginia, *Water quality control, *Water pollution, *Legal review, Legislation, Judicial decisions, Legal aspects, Regulation, Administrative agencies, Adoption of practices, Comprehensive planning, State governments, Social aspects, State jurisdiction, Federal jurisdiction, reasonable use, Water policy, Project planning, Comparative costs, Pollution abatement, Tidal waters.
Identifiers: *Virginia Water Control Act.

Early pollution problems in Virginia arose in the tidewater region; court cases and legislation relating to tidewater pollution are examined. Inland water pollution legislation is also discussed. The main thrust is a discussion of the water control law of Virginia. The Water Control Board is the major administrative arm under the act. The broad scope and jurisdiction of the act is examined in detail in reference to the following: geographic jurisdiction, types of pollution, persons subject to jurisdiction, and jurisdictional limits. The surveillance and enforcement powers of the Board include: regional organization, special investigative teams, mechanical monitoring stations, and reports from other agencies. State policy is directed at abating pollution and preventing future pollution; however, no policy is set for how fast this is to occur. Policy is analyzed as it relates to industry, municipalities, water quality preservation, and waste treatment. Problem areas and loopholes discussed include: sedimentation and erosion, urban runoff and storm sewers, pollution from vessels, wetlands, and interstate compacts. A major flaw in the Virginia scheme is the test of reasonableness, which hampers efforts to clean the state's waters. (Grant-Florida)

W72-11972

INDIVIDUAL LEGAL REMEDIES AGAINST POLLUTION IN ILLINOIS,
Illinois Inst. of Tech., Chicago. Kent Coll. of Law.
For primary bibliographic entry see Field 06E.
W72-11973

ADMINISTRATIVE, JUDICIAL AND NATURAL SYSTEMS: AGENCY RESPONSE TO THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
For primary bibliographic entry see Field 06E.
W72-11974

VOLUME WEIGHT OF RESERVOIR SEDIMENT IN FORESTED AREAS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02J.
W72-12000

WASTE WOOL AS A SCAVENGER FOR MERCURY POLLUTION IN WATERS,
Little (Arthur D.), Inc., Cambridge, Mass.
P. Tratnyek.
Copy available from GPO Sup Doc EPA 16080 HUB 04/72, $0.60; microfiche from NTIS as PB-211 128, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 49 p, 2 fig, 16 tab, 10 ref. EPA Program 16080 HUB 04/72.

Descriptors: *Mercury, *Sorption, *Separation techniques, Sediments, Performance, Temperature, Hardness (Water), Anaerobic conditions, Sulfur, Laboratory tests, Feasibility studies, Water quality control, Hydrogen ion concentration.
Identifiers: *Wool, *Waste fiber utilization.

Laboratory studies demonstrated the feasibility of using waste wool and wool/polyester blend fibers to remove mercury pollution from waters and bottom deposits. Nylon fiber was shown to have limited potential. Within 24 hours, 90-95% of mercury at the 1-ppm level was removed by the wool fiber. At higher levels of mercury, larger quantities were removed, but the percentage decreased. Changes in pH (2 to 10) and temperature (5 to 35C) did not markedly alter efficacy of wool, nor did anaerobic conditions or variation in water hardness. However, the presence of sulfide in water or sediment reduced effectiveness of wool. Sources of mercury used were mercuric chloride, methyl mercuric chloride, phenyl mercuric acetate, bis (2-methoxyethyl) mercury, and dissolved metallic mercury. (Lowry-Texas)
W72-12008

NATURAL AREAS,
For primary bibliographic entry see Field 06G.
W72-12039

SELF PURIFICATION IN SEWERS,
Los Angeles County Sanitation Districts, Calif.
R. D. Pomeroy, and J. D. Parkhurst.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 11, Hall C, Paper No. 21, June 22, 1972, 16 p, 7 fig, 2 tab, 3 ref.

Descriptors: *Sewers, *Biodegradation, *Aeration, Temperatures, Slopes, Flow rates, Turbulence, Slime, Mass transfer, Dissolved oxygen, Waste water treatment, *Water purification, *Self-purification, Water quality control, Reaeration.
Identifiers: *Oxygen reaction rates.

Both laboratory and full-scale testing have demonstrated that oxygen reaction rates in sewage vary widely. Investigations showed that oxygen reaction rates are low near the origin of the sewage, increasing for several hours if aerobic conditions prevail, up to rates as high as 20 mg/l-hr., then declining. By using a predictive equation for reaeration and measuring the rates of use of oxygen by the sewage, calculations were made of the rate of oxygen utilization by the slime layer on the pipe wall. It was hypothesized that in the sewers tested the slime layer acted as an efficient sink for the oxygen reaching it. Rate of loss of oxygen to the slime layer was predicted by development of a formula. Since a substantial amount of biological oxidation occurs in some sewers, particularly where the oxygen supply is augmented by the turbulence produced at junctions and other structures, sewers should be designed in ways to maximize aeration so that sufficient biodegradation may be induced to effect substantial BOD load reductions to the treatment plants. (Lowry-Texas)
W72-12047

REGIONAL WASTEWATER MANAGEMENT SYSTEMS FOR THE CHICAGO METROPOLITAN AREA-SUMMARY REPORT,
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-12055

SUBMERSIBLE WATER QUALITY MONITORING EQUIPMENT,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05A.
W72-12058

THE POTENTIAL ROLE OF EFFLUENT CHARGES IN WATER QUALITY MANAGEMENT,
Secretariat Permanent pour l'Etude des Problemes de l'Eau, Paris (France).
J. F. Saglio, and J. Garancher.
Preprint, presented at Sixth International Water Pollution Research Conference, Session 14, Hall A, Paper No 28, June 22, 1972. 6 p.

Descriptors: *Water pollution control, *Waste assimilative capacity, *Water quality standards, Domestic wastes, Industrial wastes, Legislation, Assessments, Waste water treatment, *Pollution taxes (Charges).
Identifiers: *France, *Effluent charges.

Assignment of a financial schedule in France by which participating industries are assessed in relation to the pollutional load in their effluents has further stimulated industrial efforts at pollution abatement by effluent reduction and other methods. The development of the plan has included a national survey of water quality and of industrial effluents to determine both the pollution potential of the wastes as well as the waste assimilative capacity of the stream. Problems encountered in determining effluent discharge limits and assigning the proper cost to each discharge were caused primarily by the fact that only a range of probabilities were available as to whether or not an effluent would cause damage. Through cooperation with the industries, and a careful scrutiny of all discharge standards by the regulatory agency, settlements have been agreed upon and the entire program of pollution abatement is functioning well as both a water pollution control scheme and an industrial location development scheme. (Lowry-Texas)
W72-12067

SAND AND GRAVEL OVERLAY FOR CONTROL OF MERCURY IN SEDIMENTS,
Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
L. H. Bongers, and M. N. Khattak.
Copy available from GPO Sup Doc EPA 16080 HVA 01/72, $0.55; microfiche from NTIS as PB-211 165, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1972. 45 p, 12 fig, 10 tab, 28 ref. EPA Program 16080 HVA 01/72.

Descriptors: *Mercury, *Sediments, *Sands, Anaerobic conditions, Aerobic conditions, Deposition (Sedimentation), Laboratory tests, Toxicity, Economic feasibility, Technical feasibility, Water quality control.
Identifiers: *Sand blankets, *Mercury release, *Ascorbate.

The release of toxic mercurials by mercury-enriched river sediments was examined in the laboratory. Tests showed a release of 1 microgram of methylmercury per m2, per day. Methylmercury occurred in sediments with low and with high organic content, in sediments with low and high cation exchange capacity, and in aerobic and anaerobic sediments. The release of toxic mercury could be prevented by a layer of sand, 6 cm in thickness, applied over the mercury-enriched sediments. Layers of fine or coarse gravel (6 cm deep) were as effective as sand. Thinner layers of sand, (1.5 and 3 cm) were unsatisfactory. The cost of applying 3-inch layers of sand or gravel was about $3000 to $4000 per acre. A slow release of metallic mercury occurred in aerobic sediments. The release was much faster in anaerobic sediments. Using ascorbate as an artificial electron donor, metallic mercury could be released at high rates from aerobic sediments as well. Ascorbate appeared to be a useful indicator of divalent and biologically accessible mercury. The laboratory investigations proved the soundness of the sand blanket approach. Its practical and economic feasibility must be determined in a combined field and laboratory analysis program. (Lowry-Texas)
W72-12069

MERCURY POLLUTION CONTROL IN STREAM AND LAKE SEDIMENTS,
Advanced Technology Center, Inc., Dallas, Tex.
J. D. Suggs, D. H. Petersen, and J. B. Middlebrook, Jr.
Copy available from GPO Sup Doc EPA 16080 HTD 03/72, $0.50; microfiche from NTIS as PB-211 250, $0.95; paper copy $2.50. Environmental Protection Agency, Water Pollution Control Research Series, March 1972. 38 p, 4 fig, 4 tab, 7 ref. EPA Program 16080 HTD 03/72.

Descriptors: *Mercury, *Toxicity, *Sorption, Deposition (Sedimentation), Sulfur, Separation techniques, Solubility, Sediments, Dissolved oxygen, Water quality control, Hydrogen ion concentration.
Identifiers: *Mercury pollution control.

Organic fractions in sediments exhibit a strong tendency to sorb inorganic mercury resulting in localized deposition near the contamination source. High concentrations of mercury do not exist in natural waters until the underlying sediments have reached their sorption limits or until soluble organic forms have been generated. Mercury getters based on elemental sulfur and thio-organic compounds dispersed in recoverable matrices are capable of removing mercury from both the water column and underlying sediments. Elemental sulfur deployed as a coated meshwork was the most effective means of recovering inorganic mercury. The gettering action occurs over a period of months with no apparent degradation in water quality. Furthermore, the presence of elemental sulfur retards biological methylation of mercury. Long-term evaluation of mercury getter systems indicates that pH and dissolved oxygen are important only to the extent that they affect the concentration of desorbed mercury in the vicinity of the getter. (Lowry-Texas)
W72-12070

RENOVATING SECONDARY SEWAGE BY GROUNDWATER RECHARGE WITH INFILTRATION BASINS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 05D.
W72-12071

CHANGES IN WATER QUALITY RESULTING FROM IMPOUNDMENT,
Robert S. Kerr Water Research Center, Ada, Okla.
W. R. Duffer, and C. C. Harlin, Jr.
Copy available from GPO Sup Doc EPA 16080 GGH 08/71, $1.25; microfiche from NTIS as PB-211 159, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, September 1971. 110 p, 32 fig, 9 tab, 16 ref. EPA Program 16080 GGH 08/71.

Descriptors: *Reservoirs, *Pre-impoundment, *Post-impoundment, *Water analysis, Dissolved oxygen, Thermal stratification, Nutrients, Biochemical oxygen demand, Aquatic life, Sewage effluents, Decomposing organic matter, Statistical methods, Water balance, Water quality control, Oklahoma.
Identifiers: *Arbuckle reservoir, Rock Creek, Oxidation metabolism, Hypolimnetic oxygen deficit.

Changes in stream water quality, resulting from recent impoundment, are presented and discussed. Extensive data reflecting pre- and post-impoundment conditions were statistically analyzed. The extent to which pollutants influence changes in water quality was minimal, since the drainage basin was relatively undisturbed by the activities of man. Chemical, physical, and microbiological parameters at stream stations were evaluated for three discrete periods of time: prior to closure of the dam, during filling of the active conservation pool, and following filling with the surface maintained near the top of the active conservation elevation. Effects of removing treated municipal waste effluents from a tributary were also evaluated. Water quality changes within the impoundment were compared with respect to season, year, station location, and depth of sampling. Critical factors in the impoundment, which contributed to water quality changes, are identified. (Lowry-Texas)
W72-12072

PNEUMATIC BARRIER AND BEACH POLLUTION,
AMF Technical Center, Stamford, Conn.
M. S. Hertzendorf, J. V. Fiore, H. E. Klei, and I. J. Kopelman.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA2, p 379-396, April 1972. 10 fig, 5 tab, 10 ref. FWPCA Grant No. WDP-229-01-68.

Descriptors: *Sanitary engineering, *Beaches, *Recreation facilities, *Pollution abatement, *Water quality control, *Barriers, *Chlorination, *Aeration, *Bacteria, Coliforms, Dissolved oxygen, Organic compounds.
Identifiers: *Pneumatic barriers.

Pneumatic barriers, both with and without chlorination, for improving the sanitary conditions of certain beaches were studied by an experimental system consisting of four parallel lines (three air and one water chlorination) covering approximately 355 ft. of beach under a mean tidal value of 72 ft., a complete cycle of about 12 hrs. 15 min. and a net water exchange of 1,600,000 gal. Air was supplied by two 100 standard cu f/min compressors and was sparged through 1/64 in. or 1/32 in. openings, spaced at 30 in. intervals at conditions assuring critical velocity across these openings. Aeration proved to have no statistically significant effect in lowering bacterial levels. Chlorination did effectively reduce all bacteria levels in the basin and pneumatic curtains were effective in containing surface debris and oil. (Ensign-PAI)
W72-12076

SEPARATION MECHANISM OF MITSUBISHI OIL-WATER SEPARATOR,
Mitsubishi Heavy Industries Ltd., Nagasaki (Japan). Nagasaki Technical Inst.
K. Katsuta.
Mitsubishi Heavy Industries Technical Review, Vol. 8, No. 3, p 70-75, 1971. 12 fig.

Descriptors: *Oil pollution, *Separation techniques, *Flow separation, *Fluid mechanics, *Coalescence, Drops (Fluids), Tubes, Equations, Water quality control.
Identifiers: *Japan, Mitsubishi Oil-Water Separator.

The Mitsubishi oil-water separator is described. The critical diameter of oil particle can be separated from water in a small tube under laminar flow. Smaller oil particles can be separated by the collision with larger particles in a small tube. Oil separated on the wall of the tube gradually rises along the tube wall to the top, where it is condensed into oil film. When the thin film reaches the end of the tube it becomes a large oil drop and floats up immediately. The drop is 100-300 times as large as the oil particle at the inlet of the separator. (Ensign-PAI)
W72-12079

A STUDY OF THE EFFECTS OF A COMMERCIAL HYDRAULIC CLAM DREDGE ON BENTHIC COMMUNITIES IN ESTUARINE AREAS,
Florida Dept. of Natural Resources, St. Petersburg, Marine Research Lab.
For primary bibliographic entry see Field 05C.
W72-12083

GENERAL THEORY OF SELF-PURIFICATION IN THE SEA, (THEORIE GENERALE DE L'AUTO-EPURATION DE LA MER),.
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert.
Revue International D'Oceanographie Medicale, Vol. 24, p 61-125, 1971. 1 fig, 6 tab, 92 ref. Article in French.

Descriptors: *Self-purification, *Marine bacteria, *Pollution abatement, *Estuaries, *Hypolimnion, *Sediments, Bacteria, Sedimentation, Precipitation.
Identifiers: *Pelagic environment, Predatory activity, *Chemical secretions, Protozoa, Metazoa, Superior algae, Cyanophycea.

Self-purification and its importance in the bacterial pollution phenomena in ocean waters are analyzed. A specificity of actions in the estuarine, benthic and pelagic environments is detailed. Self-purification in the estuarine environment, such as sedimentation, precipitation and the predatory activity of micro-organisms, has only a mild impact against the great numbers of pollutant organisms. In the benthic environment, as in estuaries, protozoa's and metazoa's predatory roles promote purification. Also the indirect activity of organisms discharging various chemical substances through active and passive secretions was found to be purifying. In sediments these biochemical mediators are marine bacteria, in the aquatic benthic environment superior algae and cyanophycea play this role. These secretions diffuse into the whole of marine waters. In the pelagic environment the predatory phenomenon is quite negligible against such an enormous phytoplanktonic biomass. The secretions do, however, confer an important antibiotic influence in sea water during long periods of the year. The self-purification phenomenon based on the specificity of mechanisms by marine organisms antagonistic to terrestrial bacteria constitutes the basic element of stability or biological equilibrium necessary for a healthy marine environment. (Ensign-PAI)
W72-12095

FLOATING OIL BARRIER,
Sawyer-Tower Products, Inc. Watertown, Mass.
W. A. Reilly.
U.S. Patent No. 3,548, 599, 2 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 4, p. 1348, December 22, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution, Equipment, Separation techniques, *Water pollution treatment, Leakage.

This oil spill barrier comprises a semi-flexible buoyant section and a semi-flexible submerged stabilizing section. These hold the upper surface of an elongated trough-shaped deck above the normal water level. Liquid sloshing over one side of the barrier into the trough can be drained out of one or both ends of the trough. An array of such barriers may be used to surround the source of oil leakage. (Sinha-OEIS)
W72-12129

STAGED OXYGENATION OF BOD-CONTAINING WATER,
Union Carbide Corp., New York.
For primary bibliographic entry see Field 05D.
W72-12131

ABSORPTION OIL SKIMMER,
Standard Oil Co., Chicago, Ill.
R. G. Will, and W. F. Swiss, Jr.
U.S. Patent No. 3,546,112, 4 p, 3 fig, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p. 704, December 8, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Separation techniques, *Hydrocarbons, Organic compounds, Water pollution control, Water pollution treatment, Equipment, *Absorption.
Identifiers: *Oil skimmers.

This invention provides for absorption of the oil layer and some of the water into an open pored resilient material. A mild compressive force is applied to the material to remove the water and a severe compressive force removes the oil. The apparatus comprises a drum mounted for rotation along its longitudinal axis on a mounting platform. The drum is covered with an open pored resilient plastic foam. As the drum rotates the liquids are picked up and subsequent compressive forces are applied to remove the water and the oil. (Sinha-OEIS)
W72-12138

METHOD AND APPARATUS FOR NEUTRALIZING ACID WASTE WATER,
United States Steel Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05D.
W72-12147

METHOD OF AERATING STILL BODIES OF WATER,
M. Mendelson.
U. S. Patent No. 3,540,222, 3 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 880, No 3, p 798, November 17, 1970.

Descriptors: *Patents, *Aeration, Wave action, Buoys, *Stratification, Water pollution control.
Identifiers: Stirring.

This device comprises a buoy floating on the surface of a stratified body of water. It is connected by cables to a stirring device suspended at a point between the bottom and top of the water. When wave action raises the buoy, the stirrer is moved upward inducing vertical flow. The stratification is disrupted and bottom water moves to the surface where it may be aerated. (Sinha-OEIS)

W72-12152

OIL COLLECTION BOOM,
M. F. Smith.
U. S. Patent No. 3,539,013, 3 p, 5 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 487, November 10, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution, Water pollution treatment, Separation techniques, Equipment.
Identifiers: *Oil booms.

The oil collection boom comprises a porous elongated tubular net sleeve and thin flat elongated bats of compressible buoyant, oil sorbent material inside the length of the sleeve. The bats are formed of a randomly oriented mass of polymer fibers. The boom can be conveniently deployed in the path of an oil slick. Most or all of the oil is collected upon the fibrous surfaces inside the bat and very little oil escapes beyond the structure. (Sinha-OEIS)
W72-12154

MEANS FOR COLLECTING FLOTSAM,
A. F. A. Pearson.
U. S. Patent No. 3,539,048, 3 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 496, November 10, 1970.

Descriptors: *Patents, Harbors, Ports, *Flotsam, *Domestic wastes, *Municipal wastes, Pollution abatement, Equipment, Water pollution control, Water pollution treatment, Treatment.

A single or twin hulled vessel (ship) is used for collecting floating domestic or municipal wastes from the surface of the water in harbors or ports. It has an endless conveyer which is arranged to project into the water. The conveyor has spikes arranged in any combination or pattern to pick up the solid floating debris. It lifts the debris into a collecting receptacle. The collecting receptacle may be a hold in the vessel itself, or if the vessel is twin hulled the receptacle may be a barge which can be nosed in between the two hulls. (Sinha-OEIS)
W72-12155

FIRE EXTINGUISHING OIL SLICK SEPARATOR,
McRae Oil Corp., Houston, Tex.
B. G. Cornelius.
U. S. Patent No. 3,536,199, 6 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 879, No 4, p 1137, October 27, 1970.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Pollution abatement, Separation techniques, Water pollution control, Water pollution treatment.

This separator consists of a rotating drum floated on an oil slick on the water surface. The drum picks up the oil and carries it into a chamber to be scraped off and remain where combustion will not take place. The separator drum is held by mounting arms which have upper ends mounted on pivot pins on each side of the bow of the vessel. Axially aligned axle ends extend outward from the drum end closures and these are journaled in the lower ends of the mounting arms. (Sinha-OEIS)
W72-12158

INACTIVATION OF VIBRIO PARAHAEMOLYTICUS IN DISTILLED WATER,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 05C.
W72-12163

A MONTE CARLO STUDY OF SOME SMALL SAMPLE PROPERTIES OF TESTS FOR SPECIFICATION ERROR,
Michigan State Univ., East Lansing. Dept. of Economics.
For primary bibliographic entry see Field 07C.
W72-12183

VERIFICATION ERROR IN SINGLE SAMPLING INSPECTION PLANS FOR PROCESSING SURVEY DATA,
Bureau of the Census, Suitland, Md. Statistical Research Div.
For primary bibliographic entry see Field 07C.
W72-12184

HIGH RATE FILTRATION OF COMBINED SEWER OVERFLOWS,
Hydrotechnic Corp., New York.
For primary bibliographic entry see Field 05D.
W72-12191

MANAGEMENT MODELS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 06A.
W72-12225

DYNAMIC PROGRAMMING APPLIED TO SEWER STUDIES,
Illinois University, Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12234

ECOCIDE AND THOUGHTS TOWARD SURVIVAL.
For primary bibliographic entry see Field 06G.
W72-12261

SAFETY CONSIDERATIONS FOR DETERGENTS,
Proctor Gamble Co., Cincinnati, Ohio. Miami Valley Labs.
N. R. Artman.
Preprint, presented at 6th International Water Pollution Research Conf., Session 6, Hall A, Paper No 11, June 20, 1972. p A/6/11/1-A/6/11/8.

Descriptors: *Environmental effects, *Safety, *Detergents, *Biodegradation, Alkylbenzene sulfonates, Chemical properties, Laboratory tests, Toxicity, Activated sludge, Trickling filter, Efficiencies, Performance, Heavy metals, Chelation, *Water quality control.
Identifiers: *NTA, *Nitrilotriacetic acid, Pharmacology, Consumer testing, Treatability, Concentration levels.

Procedures involved in the investigation of environmental safety of new substances or formulations proposed for new products were described. The case history of NTA in detergents was presented. Testing procedures have not been the same for each product, but as a minimum each of the following has been considered: chemical properties, pharmacology, toxicology, consumer testing, biodegradability, environmental toxicity, treatability and projection of concentration levels. NTA, the trisodium salt of nitrilotriacetic acid, added at levels of 5-50 mg/l to unacclimated river water was degraded after 8-12 days, when added to water previously acclimated, degradation times ranged from 2-6 days. Both activated sludge and trickling filter units, once acclimated, consistently gave greater than 90% removal of NTA from incoming sewage. Most NTA-heavy metal chelates were degraded as rapidly as NTA itself. If NTA replaced phosphate in all detergent products, its projected level in receiving waters would average no more than 25 ppb. Also, the history of alkylbenzene sulfonates (ABS), illustrating some of the broader points of safety testing was presented. (Galwardi-Texas)
W72-12290

LEGAL ASPECTS OF WATER POLLUTION IN DELAWARE, MARYLAND AND VIRGINIA, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-211 247, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report, WRSIC 72-206, May 1972. 127 p.

Descriptors: *Delaware, *Maryland, *Virginia, *Bibliographies, *Abstracts, Legal aspects, Water pollution, River basins, Administrative agencies, Federal government, Water pollution control, Information retrieval, Publications.

The bibliography is a compilation of selected water resources abstracts on the legal aspects of water pollution in Delaware, Maryland and Virginia. A series of 84 selected abstracts is included from a data base of 37,916 abstracts. A separate list of significant weighted descriptors and identifiers used to index the abstracts is printed, along with a comprehensive list of all descriptors and identifiers contained in the abstracts. (Grant-Florida)
W72-12297

POLLUTION OF THE SEAS BY CRUDE OIL--A PROPOSAL FOR EFFECTIVE REMEDIAL ACTION,
R. A. Marks.
Ohio State Law Journal, Vol 33, p 80-101, 1972. 195 ref.

Descriptors: *Oil pollution, *Oily water, *Remedies, *Washington, *Federal government, Legislation, Water pollution sources, Water management (Applied), Water pollution effects, International waters, United States, Oil industry, Water pollution, Water pollution treatment, Abatement, Comprehensive planning.

This discussion is limited to pollution of the seas by crude oil and considers a proposal for the prevention and cleanup of further pollution. The sources, effects, and future of oil pollution are considered. The sources include maritime carriage of oil, off-shore drilling operations, intentional dumping of oil, and oil rising from cracks in the ocean floor which are created by man and by natural seismatic activity. The most serious consequence of oil pollution on the environment is the destruction of aquatic life. The international response to oil pollution, which includes the International Convention for the Prevention of Pollution of the Sea by Oil in 1954, the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casulaties, the International Convention on Civil Liability for Oil Pollution Damage, and the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution is examined. The United States response to this problem and the example set by the State of Washington in imposing a strict liability standard for pollution of its waters by oil are described. Proposals are suggested in terms of prevention, cleanup, and liability for damages. (Widman-Florida)
W72-12300

THE REFUSE ACT OF 1899: KEY TO CLEAN WATER,
For primary bibliographic entry see Field 06E.
W72-12301

ENVIRONMENTAL LAW--THE REFUSE ACT,
D. J. Millstone.
West Virginia Law Review, Vol. 73, p. 267-282, 1971. 29 ref.

Descriptors: *Rivers and Harbors Act, *Watercourses (Legal aspects), *Navigable waters, *Pollution abatement, Water pollution control, Legal aspects, Water law, Legislation, Judicial decisions, Regulation, Industrial wastes, Solid wastes, Waste disposal, Water pollution, Water pollution sources, Federal government, Water resources, Law enforcement, Federal Water Pollution Act, Sewage effluents, Permits.
Identifiers: *Refuse Act.

Discharging refuse matter into navigable waters, or into any tributary of navigable waters, constitutes a violation of the Refuse Act. An exception to this prohibition is the discharge of refuse flowing in a liquid state from streets and sewers. The responsibility for enforcement of the Act is vested in the Army Corps of Engineers, who also have the authority to issue permits for discharges. There is a federal interest in protecting tributaries of navigable waters from pollution. Even though waters flow indirectly into navigable waters, they are within the scope of regulation of the Refuse Act. In at least one case it was contended that the Federal Water Pollution Act suspended pollution control measures under the Rivers and Harbors Act. Looking to express provisions of the Water Pollution Act the courts would be compelled to find that the Act does not supersede or supplant the Refuse Act. The Refuse Act may be made sterile by a limited definition of the term 'tributary', but with a liberal definition of this term the public may be offered an excellent source of protection. (Brackins-Florida)
W72-12302

EXPANSION OF THE ALASKA WATER LABORATORY,
Congress, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-12303

JACKLOVICH V. INTERLAKE, INC. (QUI TAM ACTION MAY NOT BE MAINTAINED UNDER RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 06E.
W72-12306

AN ACT....RELATING TO WATER POLLUTION CONTROL, WATER SUPPLY AND SEWER SEPARATION PLANNING ASSISTANCE AND GRANTS.
For primary bibliographic entry see Field 06E.
W72-12309

ENVIRONMENTAL PROTECTION ACT OF 1971.
For primary bibliographic entry see Field 06E.
W72-12310

WATERS--PERMITS FOR NEW DISCHARGES.
For primary bibliographic entry see Field 06E.
W72-12311

WATER POLLUTION CONTROL-TREATED SUBSTANCES-DISCHARGE.
For primary bibliographic entry see Field 06E.
W72-12312

WATER POLLUTION CONTROL--PERMITS FOR NEW DISCHARGES--HEARING.
For primary bibliographic entry see Field 06E.
W72-12313

CONSTITUTIONAL LAW--FEDERAL PREEMPTION OF STATE REGULATORY AUTHORITY--FEDERAL GOVERNMENT HAS SOLE AUTHORITY UNDER ATOMIC ENERGY ACT TO REGULATE RADIOACTIVE WASTES DISCHARGED FROM NUCLEAR POWER PLANTS--NORTHERN STATES POWER CO. V. MINNESOTA,
A. N. Elgart.
Boston College Industrial and Commercial Law Review, Vol. 13, p. 813-826, 1972. 83 ref.

Descriptors: *Federal jurisdiction, *State jurisdiction, *Nuclear powerplants, *Federal-state water rights conflicts, Judicial decisions, Discharge (Water), Environmental effects, Federal government, Nuclear energy, Water pollution sources, Legal review, Water law, Legal aspects, Jurisdiction, Governmental interrelations.

In 1967 the Atomic Energy Commission (AEC) issued plaintiff Northern State Power Company, a Minnesota corporation, a construction permit to build a nuclear-fueled electric power plant in Minnesota. Defendant state and Minnesota Pollution Control Agency subsequently issued plaintiff a permit requiring radioactive discharges to comply with state standards which were more restrictive than those of the AEC. Plaintiff sought a judgment declaring defendant to lack the authority to regulate discharges of radioactive wastes because this field of regulation had been preempted by the federal government under the Atomic Energy Act. The federal district court found for plaintiff and the court of appeals affirmed, holding that the United States has sole authority under the Atomic Energy Act to regulate the construction and operation of nuclear power plants, and this authority necessarily includes regulation of the levels of radioactive effluents discharged from the plant. This case note first examines the doctrine of preemption and the various factors which establish congressional intent to preempt a field of regulation. The instant holding is discussed in relation to state police powers to control pollution. The dissenting opinion is examined. An amendment to the Atomic Energy Act expressly declaring that radioactive discharge standards are within the exclusive jurisdiction of the AEC is needed. (Widman-Florida)
W72-12314

JUDICIAL RECOGNITION OF THE SUBSTANTIVE REQUIREMENTS OF THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
B. S. Cohen, and J. M. Warren.
Boston College Industrial and Commercial Law Review, Vol. 13, p. 685-704, 1972. 73 ref, append.

Descriptors: *Federal project policy, *Legal review, *Administrative agencies, *Decision making, Administrative decision, Legal aspects, Legislation, Federal government, Projects, Project planning, Regulation, Environmental effects, Administration, Judicial decisions.
Identifiers: *National Environmental Policy Act.

In litigation based on the National Environmental Policy Act the broadest limits to which the courts have been willing to construe the Act has been to hold that the procedural requirements were to be strictly applied, but they have declined to hold that the substantive provisions were to be similarly enforced. By evaluating only compliance with procedural requirements of NEPA, the courts, in effect, make the agency the final arbiter of administrative compliance with the substantive provisions of the Act. The courts have ignored the fact that the procedural and substantive provisions of the Act are conjunctive and intended to have equal applicability. The procedural requirements incorporate the substantive policy and goals of NEPA, thereby imposing an affirmative duty on all federal agencies to protect the environment by avoiding adverse environmental effects to the fullest extent possible. The failure of the courts to require compliance with the substantive requirements will lead to frustration of the legislative purpose of NEPA. (Brackins-Florida)
W72-12316

A STRUCTURAL MODEL FOR A WORLD ENVIRONMENTAL ORGANIZATION: THE ILO EXPERIENCE,
For primary bibliographic entry see Field 06G.
W72-12317

THE POLLUTION FIGHT BEFORE THE U.S. COURTS,
Michigan Univ., Ann Arbor. School of Law.
For primary bibliographic entry see Field 06E.
W72-12320

WATER POLLUTION,
American Univ., Washington, D.C.
H. Lieber.
Current History, Vol 59, p 23-30, 50-52, July 1970. 1 map.

Descriptors: *Environmental control, *Water pollution, *Legislation, *Federal government, *Water pollution control, Social aspects, Adoption of practices, Water pollution sources, Water policy, Water pollution effects, Water quality, Water management (Applied), Programs, Pollutants, Pollution abatement, Pollutant identification.

Water pollution is at the root of an endless list of problems which are varied, complex, and not easily given to simple or uniform solutions. Present day problems can be classified under the following catagories of pollutants: organic or oxygen-demanding wastes, infectious agents, plant nutrients, synthetic organic chemicals, inorganic chemicals and mineral substances, sediment, radioactive substances, and heat. In practice most wastes are a mixture of these eight types of pollutants, which makes treatment and control difficult. The major sources of water pollution are manufacturing, domestic or municipal wastes, agricultural wastes, mine drainage, and navigation and recreation activities. Some emergency problem areas include lake eutrophication, estuarine destruction, ocean pollution, environmental effects of power generation, and health effects of new chemicals. Federal legislation and programs to cope with these problems are examined. A discussion is included of recent developments in the area such as the National Environmental Policy Act of 1969, future trends and suggestions such as reuse and recycling of wastes, and governmental trends such as economic incentives to encourage pollution control and the environmental ombudsman concept. (Widman-Florida)
W72-12321

THE FEDERAL GOVERNMENT AND THE ENVIRONMENT,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-12322

FROM POLLUTION ABATEMENT TO QUALITY CONTROL,
Senate, Washington, D.C.
E. S. Muskie.
Current, Vol 117, p 10-13, April 1970.

Descriptors: *Federal government, *Governmental interrelations, *Pollution abatement, *Quality control, Administrative decisions, Comprehensive planning, Adoption of practices, Coordination, Administration, Planning, Regulation, Governments, Institutional constraints, Decision making, Legislation, Conservation, Social aspects, Abatement.

Pollution is the special product of any society that places the consumption of goods and services high

on its scale of values, and which has the means to provide them in abundance. While some progress has been made in the areas of water quality standards, atmospheric contamination, and solid waste control, these are only the first stages of environmental protection. The next stage will involve the more subtle and pervasive questions of land and resource use, hazardous substances, population distribution and industrial location, noise and aesthetic pollution, ecological balance, and urban design. While there has been considerable federal effort, including the National Environmental Policy Act of 1969 and the Water Quality Improvement Act of 1969, the proliferation of activities and overlapping responsibilities is becoming increasingly intolerable. The creation of an independent watchdog agency is proposed to exercise the regulatory functions associated with environmental protection. This agency would be charged with responsibility for developing and implementing federal environmental quality standards, supporting basic research, stimulating investigation of control techniques, and providing technical assistance to state, interstate, and local operations. (Widman-Florida)
W72-12323

UNITED STATES AND U.S.S.R. TABLE REVISED DRAFT TREATY BANNING EMPLACEMENT OF NUCLEAR WEAPONS ON THE SEABED,
For primary bibliographic entry see Field 06E.
W72-12324

GULF OIL CORP. V. TUG GULF EXPLORER (DUTY OF SUBMARINE PIPELINE OWNER TO AVOID RUPTURES).
For primary bibliographic entry see Field 06E.
W72-12326

ORAL PROCEEDINGS--APPROACHES TO OIL POLLUTION RESPONSIBILITY (PACEM IN MARIBUS CONVOCATION AT VALLETTA, MALTA--1971).
Oregon Law Review, Vol 50, p 587-598, Spring 1971.

Descriptors: *Ships, *Oil spills, *Law enforcement, *Waste water disposal, *Penalties (Legal), Treatment facilities, Oil pollution, Oceans, Water pollution treatment, Water pollution sources, Oil, Oily water, Oil wastes, Federal Water Pollution Control Act, Water pollution, Harbors, Oil Industry, Environmental effects.

Intentional oil spills from tankers have been increasing, and new legislation increasing fines for such spills has sought to reverse the trend. Enforcement of laws to stop the pumping of bilges into the sea has been difficult due to the fact that it is done at open sea and cannot be detected. Facilities at port for flushing these oil tanks has been deemed a solution; however, flushing facilities are either non-existent or inadequate. Thus shippers find it convenient to dump the oily water from their tanks into the sea. There is a grant to build a model plant to receive waste oily water from ships' tanks in an efficient manner. Also Oregon is considering a bill imposing a $20,000 fine for intentional or negligent discharge of oil in state waters. Increasing fines is viewed as an effective way of dealing with this problem. Controlling foreign vessels with national legislation is more difficult. There have been proposals for treaties and international agencies which have not yet been realized. The existing treaties are inadequate and bear the bias of the shipping interests. Future conventions on the matter will deal with liabilities for oil spills and construction and operation standards for tankers. (Ilkson-Florida)
W72-12328

CHIEF JOSEPH DAM (ADDITIONAL UNITS), COLUMBIA RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08C.
W72-12330

LONG BRANCH LAKE, EAST FORK, LITTLE CHARITON RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-12335

DISPOSAL OF PANTEX SEWAGE EFFLUENT HOLDING RESERVOIR PORTION OF AEC PANTEX ORDNANCE PLANT IN AMARILLO, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
General Services Administration, Washington, D.C.

Available from the National Technical Information Service as PB-201 569D, $3.00 in paper copy, $0.95 in microfiche. August 5, 1971. 8 p, 1 map.

Descriptors: *Nuclear powerplants, *Environmental effects, *Groundwater, *Water supply development, Surface waters, Subsurface waters, Surface water availability, Multiple-purpose reservoirs, Federal government, Reservoir storage, Administrative agencies, Land use, Wildlife conservation, Water resources development, Texas, Recreation facilities.
Identifiers: *Environmental Impact Statements, *Amarillo (Tex).

With the closing of Amarillo Air Force Base in 1968, sewage flow was greatly reduced as were storage requirements. The Atomic Energy Commission determined that there was no longer a requirement for the Pantex Lake Area and the land was declared excess to the needs of that agency. The proposed disposal action involves a negotiated sale of the entire fee estate to Carson County, Texas, for development of possible subsurface water underlying the land and development of the surface for parks and wildlife refuge. Water in Carson County is in short supply except from subsurface sources. These sources are considered naturally nonreplenishable and therefore withdrawal of this water could be an irreversible and irretrievable commitment of a natural resource. However, the withdrawal of this water will not create a deleterious effect on the environment and will not significantly affect the use of the surface for a wildlife refuge and park. Alternatives include conveyance of portions of the land to Texas Technological University and the local school district or to offer the land for sale by sealed bids. (Waldron-Florida)
W72-12338

TOO MANY PEOPLE ON THE COLORADO RIVER,
Arizona Daily Star, Tucson.
P. Cowgill.
The Environmental Journal, National Parks and Conservation Magazine, Vol 45, No. 11, p 10-14, November 1971. 6 fig.

Descriptors: *National parks, *Colorado River, *Recreation wastes, *Boating, Sewage, Cruises, Economic impact, Reasonable use, Public health, Recreation demand, Reservoirs, Social aspects, Scenery, Use rates.
Identifiers: *Wilderness.

In the last 7 years since the Glen Canyon dam gates were closed and the Lake Powell reservoir began rising, the river running season on the Colorado River through the Grand Canyon has increased from 4 to 8 months. During 1969, more than 6,000 people floated down the river, and in 1970 this number increased to 10,072. More than 93% were carried by commercial outfitters. This heavy increase in use has resulted in degradation and pollution in the canyon. These have taken the form of oil, gas motor noise pollution, littering, health and sanitation problems, and damage to vegetation, wildlife, historic sites and prehistoric shrines. The sanitation problem became so bad that the Park Service installed pit toilets in the wilderness area. Faced with the alternative solutions of shutting down all river running or carrying out trash, the Park Service chose the latter course. The preliminary Grand Canyon master plan proposes wilderness classification for all parts of the canyon except the river. Commercialized boat trips will still be possible and motorized boats will continue to ply the river. The critical question concerning both this region and all wild areas is: should administrators have the goal of ensuring environmental preservation or should recreational values prevail. (Casey-Arizona)
W72-12349

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

BALANCED UTILIZATION OF GROUNDWATER RESOURCES,
Layne-Western Co., Kansas City, Mo.
For primary bibliographic entry see Field 04B.
W72-11917

THE RIVER BASIN MODEL: ASSESSMENT DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12122

THE RIVER BASIN MODEL: PLANNING AND ZONING DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12123

THE RIVER BASIN MODEL: THE TRANSPORTATION SECTION.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12124

THE URBAN SYSTEM,
Martin Marietta Co., Denver, Colo.
R. E. Paulsen.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 10-32 (Chapter IB). 5 fig, 1 tab, 19 ref.

Descriptors: *Systems analysis, *Model studies, *Cities, *Urban hydrology, Financing, Transportation.

The city is a complex system which we still poorly understand. To the compelling problems of fragmentation and finances, there is a long list headed by transportation, housing, services, racial problems and the poor. To cope with such problems the government structure needs major improvement. A metro agency such as the Metropolitan Regional Council of Governments might be the answer. We need more data, and need to spend more effort discovering the underlying laws that govern the urban processes. We need a combined attack by experimental and theoretical means on the basic problem of understanding how elements of the urban system interact. (See also W72-06102) (Campbell-Cornell)
W72-12221

THE URBAN WATER SYSTEM--TECHNICAL ASPECTS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
G. T. Orlob.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 48-63 (Chapter ID). 8 fig, 4 ref.

Descriptors: *Systems analysis, *Water resources, *Cities, *Model studies, *Urban hydrology, Planning.

This study considered system analysis applications to problems of individual subsystems and to comprehensive analyses of all the connected urban water subsystems operating simultaneously. The urban water resources system is envisioned as comprising two major subsystem types: Location Subsystems and Transfer Subsystems. The major conclusion was that systems analysis did offer great potential for assisting planning, design, and operation of urban water systems. But paradoxically comprehensive modeling has to proceed from rather general descriptions of the urban water environment, whereas it is best to begin at the most detailed operational level. Hopefully a comprehensive and detailed model will be constructed, connecting the several kinds of models. (See also W72-06102) (Campbell-Cornell)
W72-12222

THE URBAN WATER SYSTEM--ECONOMIC ASPECTS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
M. B. Sonnen.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 64-90 (Chapter IE). 19 fig, 3 ref.

Descriptors: *Systems analysis, *Model studies, Economics, *Costs, *Waste treatment, *Cities, *Urban hydrology, *Decision making, Planning, *Waste water treatment.

The objective of water planning has been to maximize net benefits. This is not the same as maximizing the benefit-to-cost ratio from among a series of alternative water development plans. Levels of possible decisions about water quality and economic objectives are discussed. Some economic evaluation models built to analyze urban water economics problems on several of these levels are examined. Included are a least-cost water treatment model, a benefit-cost model for water treatment, waste treatment economics models, and comprehensive urban water economics models. (See also W72-06102) (Campbell-Cornell)
W72-12223

THE SYSTEMS APPROACH,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
G. W. Reid.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 181-187 (Chapter IIIA).

Descriptors: *Systems analysis, *Model studies, *Decision making, *Water control, *Operations research.

In search of some organizing principles that might provide a coherent approach to public problems for the next few decades, it is helpful to view the problem areas as aspects of a system. The systems approach provides a look at the whole system rather than one part at a time, as has been done in the past. A model isused as a symbolic representation of a real life situation, investigating numerous variables simultaneously. Problems can be appraised in terms of alternative decisions, and ranked in relation to other public action programs. Water problems can be looked at from several levels: strategical, logistical, or tactical, or macro, micro, and micro-micro. Operations research is a method of investigation--not problem solving. The systems approach is a new way of looking at a problem. (See also W72-06102) (Campbell-Cornell)
W72-12224

MANAGEMENT MODELS,
Colorado State Univ., Fort Collins.
D. A. Benton.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 188-207 (Chapter IIIB). 8 fig, 14 ref.

Descriptors: *Systems analysis, *Water quality, *Management, *Model studies, *Motivation, *Human resources.

When discussing water quality problems, people tend to forget the place of management and human resources models in urban water systems. The human element is a major part of systems theory and models. There are several models of motivation and organizational behavior: by Maslow, McGregor, Herzberg, Blake and Mouton, and Likert and Davis. They all show that management should be and probably is moving toward a more enlightened, more people-centered type of organizational behavior. The human individual deserves to be a major part of our models and systems. (See also W72-06102) (Campbell-Cornell)
W72-12225

MATHEMATICAL MODELING,
Geological Survey, Fort Collins.
D. R. Dawdy.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 208-212 (Chapter IIIC).

Descriptors: *Systems analysis, *Mathematical models, *Optimization, *Model studies, *Planning.

An introduction to systems analysis, which is described as a state of mind and attitude, is presented. Mathematical modeling is one of the tools of systems analysis. Whereas mathematical programming is concerned with optimization, modeling describes a system. The two kinds of models are deterministic and stochastic. The latter is for a long-term prediction of a series of events, ans so is generally used for planning. Deterministic models are used in daily operation, and as a tool to predict what will happen as a result of a given action. (See also W72-06102) (Campbell-Cornell)
W72-12226

OPTIMIZATION TECHNIQUES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
G. L. Smith.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 213-232 (Chapter IIID). 3 fig, 1 tab, 11 ref.

Descriptors: *System analysis, *Optimization, *Computers, *Model studies, *Analytical techniques.
Identifiers: Sensitivity analysis.

Interest in mathematical optimization techniques has been largely motivated in the last 15 years by a host of new problems in technology, science, and economics. The advent of high speed computers has greatly broadened the scope and capability of optimization methods. The following methods of analysis are examined: production function or technologic efficiency; systems analysis and optimization; models as an optimization technique; analytic solutions or mathematical programming methods; and sensitivity analysis. Examples are given of each of these techniques. (See also W72-06102) (Campbell-Cornell)
W72-12227

THE MACRO APPROACH--URBAN WATER DEMAND MODELS,
Oklahoma Univ., Norman. School of Civil and Environmental Science.
G. W. Reid.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 235-294 (Chapter IVA). 5 fig, 5 tab, append.

Descriptors: *Water demand, *Forecasting, *Model studies, Economic analysis, Estimating, *Systems analysis, Alternative planning, Water users.

To study long range problems of the demand for water requires macro level, multistructural, multistaged, multivaried models, articulated over time toward consumer understandable objectives. The systems approach provides an ideal technique to have looks into the future, looks that are essential to the management for beneficial use of critical resources. Presented is a discussion of water demand estimating techniques. The demand models are described as consisting of population, an economic, a reconcilation, and life style model with definition of public service and private sector commitments. The demand can be expressed as the summary of municipal, industrial, and agricultural uses. The macro approach and use of the economic model leads the planner towards a series of goals both probable and possible. (See also W72-06102) (Bell-Cornell)
W72-12228

THE MICRO APPROACH--COMPUTERIZED MODELS FOR MUNICIPAL WATER REQUIREMENTS,
Hittman Associates, Inc., Columbia, Md.
J. J. Boland.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 295-316 (Chapter IVB). 9 fig, 6 ref.

Descriptors: *Water requirements, *Municipal water, *Forecasting, *Water supply, Estimating, Urban hydrology, Water users, *Model studies, Computer programs, Systems analysis.

The availability and quality of municipal water supply have had, over the years, a monumental effect on the nature of our development as an urban civilization. Primarily due to population growth, there is now a most critical need for the effective planning and management of water utilities. Although forecasting is a risky business, it is absolutely essential that forecasts be made in order for a water supply system to meet its demand. Described is a research program which accomplishes: a review and evaluation of existing and possible techniques for estimating and forecasting municipal water supply demands; selection and merging of consistent techniques into a single comprehensive planning tool; and the development of a computer program to minimize the computational burden on the water supply planner. It is emphasized that the problem confronting most water supply planners is an intensely local one. It is suggested that the basic per capita approach to water planning, although generally successful when considering national or large-area forecasts, may not fully satisfy the requirements of the local water supply planner who is dependent upon precise accuracy, a necessity on the 'micro' level. The resulting convenient, reliable, and comprehensive method for forecasting municipal water supply requirements in urban areas is described in detail. (See also W72-06102) (Bell-Cornell)
W72-12229

APPLICATIONS OF LINEAR PROGRAMMING, OR LINEAR POTPOURRI,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
S. Doddiah.

In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 404-410 (Chapter VIIA).

Descriptors: *Linear programming, *Mathematical models, *Systems analysis, *Planning, Optimum development plans, *Model studies.

Linear programming involves the planning of activities to obtain an optimal result which reaches the specified goal most efficiently (according to the mathematical model) among all feasible alternatives. There is a wide variety of problems which lend themselves to solution by linear programming. Some examples of these problems are presented and possible models for them are described. To name a few: Network-flow, activity analysis, and transportation problems. (See also W72-06102) (Bell-Cornell)
W72-12230

LINEAR PROGRAMMING: GENERAL CONCEPTS AND METHODS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
G. L. Smith.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 411-431 (Chapter VIIB). 10 fig, 2 tab, 3 ref.

Descriptors: *Linear programming, *Algorithms, Mathematical models, Equations, *Model studies.
Identifiers: *Slack variables, *Simplex method.

Presented is a detailed geometric interpretation of linear programming. Beginning with a simple problem involving only two decision variables, the role of the linear equation is explained. Further examined are convex sets and feasible region concepts, lines and polygonal convex sets, and linear programming equations. Presented also is a detailed algebraic interpretation of linear programming; the concept of slack variables and basic concepts of the simplex method are discussed. (See also W72-06102) (Bell-Cornell)
W72-12231

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND SUPPLY,
Denver Board of Water Commissioners, Colo.
N. Hobbs.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 442-477 (Chapter VIID). 5 fig, 6 tab.

Descriptors: *Linear programming, *Optimization, *Water demands, *Water supply, *Water management (Applied), *Water sources, *Water treatment, Model studies, Costs, Planning, Estimating, Systems analysis, Reservoirs, Constraints, *Colorado, Treatment facilities.
Identifiers: *Denver.

Denver, Colorado must gird itself to face the challenge of greater water use in future years. To insure optimum utilization of its present sources, planners are analyzing the techniques of linear programming to establish the future role of linear analysis in the operation of the Denver system. The case study reviewed deals with the furnishing of water from existing sources to existing treatment plants to meet current demands, subject to the physical constraints of the water system. Provided is a description of these constraints and an introduction to two methods of approach (1) the linear programming analysis and (2) the network analysis. (See also W72-06102) (Bell-Cornell)
W72-12232

DYNAMIC PROGRAMMING CONCEPTS AND APPLICATIONS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
D. D. Meredith.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 599-625 (Chapter IXA). 4 fig, 3 tab, 31 ref.

Descriptors: *Mathematical models, *Dynamic programming, *Equations, *Algorithms, Stochastic processes, Optimization, Model studies.
Identifiers: Probabilistic models, *Recursive equation.

An exposition is presented of the concepts and applications of the dynamic programming computational procedure for the reader who has had no previous experience with this procedure. The concepts and procedures necessary for the application of the procedures, not rigorous proofs are discussed. Included is a list of 31 references for suggested reading and study to fill gaps in the material presented. A simple hypothetical example of a pipe distribution system is used to acquaint the reader with the details of a recursive equation and an algorithm. (See also W72-06102) (Bell-Cornell)
W72-12233

DYNAMIC PROGRAMMING APPLIED TO SEWER STUDIES,
Illinois University, Urbana. Dept. of Civil Engineering.
D. D. Meredith.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 626-652 (Chapter IXB). 4 fig, 5 tab, 12 ref.

Descriptors: *Dynamic programming, *Sewers, Costs, Hydraulics, Flow, Topography, *Systems analysis, Computers, Constraints, *Pipes.

Simplified problems are discussed to enable the student to learn the dynamic programming approach, its limitations, its data requirements, and its usefulness in sewer studies. Many types of information are required to analyze a proposed sewer system, such as the cost of sewer pipes, the hydraulics of flow in sewers and the topography of the region; a sewer system layout must be derived. A functional diagram, the stages, the states, the decisions, returns and transformation functions, the incidence identities, the constraints, the recursive equation, a flow diagram, the computer program and the solution are presented for each problem and are recommended as necessary for the formulation and solving of dynamic programming problems. The emphasis is upon the dynamic programming technique and not the mechanics of sewer design and construction. (See also W72-06102) (Bell-Cornell)
W72-12234

NONLINEAR PROGRAMMING AND SENSITIVITY ANALYSIS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
T. M. Rachford.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 655-672 (Chapter XA). 9 fig, 6 ref.

Descriptors: *Algorithms, *Linear programming, *Mathematical models, Constraints, Optimization, Computers, Systems analysis.
Identifiers: *Nonlinear programming, Convexity, Concavity, Simplex algorithm, *Sensitivity analysis.

Nonlinear programming is discussed in relation to linear programming, the nonlinear procedure of separable programming is examined in some detail, and the purpose, methods and types of sensitivity analysis are explained. Nonlinear programming is a logical extension of linear programming. The two techniques differ basically in the additivity property: increasing or decreasing returns to scale are not allowed in linear programming. The importance of the concept of convexity and concavity in nonlinear programming is discussed. Special attention must be given to the types of nonlinearities present in nonlinear programming problems. There is no single procedure for solving all nonlinear programming problems. The success of a particular algorithm is closely related to the size of the problem, the density of the coefficient matrix, and the type of computer capability available. Advantages of the separable programming technique are that: (1) it permits the use of the Simplex algorithm for solution, and (2) it allows the use of data in the form in which it is often obtained. Sensitivity analysis is valuable as a tool to explore sensitivities that most strongly recommend linear and nonlinear programming; however, extensive sensitivity analysis is impractical without a digital computer. (See also W72-06102) (Bell-Cornell)
W72-12235

UNIT OPERATIONS AND TREATMENT KINETICS OF WATER PURIFICATION AND WASTE WATER TREATMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. C. Ward.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 673-693 (Chapter XB). 6 fig, 4 tab, 6 ref.

Descriptors: *Sanitary engineering, *Waste water treatment, *Kinetics, *Water purification, Operations research, Biological treatment, Chemicals, Physical properties, Flocculation, Disinfection, Chlorination, Fluoridation, Sedimentation, Aeration, Sewage treatment, Biochemical oxygen demand, Bacteria, Suspended solids, Mixing, Adsorption, Filtration.
Identifiers: Unit operations.

Conventional unit operations of water treatment are discussed. The term 'unit operations,' as used by the sanitary engineer, refers to the physical, chemical, and biological phenomena occurring simultaneously in the unit operations of water purification and waste water treatment. A list of unit operations is presented. It contains: Mixing, Flocculation (physical), Solids transfer, Gas transfer (includes aeration), Ion transfer, Nutrient or molecular transfer, Disinfection (usually chlorination), Solids concentration and stabilization, Heat transfer, and others. Figures are presented showing: (1) a typical water treatment plant; (2) a conventional contact-stabilization activated sludge waste water treatment plant; (3) a typical trickling filter waste water treatment plant; (4) typical stabilization (photosynthetic) or mechanically aerated pond waste water treatment plant; and (5) a proposed physiochemical waste water treatment plant. Discussed are the kinetics of water purification and waste water treatment. (See also W72-06102) (Bell-Cornell)
W72-12236

CASE STUDY ON SENSITIVITY ANALYSIS AND NONLINEAR PROGRAMMING APPLICATIONS TO PROCESS ANALYSIS AND CONTROL,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
T. M. Rachford.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 694-708 (Chapter XC). 5 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, Optimization, Economic analysis, Costs, Constraints, Operations research, Mathematical models, Biochemical oxygen demand, Suspended solids, *Treatment facilities, *Design.
Identifiers: *Nonlinear programming, *Sensitivity analysis, Convexity.

Nonlinear programming and sensitivity analysis are used to determine an economical, yet technically sound design for a hypothetical waste water treatment facility and to explore its sensitivity to changes in specifications and input prices. The objective is to minimize cost, subject to a constraint on BOD removal. Factors over which the planner has no control are: the design flow; physical, chemical and biological characteristics of the raw sewage; available technology; and design specifications, in the form of stream or effluent standards. It is found that the objective function will be convex and thus compatible with the method of linear programming. Cost-effectiveness functions for each unit process are derived from two separate analyses: (1) relationships between process efficiency and the physical characteristics and operational parameters (detention times, chemical dosages) of the unit processes are developed; (2) cost of each unit is related to these operational parameters and physical characteristics. A decision model is derived and the case requirements presented. The objective function composed of nonlinear cost-effectiveness functions for primary, secondary, and tertiary waste water treatment is linearized by piecewise approximation. The basic solution is presented and post-optimality, sensitivity analysis is performed. (See also W72-06102) (Bell-Cornell)
W72-12237

SOCIAL PROCESSES IN WATER MANAGEMENT SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Sociology.
E. C. Vlachos.
In: Treatise on Urban Water Systems, Colorado State University Press, July 1971, p 722-739 (Chapter XIC). 3 fig.

Descriptors: *Environmental engineering, *Natural resources, *Water management (Applied), *Social aspects, *Water resources, Systems analysis, Mathematical models, Water demands, Urban hydrology, Human population, Planning, Water use, *Urbanization.
Identifiers: *Urban growth, External environment, Internal environment.

A new approach to environmental resource management is needed which must involve technological assessments and evaluations that include much broader constraints than have been required in the past. The interaction of four essential elements must be taken into account: Population, Environment, Technology, and Social organization. Technological options must be assessed as significant social matters and their future implications plotted as efficiently as possible. Presented is a detailed systematic sociological analysis of natural resources and an effort towards a generalized model exemplifying an attempt for an integration of the organizational aspects of water management systems. (See also W72-06102) (Bell-Cornell)
W72-12238

6B. Evaluation Process

SALINITY AND WATER USE.
For primary bibliographic entry see Field 03C.
W72-11755

ECONOMIC AND SOCIAL ASPECTS OF SALINE WATER USE AND MANAGEMENT,
Gutteridge, Haskins and Davey, Melbourne (Australia).
For primary bibliographic entry see Field 03C.
W72-11769

SALINITY AND WATER USE: FUTURE RESEARCH DIRECTIONS,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Soils.
For primary bibliographic entry see Field 03C.
W72-11772

THE HUMAN DIMENSIONS OF DAM SAFETY,
Department of Fisheries and Forestry, Ottawa (Ontario).
S. Chaterjee, and A. K. Biswas.
Water Power, Vol. 23, No. 12, Part I, p. 446-453, Dec 1971; Vol. 24, No. 1, Part II, p. 17-21, Jan 1972. 13 p, 3 tab, 62 ref.

Descriptors: *Dam failure, *Safety, *Dams, *Disasters, Insurance, Investigations, Project planning, Impact, Benefits, Legislation, Behavior, Economics, Responsibilities, Warning systems, Bibliographies, Costs, Social aspects, Damages, Education, Zoning, Dam design, Psychological aspects.
Identifiers: Canada, Malpasset Dam (France), Baldwin Hills Resvr (Calif), Vaiont Dam (Italy), Oros Dam (Brazil).

Dam safety has long been considered a technical subject, and the significance of the human aspect in the overall problem of dam disasters has seldom been recognized. Reasons for this past neglect are: (1) lack of knowledge regarding quantification of associated benefits and costs; (2) reluctance and indifference at the various levels of government; (3) lack of proper investigation and assessment of past dam failures; (4) dearth of research to test, improve, and innovate methods of handling disaster problems; and (5) lack of community perception of the problems. Research is needed to resolve some of these complexities. Studies of dam disasters indicate a great need for investigation and regulation of the human aspects of dam safety, and the many potential benefits to be gained from such studies. Because the present state of the art cannot completely eliminate dam failures, the major objective suggested is to minimize potential failure losses by such measures as zoning, disaster warning systems, dam safety insurance, and legislative action. Dam safety is important to society as a whole; engineers responsible for the design of dams and associated structures should work closely with economists and behavioral scientists to alleviate the problem of dam safety. (USBR)
W72-11790

BETTER TOOLS FOR WATER RESOURCES,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 03B.
W72-11891

CRITERIA FOR ANALYSIS OF INTERREGIONAL TRANSFERS OF WATER,
Washington State Water Research Center, Pullman.
E. R. Tinney.
Journal of the American Water Works Association, Vol 58, No 11, p 1369-1373, November 1966.

Descriptors: *Planning, *Evaluation, *Water resources development, *Methodology, *Water transfer, *Technology, *Project planning, *Water sources, Droughts, Political aspects, Economic efficiency, Obsolescence, Multiple-purpose projects, Optimum development plans, Regional analysis.
Identifiers: British Columbia, Technologic obsolescence, Interregional transfers.

Six criteria are developed for analysis of interregional diversions. These include delimitation of the regions affected by incremental economic analysis, inclusion of only those regional units for which benefits and costs can be ascribed, use of appropriate time frame in terms of obsolescence and growth of region of origin, examination of the full range of alternatives, and recognition of variation of supply and provision for droughts. Application of these six criteria to analysis of interregional transfers would probably show that most such schemes are not feasible. Two major needs, to be developed through research, will be required to make the appropriate analysis. These are (1) the date of technologic obsolescence, and (2) the technique for determining net socio-economic benefits. The challenge is to the researcher to give the planner these new tools. (Flack-AWWARF)
W72-11897

NEW LOOK AT RESOURCES POLICY,
Cornell Univ., Ithaca, N.Y. Coll. of Engineering.
G. P. Fisher.
Journal of the American Water Works Association, Vol 57, No 3, p 255-261, March 1965. 2 ref.

Descriptors: *Water resources, *Water policy, *Water shortage, *Water allocation (Policy), *Water pollution, *Water law, *Multiple purpose, *Water reuse, Water rights, Water quality, Competing uses, Recreation, Distribution, Pricing, Political aspects, Institutions.
Identifiers: Public policy, Market place.

The United States is not confronted with a widespread water shortage but its water problems will increase in severity if present management and use continue. The problems relate to (1) supply and demand, (2) demand and cost, and (3) law and public policy. Wise management includes judicious allocation, definition of water rights, equitable pricing, more efficient distribution, multiple-purpose storage, and, in particular, reuse. The market system in water should be encouraged and law institutions modified to allow the market to operate. The public must be led to a balanced concern for all aspects of the water problem. (Flack-AWWARF)
W72-11900

DETERMINATION OF STREAM USE,
Philadelphia Water Dept., Pa.
For primary bibliographic entry see Field 05G.
W72-11910

WATER SUPPLY ECONOMICS, TECHNOLOGY AND POLICY,
RAND Corp., Santa Monica, Calif.
J. C. De Haven.
Journal of the American Water Works Association, Vol 55, No 5, p 539-547, May 1963. 1 ref.

Descriptors: *Water supply, *Economics, *Water policy, *Water law, *Pricing, *Prices, *Water utilization, Competing uses, Hydrologic cycle, Political aspects, Transpiration, Benefits, Discriminatory pricing, Intangible benefits, Reasonable use, Beneficial use, Economic efficiency, California, New York, Water transfer.
Identifiers: *Alternatives, *Misallocation, Market place, Subsidy, Allocation, Metropolitan Water District of Southern California, New York City, Los Angeles, Imperial Valley.

Efficient allocation of present water supplies and development of new sources require use of economic criteria to lead to more efficient uses. Case studies of New York City and Southern California water systems reveal gross misallocation, waste, discriminatory and subsidized pricing and defective water law. Low subsidized prices are charged irrigators with resulting waste and low economic crop production. Lack of metering and excessive leaks in New York City encourage waste and overbuilding. Overinvestment and premature investment are based on errors in fact or on faulty reasoning such as counting intangibles or secondary benefits. Water rights are not clearly defined, lack certainty and cannot be transferred

easily. State assumption of ownership of unappropriated water is justified. A major change rather than a marginal modification is in order. (Flack-AWWARF)
W72-11913

STATUS OF WATER RESOURCES USE, CONTROL AND PLANNING IN THE UNITED STATES,
John Hopkins Univ., Baltimore, Md.
A. Wolman.
Journal of the American Water Works Association, Vol 55, No. 10, p 1253-1272, October 1963. 1 fig, 2 tab.

Descriptors: *Water utilization, *Water resources development, *Research priorities, Water demand, Economics, Competing uses, Runoff, Hydrologic cycle, Precipitation, Arid lands, Streamflow, *Planning, Political aspects, Scientific personnel, Training, Optimum development plans, Systems analysis, Humid areas, Regulated flow, Colorado River Basin, Foreign countries, Climatic zones.
Identifiers: *Basic research, *Research needs, Allocation, Basin planning, Senate Select Committee on Water Resources.

The more significant problems in water resources and the research that will contribute to understanding and use of this resource are identified. Water problems are regional and solutions must be found on a regional basis. Research needs vary regionally but some are common, including stream forecasting, optimizing water systems, weather forecasting and physiological aspects of water quality. Shortage of water scientists is a strong deterrent to solving water problems. Specifying research is basically a problem of optimal allocation of resource funds and talent. (Flack-AWWARF)
W72-11914

USE OF WATER IN ALABAMA, 1970, WITH PROJECTIONS TO 2020,
Geological Survey of Alabama, University.
L. B. Peirce.
Alabama Geological Survey Information Series 42, 1972. 77 p, 8 fig, 9 tab, 30 ref, 3 append.

Descriptors: *Water utilization, *Water resources development, *Alabama, Water yield, Streamflow, Groundwater, Reservoirs, Consumptive use, Municipal water, Industrial water, Hydroelectric plants.

In 1970, withdrawal use of water for all purposes in Alabama averaged about 6,700 mgd --nearly 2,000 gallons per capita daily. Of the total withdrawal, 96% was surface water drawn from streams or reservoirs, and 4% was groundwater drawn from wells or springs. Thermoelectric powerplants were the largest withdrawers of water, accounting for 75% of total withdrawal. The remaining 25% was accounted for by self-supplied industry (16%), public water supply (7%), and rural use (2%). Public water systems served about 2,187,000 persons, or 63% of the State's population in 1970. Of those served, 65% were supplied from surface-water sources and 35% from groundwater sources. The total flow of Alabama streams averages about 93,000 mgd. Present commitments against this dependable supply amount to about 46,000 mgd, which includes all consumptive uses plus the water requirements for hydroelectric power generation. It is estimated that the remaining undeveloped surplus of 6,000 mgd, when allocated to consumptive use, would support water withdrawals at 10 times the present rate. (Knapp-USGS)
W72-11979

WATERPOWER RESOURCES OF THE USSR,
A. N. Voznesenskii, A. B. Abakyan, V. A. Bernshtein, and A. A. Beschinskii.
Available from NTIS, Springfield, Va 22151 as TT70-50069 Price $9.00 paper copy. Israel Program for Scientific Translations, Jerusalem, 1971. 646 p. (TT70-50069, Originally published by Izatel'stvo 'Nauka, Moskva, 1967.).

Descriptors: *Hydrology, *Water resources, *Water resources development, *Hydroelectric power, *Hydroelectric plants, Reservoirs, Reservoir sites, Reservoir construction, Reservoir operation, Rivers, River basins, River basin development, Potential water supply, Water utilization, Water management (Applied), Economics, Economic impact, Costs, Investment, Maps.
Identifiers: *USSR, *Waterpower, *Hydropower.

This two-part monograph provides a comprehensive and detailed study of the waterpower resources of the USSR and of the problems connected with their development. Part One (Chapers I-VII) deals with waterpower resources and their evaluation, including potential waterpower resources of the USSR, technically exploitable waterpower resources, economically effective waterpower resources, tidal energy as a potential power resource, and waterpower resources of the world. Part Two (Chapters VIII-XII) deals with utilization of waterpower resources, including examination of basic technical and economic aspects of waterpower engineering, nature and characteristics of waterpower development, and economic importance of reservoirs. The concluding chapter presents engineering and economic figures for hydropower plants in operation under construction, and in the design stage. The data can be used to assess the engineering and economic importance of potential river power for power generation. (Josefson-USGS)
W72-12024

A PRELIMINARY SURVEY OF PUBLIC-RELATED AGENCIES IN HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W72-12100

AN APPRAISAL OF PLANS TO MEET THE FRESH WATER REQUIREMENTS OF THE MISSISSIPPI GULF COAST AREA,
Mississippi State Univ., State College. Water Resources Research Inst.
D. C. Williams, Jr., C. P. Cartee, and M. H. Malchow.
Available from the National Technical Information Service as PB-211 157, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, July 1972, 43 p. OWRR A-052-MISS (1).

Descriptors: *Water supply, *Planning, *Mississippi, *Gulf Coastal plain, *Water requirements, Administrative agencies, State governments, *Project planning, Institutional constraints.

The purpose was to inventory and assess the plans to meet the fresh water needs of the Mississippi Gulf Coast. Over 30 fresh water related plans and studies involving the three coastal counties (Jackson, Harrison, and Hancock) were identified through literature review and contacts with the various planning agencies and governmental units. Seventeen of the plans considered to be relevant were evaluated in terms of selected criteria, the results of which are presented in tabular form. These plans are also discussed by county, to give a picture of the planning for each county in the study area. There is overlapping and fragmentation of plans and planning agencies. Also, there is a divergence of opinions as to the adequacy of current water supply and recommendations to meet the fresh water needs. Recommended new facilities have not been built. This may be the result of a normal time lag between recommendations and authorization, or the action agencies may not feel the urgency suggested in the reports and/or other factors. The findings suggest there is a gap between the 'planners' and the officials with the direct responsibility of providing fresh water to the various users.
W72-12103

COMMUNITY ORGANIZATION PROGRAMS AND RELATIONSHIPS IN WATERSHED DEVELOPMENT,
Mississippi State Univ., State College. Water Resources Research Inst.
J. H. Peterson, and R. N. Friery.
Available from the National Technical Information Service as PB-211 152, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, 1972, 49 p, 19 tab, 7 ref, append. OWRR A-059-MISS (1).

Descriptors: *Planning, *Organizations, *Community development, Water resources development, *Mississippi, *Watershed management, *Communication.

The study involved a watershed project in Northeast Mississippi where community organizations were the primary means for dissemination of watershed information. Investigation focused on the impact of this means of dissemination. Thirty-nine major community organizations interested in water resource development were identified in two counties and their leaders interviewed to determine activities of the organizations related to water resources, degree of cooperation with other organizations, and knowledge and attitudes of leaders with respect to water resource development. Data were compared by type of organization (county seat, small town and rural) and by county. Findings included: a general absence of community organizations in rural areas; a low level of active cooperation by community organizations in water resource programs; a higher level of information programs, greater knowledge and more favorable attitudes associated with county seat than small town organizations, and small town than rural organizations; higher levels of knowledge than participation in information programs in county seat organizations, with the reverse true for small town and rural organizations, a lower level of information programs in the county more distant from the center of the project. Alternative means of dissemination especially aimed at rural landowners are needed.
W72-12108

SOCIAL PROCESSES IN WATER MANAGEMENT SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Sociology.
For primary bibliographic entry see Field 06A.
W72-12238

SOME PROBLEMS OF WATER RESOURCE MANAGEMENT IN VIRGINIA: A PRELIMINARY EXAMINATION,
College of William and Mary, Williamsburg, Va.
J. A. Miri.
William and Mary Law Review, Vol. 13, p. 388-423 (1971). 36 p, 2 tab, 112 ref.

Descriptors: *Virginia, *Water resources development, *Water policy, *Administrative agencies, Legislation, Legal review, Legal aspects, Social aspects, Political aspects, Political constraints, Institutional constraints, State jurisdiction, Regulation, Adoption of practices, Water management (Applied), Diversion, Alteration of flow, Impoundments, Reasonable use, Riparian rights, Decision making, Planning.

The existing legal and administrative machinery for water resource management in Virginia is examined. The general availability of water in the

state is misleading because it is no guarantee that individual areas have enough water. Another problem is the financial difficulty of resource development. Riparian law is examined and the author shows its problems in relation to resource development: uncertainty of riparian rights, inapplicability to inter-basin transfers, and unsuitability to ground-water resources. Two problems with existing statutory law are the fragmentation of policy and resource management responsibilities. These are analysed in detail. The author discusses the state's need for regulation of water diversions. The state water control board does not have the authority to regulate all diversions and impoundments, and there is no central state decision-making mechanism for assessing overall water resource needs. Planning and development needs are discussed including: the need for a more affirmative approach, the need for a more assertive state role, regional authorities and service districts, and state intervention where local government does not act. The author feels a comprehensive study of water resource management in Virginia is needed to eliminate gaps in planning. (Grant-Florida)
W72-12318

TOO MANY PEOPLE ON THE COLORADO RIVER,
Arizona Daily Star, Tucson.
For primary bibliographic entry see Field 05G.
W72-12349

AN INDEPENDENT STUDY COURSE IN WATER RESOURCES,
Southern Illinois Univ., Carbondale. Dept. of Conservation and Outdoor Education.
For primary bibliographic entry see Field 09A.
W72-12350

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FUTURE PLANNING OF WATER RESOURCES AT THE REGIONAL WATER DISTRICT LEVEL,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03D.
W72-11884

DUAL WATER SYSTEMS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 03D.
W72-11904

6D. Water Demand

MEETING FUTURE WATER REQUIREMENTS THROUGH REALLOCATION,
Colorado Univ., Boulder. Dept. of Civil Engineering.
J. E. Flack.
Journal of the American Water Works Association, Vol 59, No 11, p 1340-1350, November 1967. 2 tab, 16 ref.

Descriptors: *Future planning (Projected), *Methodology, *Water rights, *Water transfer, *Appropriation, *Water allocation (Policy), *Competing uses, *Elasticity of demand, Return flow, Condemnation, Institutional constraints.
Identifiers: Re-allocation, Reserved rights.

The scope of the U. S. water problem and how reallocation can solve shortage problems are discussed. Demand projections of various uses are analyzed and reallocation of presently used water to higher economic uses is shown to be economically competitive with developing new sources in areas of shortage. Valuation of water rights, engineering studies, reserved rights and institutional contraints on water transfers are important problems that are of concern in re-allocation. (Flack-AWWARF)
W72-11888

TOMORROW'S METHODS TO PROVIDE TOMORROW'S SERVICE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05G.
W72-11894

RECREATIONAL USE OF WATERSHEDS--JOINT DISCUSSION,
Washington Suburban Sanitary Commission, Hyattsville, Md.; Sport Fishing Inst., Washington, D. C.; Maryland State Dept. of Health, Baltimore; and Public Health Service, Washington, D.C.
A. P. Brigham, R. H. Stroud, I. D. McKewen, and F. B. Taylor.
Journal of the American Water Works Association, Vol 58, No 10, p 1260-1274, October 1966. 21 ref.

Descriptors: *Recreation demand, Boating, Sport fishing, *Recreation facilities, Swimming, Water policy, *Lakes, *Multiple-purpose reservoirs, Water quality control, *Water supply, *Water pollution.
Identifiers: Washington Suburban Sanitation Commission, Outdoor Recreation Resources Review Commission, San Diego, Fishing management, New York City, U.S.P.H.S. Drinking Water Standards.

A joint discussion is presented of the operator's concervationists, and state health, and federal officials view of recreation use of public water supply watersheds. Controlled recreation is stressed by the operator, fishing as a key to recreational use by the conservationist, public health as a requirement but concern for all human needs by the state health spokesman and concern with Drinking Water Standards by the U.S. Public Health Service. The American Water Works Association Statement of Policy on Recreational Use of Domestic Water Supply Reservoirs is recommended as a guide but each reservoir should be appraised on its own merits. Restricted recreation usage may generate a recreation clientele of its own. (Flack-AWWARF)
W72-11896

USE OF WATER IN ALABAMA, 1970, WITH PROJECTIONS TO 2020,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06B.
W72-11979

THE MACRO APPROACH--URBAN WATER DEMAND MODELS,
Oklahoma Univ., Norman. School of Civil and Environmental Science.
For primary bibliographic entry see Field 06A.
W72-12228

THE MICRO APPROACH--COMPUTERIZED MODELS FOR MUNICIPAL WATER REQUIREMENTS,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 06A.
W72-12229

CASE STUDY ON LINEAR PROGRAMMING FOR OPTIMIZATION OF PRODUCTION AND SUPPLY,
Denver Board of Water Commissioners, Colo.
For primary bibliographic entry see Field 06A.
W72-12232

6E. Water Law and Institutions

ADMINISTRATIVE AND LEGAL ASPECTS OF SALINE WATER USE AND MANAGEMENT,
Melbourne Univ., Parkville (Australia).
For primary bibliographic entry see Field 03C.
W72-11770

IMPLICATIONS OF THE PRESENT STATE OF SCIENTIFIC KNOWLEDGE FOR TECHNICAL MANAGEMENT,
Water Conservation and Irrigation Commission, Sydney (Australia).
For primary bibliographic entry see Field 03C.
W72-11771

PARTNERSHIP IN COMPREHENSIVE RIVER BASIN PLANNING,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-11886

MEETING FUTURE WATER REQUIREMENTS THROUGH REALLOCATION,
Colorado Univ., Boulder. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W72-11888

NORTHEAST WATER CRISIS AND ITS SOLUTION,
For primary bibliographic entry see Field 03D.
W72-11890

NEW LOOK AT RESOURCES POLICY,
Cornell Univ., Ithaca, N.Y. Coll. of Engineering.
For primary bibliographic entry see Field 06B.
W72-11900

DEVELOPMENT AND EFFECT OF THE DELAWARE RIVER BASIN COMPACT,
New York City Board of Water Supply.
V. G. Terenzio.
Journal of the American Water Works Association, Vol 54, No 12, p 1445-1456, December 1962. 8 ref.

Descriptors: *Delaware River, *Delaware River Basin Commission, *Interstate, *Water resources development, Water supply, Project planning, Judicial decisions, Interstate compacts, Interstate rivers, Interstate commissions, River basin commissions, Water law, New Jersey, Pennsylvania, Delaware, New York.
Identifiers: *Delaware River Basin Compact, Trenton, Philadelphia, New York City, Catskill Mountains, Supreme Court, Corps of Engineers, Council of State Governments, Comprehensive plan.

The Delaware River Basin has a population of 22 million in four states served by its water systems. New York City's dependence on the Basin has grown steadily and lacking permission of the bordering states to increase its dimensions it sought such rights through the U.S. Supreme Court. Under the impetus of Corps of Engineers studies of the Delaware Basin and the Council of State Governments, interstate cooperation was fostered and the Delaware River Basin Compact resulted. Congress approved the Compact with rather stringent federal controls. The compact commission is precluded from interfering with the rights granted New York City and New Jersey by the Supreme Court and is obligated to formulate and adopt a Comprehensive Plan for water management in the basin. (Flack-AWWARF)
W72-11915

A POSTSCRIPT TO CALVERT CLIFFS',
For primary bibliographic entry see Field 05G.

W72-11938

CONTROLLING GREAT LAKES POLLUTION: A STUDY IN UNITED STATES-CANADIAN ENVIRONMENTAL COOPERATION,
Wisconsin Univ., Madison. School of Law.
For primary bibliographic entry see Field 05G.
W72-11939

ENVIRONMENTAL QUALITY AND THE NEED FOR ELECTRIC POWER--LEGISLATIVE REFORMS TO IMPROVE THE BALANCING PROCESS,
Atomic Energy Commission, Washington, D.C.
J. T. Ramey, and M. G. Malsch.
Notre Dame Lawyer, Vol. 47, p. 1139-1162, 1972. 122 ref.

Descriptors: *Federal government, *Electric powerplants, *Envir1972ffects, *Legislation, *Electric power demand, Governments, Electric power production, Administration, Legal aspects, Comprehensive planning, Coordination, Regulation, Decision making, Public rights, Administrative decisions, Sites, Powerplants.

The current nature of those regulatory processes involved in the siting, construction, and operation of electric power plants is described. Emphasis is placed on the regulatory processes at the federal level, and some proposed institutional reforms intended to facilitate the balancing process between the need for electrical energy and the need for environmental protection. The Interagency Power Plant Siting Study Group, the Administration's proposed Power Plant Siting Act of 1971, proposed amendments to the Federal Water Pollution Control Act, and the other legislative proposals in this area are discussed. Problem areas relating to power plant siting legislation include the elimination of regulatory asymmetry between different types of plants, impact on existing plants, federal coordination, role of states in the regulatory process and federal pre-emption, and administrative procedures to be followed by regulatory agencies in decision making. The essential elements of the Administration's proposal--long range planning, early public notice and hearings, pre-construction review and approval after public hearings, and expanded research and development--combined with increased flexibility in decision-making procedures could provide a workable solution. (Widman-Florida)
W72-11940

INTERNATIONAL CONFERENCE ON OCEAN POLLUTION.
Hearings--Subcomm. on Oceans and Atmosphere--Comm. on Commerce, U.S. Senate, October 18 and November 8, 1971. 126 p, 14 fig, 8 tab.

Descriptors: *Water pollution sources, *Oceanography, *Environmental effects, *Oceans, Nutrients, Water quality, Fertilizer, Continental shelf, Continental slope, Exploration, Exploitation, Oil wastes, Oil-water interfaces, Drilling, Mining, Mining engineering, Technology, Aquatic habitats, Ecology, Fisheries, Fishkill, Waterfowl, International law, Wastes.

Testimony is presented before the Senate Subcommittee on Oceans and Atmosphere concerning the extent of ocean pollution. Captain Jacques Cousteau testified concerning the pollution he had observed in the world's oceans and the effect on ocean life. In particular his testimony describes the elimination of certain species of animals on the California coast, and the need to suffer certain loss of comforts in life in order to reduce pollution. Testimony of others concerns the growth in ocean exploration and exploitation technology such as deep sea drilling and mining and advanced shipping techniques. The ocean study programs of NASA and the U.S. Navy are described. Testimony is also presented by Thor Heyerdahl concerning the extent and degree of surface pollution he has observed on his ocean crossings. Dr. Barry Commoner testified concerning the interrelation between modern technological advances which make life more enjoyable and the pollution which results therefrom, such as increased need for fuels and resulting air pollution. Included is a paper on the origins of the environmental crisis covering agricultural production, textiles, detergents, secondary effects of technological displacements, and packaging. (Grant-Florida)
W72-11941

WATER POLLUTION--CONTROL OF NUTRIENTS--CLEANING AGENTS--WATER CONDITIONERS.
Minnesota Session Laws Ch. 896 (1971).

Descriptors: *Minnesota, *Detergents, *Water pollution control, *Legislation, Legal aspects, Administrative agencies, Adoption of practices, Phosphates, Nutrients, Penalties (Legal), Regulation, Public health, Water pollution abatement, Chemicals, Cleaning, Domestic wastes.

The Act is designed to encourage the Minnesota Pollution Control Agency to set standards limiting the amount of nutrients in various cleansing and water conditioning agents. The factors influencing the prohibitions are outlined. The Act prohibits the manufacture for sale or use in Minnesota or import into Minnesota for resale any cleansing agent or chemical water conditioner which contains a prescribed nutrient. The pollution control agency may make regulations to carryout the prohibition. The agency is given power to seize prohibited cleaning agents. A procedure for restoration of seized items is provided. The sale or possession with intent to sell a household detergent by a manufacturer or retailer without a verified test result having been filed is prohibited. Retailers are required to post lists of phosphate content of detergents and presoaks. Violation of the Act is a misdemeanor, punishable by a fine of not more than $5,000 for each offense. The court may also enjoin further violations of the Act. Procedural matters are provided for in the trial of actions. (Grant-Florida)
W72-11942

CONSERVATION OF FISHERIES RESOURCES.
N.C. Gen. Stat. secs. 113-229, 113-230 (Supp. 1971).

Descriptors: *North Carolina, *Permits, *Legislation, *Dredging, Excavation, Earthworks, Soil mechanics, Legal aspects, Administrative agencies, Adoption of practices, Estuaries, Fish conservation, Landfills, Aquatic animals, Wildlife habitats, Marshes, Land reclamation, Tidal marshes, Lakes, Navigable waters, Environmental effects, Riparian rights, Governmental interrelations, Law enforcement.

Before any excavation or filling project is begun in any estuarine waters, tidelands, marshlands, or state-owned lakes, the statute requires that the party desiring to undertake the project secure a permit from the North Carolina Department of Conservation and Development. A Corps of Engineers permit may also be required, but the Department of Conservation coordinates with the Corps. The permit application is circulated among appropriate agencies and it may be denied if: (1) the proposed action will adversely affect public water use, (2) there will be a significant adverse effect on riparian land, (3) there will be a significant adverse effect on public health and safety, (4) there will be a significant adverse effect on conservation of public water supplies, or (5) there will be a significant adverse effect on fish and wildlife. Review provisions are included where another agency objects to the action of the Department of Conservation. Enforcement by criminal and civil proceedings is provided. The act applies to all persons, corporations and their employees in the state. The act does not affect a riparian landowner's right of ingress and egress to navigable waters. (Grant-Florida)
W72-11943

HURRICANE FLOOD PROTECTION AND BEACH EROSION CONTROL PROJECT REVOLVING FUND.
N.C. Gen. Stat. sec 143-215.62 (Supp. 1971).

Descriptors: *North Carolina, *Legislation, *Hurricanes, *Flood protection, *Beach erosion, Financing, Project planning, Economics, Local governments, Governmental interrelations, Water resources development, Legal aspects, Administrative agencies, Administration, Erosion control.

A Hurricane Flood Protection and Beach Erosion Control Project Revolving Fund is established under the North Carolina Board of Water and Air Resources to finance the local portion of the cost of hurricane flood protection and beach erosion control projects. The Board shall make advances to cities and counties for advance planning and engineering work necessary to promote the development, construction, or preservation of hurricane flood protection and beach erosion control projects; construction of such projects and related costs such as right of way acquisition; and maintenance of the projects. Such advances are subject to repayment. Prior to making any advances to local governments the Board shall advise the government whether the projects would serve their intended purposes, whether there is a prospect of federal financing, and whether the anticipated financial outlays would constitute an unreasonable burden on the citizenry. No advance may be made without reasonable assurances that the project will be undertaken and the advances repaid. (Grant-Florida)
W72-11944

REGIONAL SEWAGE DISPOSAL PLANNING ACT.
N.C. Gen. Stat. secs. 162A-26 thru 162A-30 (Supp. 1971).

Descriptors: *North Carolina, *Sewage disposal, *Legislation, *Treatment, *Project planning, Economic feasibility, Economics, Sanitary engineering, Environmental sanitation, Sewage effluents, Financing, Project feasibility, Water pollution treatment, Local governments, Waste treatment, Waste disposal.

A Regional Sewage Disposal Planning Revolving Fund is established under the North Carolina Department of Administration for the purpose of advancing funds for planning and advance engineering work on collective regional sewage disposal projects between cities, counties, and sanitation districts. The applicant must repay the grant from the proceeds of bonds sold to finance construction of the project; however, repayment is not necessary where the project is not undertaken due to departmental direction for reasons of unfeasibility or inefficiency. Prior to approval the application must be referred to the Department of Water and Air Resources to ascertain whether the area is suitable for a regional project based on growth projections, the applicant proposes to undertake a long-term planning project to meet the needs of a high quality regional project, the applicant will coordinate the project with area wide land use planning, and the applicant will hire a licensed engineer to prepare a comprehensive regional disposal plan on a variety of technical matters. The Department must also insure that reasonable prospects of financing the project exist and that the applicant will undertake the project. (Grant-Florida)
W72-11945

WATER POLLUTION CONTROL--SEWER AND DISPOSAL PLANT PROJECTS.
Conn. Public Act No. 305 (1971).

Descriptors: *Connecticut, *Legislation, *Sewage disposal, *Law enforcement, Legal aspects, Permits, State jurisdiction, Discharge (Water), Effluents, Administrative agencies, Adoption of practices, Municipal wastes, Water pollution sources, Waste water treatment, Sewage effluents, Sewage treatment.
Identifiers: *Injunction (Prohibitory).

The Act requires that a municipality which has been ordered to construct a sewage treatment plant by the Connecticut Water Resources Commission establish a sewer authority and authorize the necessary funds to undertake the project. If any person or municipality violates these provisions the Commission is required to bring an action to enforce the statute by injunction. As to a municipal violator the Commission may alternatively advise the public works commissioner to take corrective measures, in which case the municipality's powers are suspended pending completion of the corrective measures. The municipality is also liable for certain state-incurred costs. If the municipality violates an injunction the comptroller may withhold state aid or grant payments to such municipality. A penalty of $1,000 per day for continuance of a knowing violation of this act may be assessed in an enforcement action brought by the Water Resources Commission. (Grant-Florida)
W72-11946

INTERNATIONAL ASPECTS OF THE 1972 ENVIRONMENTAL PROGRAM,
Executive Office of the President, Washington, D.C.
R. Nixon.
Dep't. of State Bull, Vol. 66, p. 301-303, 1972.

Descriptors: *Oceans, *International waters, *International commissions, *United Nations, Oil pollution, Oil spills, Law of the sea, Water pollution, Water pollution control, Waste disposal, International law, Ships, Water law, Pollution abatement, Water resources development, Federal government, Legal aspects, Legislation.

A United Nations Fund for the Environment should be established to stimulate international cooperation on environmental problems. This would help bring new resources to bear on the increasing problems of the environment through activities such as monitoring and cleanup of the oceans. Further congressional action is needed to ratify pending international conventions and to adopt implementing legislation for various oil-spill conventions. Preparations are under way for the 1973 intergovernmental Maritime Consultative Organization Conference to draft a convention barring intentional discharges to the sea of oil and hazardous substances from ships. In conjunction with the Law of the Sea Conference of 1973, measures are being examined to control the effects of developing undersea resources. Progress also has been made on an agreement to regulate ocean dumping of shore-generated wastes in the preparatory work for the 1972 United Nations Conference on the Human Environment. (Brackins-Florida)
W72-11947

DEPARTMENT URGES SENATE APPROVAL OF SEABED ARMS CONTROL TREATY,
Department of State, Washington, D.C.
J. N. Irwin, II.
Dep't. of State Bull, Vol. 66, p. 309-310, 1972.

Descriptors: *Treaties, *Beds under water, *Oceans, *International commissions, International waters, International law, Law of the sea, Water law, Legal aspects, Fedral government, Oceans, Coasts, Regulation, United Nations, Governments, Water resources.

The Seabed Arms Control Treaty, now before the Senate for its advice and consent, is designed to prohibit the spread of nuclear weapons and other weapons of mass destruction on the seabed, the ocean floor and the subsoil thereof. The Treaty was drafted at the Geneva Disarmament Talks and at the United Nations General Assembly. The Treaty will now come into force when the three depository governments--the United States, the United Kingdom and the Soviet Union--ratify it. A twelve-mile coastal seabed zone is excluded from coverage. Verification procedures, either by the party itself with the assistance of other parties or through the United Nations, is also provided. These provisions will assure parties that the Treaty is being observed without interfering with legitimate seabed activities. The Treaty, banning emplacement of weapons of mass destruction on nearly seventy per cent of the earth's surface, will help preserve the seabed environment for the benefit of mankind. It is therefore urged that the Senate give its advice and consent to ratification. (Brackins-Florida)
W72-11948

AN ACT RELATING TO WATER PURIFICATION AND WASTE WATER TREATMENT OPERATORS.
Fla. Laws Ch. 71-315 (1971).

Descriptors: *Florida, *Legislation, *Treatment facilities, *Waste water treatment, Water law, Legal aspects, Water purification, Regulation, Water quality, Administration, State governments, Permits, Water quality control, Waste water disposal, Waste water (Pollution), Water treatment, Sewage disposal, Sewage.
Identifiers: Licenses.

The Division of Health of the Department of Health and Rehabilitative Services is authorized to examine and certify all water purification and waste water treatment plant operators and to issue, deny, revoke and suspend annual operator certificates. A fee of ten dollars shall be charged for examination and certification and shall be deposited in the general revenue fund of the state. No person shall perform the duties of operator of a water or waste water treatment plant unless he holds a valid operator's certificate, except that this requirement shall not apply to public lodging establishments. The Secretary of the Department is given authority to promulgate rules, regulations and minimum standards to effectuate the provisions of the Act. (Brackins-Florida)
W72-11950

CONTIGUOUS ZONES FOR POLLUTION CONTROL,
N. A. Wulf.
Journal of Maritime Law and Commerce, Vol 3, p 537-557, 1972. 39 ref.

Descriptors: *International law, *Water pollution control, *Coasts, *International waters, Oil industry, Law of the sea, Water law, Jurisdiction, Legal aspects, Regulation, Standards, Abatement, Compensation, Access routes, Water management (Applied).
Identifiers: Contiguous zone.

The most authoritative evidence of existing international law on the contiguous zone is the Convention on the Territorial Sea and Contiguous Zone, which advances a 12-mile contiguous zone. Within this zone some pollution control over foreign vessels may be authorized, but the rights of the coastal states are not absolute. The exercise of pollution control is limited to that which is reasonable to protect coastal state interests. The manner in which interests of the coastal state can be affected by shipping activities on the high seas, primarily the transport of oil is examined. Possible claims which coastal states could assert to deter intentional discharges are discussed. Coastal states could assert claims to prevent threatened pollution or to abate further pollution from a maritime casualty by a right to intervention, requiring other ships to render assistance, and requiring vessels to carry on board remedial equipment. The coastal states can also assert claims to prevent the occurrences of maritime casualties by construction standards, manning and navigational requirements, and denial of access to areas deemed unsafe. And, finally, the coastal states can assert claims to obtain compensation for pollution damage. (Widman-Florida)
W72-11960

BETZ V. COTEAU (DEFENDANT'S LIABILITY FOR EROSION INTO NATURAL DEPRESSION FROM CONSTRUCTION ACTIVITY).

261 So. 2d 373-375 (La. Ct. App. 1972).

Descriptors: *Louisiana, *Drainage, *Surface runoff, *Surface drainage, *Damages, Drainage patterns, Floods, Drainage effects, Legal aspects, Judicial decisions, Water law, Negligence, Adjacent land owners, Erosion, Land use, Drainage water, Diversion.

Plaintiff lower landowner brought suit against defendant adjoining landowner for an injunction and damages for flooding of plaintiff's land. During construction by defendant, a retaining wall was built and dirt was filled behind it over the height of the wall. The dirt eroded onto plaintiff's land causing damage. Plaintiff's land was lower than any of the surrounding land; as such his land had always occupied a natural pocket subject to flooding. Plaintiff contended that defendant was negligent in the construction activity and was liable for damages. Defendant denied negligence. The Louisiana Court of Appeals for the First Circuit held that the evidence of the case failed to demonstrate any appreciable damage which would warrant a valid complaint. There was no question but that defendant altered the physical characteristics of the land and did accelerate the runoff of rain water; however, it was because of the natural depression of plaintiff's lot that most of his difficulties arose. The Court held that any damages the plaintiff suffered from defendant's construction fell in the category of damnum absque injuria, that is the loss was not sufficient to warrant legal redress. The lower court holding was affirmed. (Brackins-Florida)
W72-11961

KALLEVIG V. HOLMGREN (SEPTIC TANK EFFLUENT HELD NOT COMMON ENEMY).
197 N.W. 2d 714-720 (Minn. 1972).

Descriptors: *Minnesota, *Surface waters, *Adjacent landowners, *Reasonable use, *Adjudication procedure, Legal review, Alteration of flow, Legal aspects, Effluents, Competing uses, Diversion, Obstruction to flow, Relative rights, Septic tanks, Waste disposal, Water law, Common law, Judicial decisions.
Identifiers: *Common enemy rule.

Plaintiff, the owner of land subject to easement for drainage of water from adjoining land, brought suit for damages against defendant owners of adjoining land for unreasonable diversion of surface waters and overflow from a septic tank. The trial court rendered judgment for defendants and plaintiff appeared. The Supreme Court of Minnesota held that septic tank effluent was not a common enemy which could be discharged upon a neighbor's land within the reasonable use rule, but that erroneous instructions at trial, including that overflow of septic tank effluent was within the reasonable use rule, was not prejudicial, where evidence fell short of raising a jury issue as to whether waste was in fact part of runoff from defendant's land. The judgment of the lower court was therefore affirmed. (Widman-Florida)
W72-11962

DEPARTMENT DISCUSSES PROGRESS TOWARD 1973 CONFERENCE ON THE LAW OF THE SEA,
J. R. Stevenson.
Dep't of State Bull Vol 66, p 672-679, 1972.

Descriptors: *Law of the sea, *Oceans, *Beds under water, *International commissions, International waters, International law, Governments, Jurisdiction, Commercial fishing, Anadromous fish, Water resources, Water resources development, Water pollution, Water pollution control, United Nations, Regulation, Foreign waters, Water law, Legal aspects, Navigation, Coasts.
Identifiers: *Contiguous zone.

In preparation for the 1973 Law of the Sea Conference there have been three meetings of the United Nations Seabed Committee and its ninety-one members. The meetings indicate agreement on the following elements: a twelve-mile territorial sea, with freedom of navigation and overflight beyond that limit; coastal state economic controls over fisheries and seabed resources beyond that limit; and an international regime for the seabed beyond the area of coastal state economic jurisdiction. The key unsettled issues are: how far beyond the twelve-mile limit should coastal state economic jurisdiction extend and should it be exclusive or subject to international standards; free transit through and over international straits; the nature of the international regime in the area beyond coastal state economic jurisdiction; and the nature of the legal regime for the control of marine pollution beyond twelve miles. The United States' policy is not opposed to delegating extensive controls over resources to coastal states or broad areas beyond the territorial sea; however, these controls must be based on an express delegation of authority from the international community and must take into account community interests. Specific positions of the United States on fisheries, seabed resources, scientific research and pollution are noted. (Brackins-Florida)
W72-11963

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT,
J. Trudeau, and R. Nixon.
Dep't. of State Bull, Vol 66, p 652-657, 1972.

Descriptors: *Great Lakes Region, *Water quality control, *Water pollution control, *Pollution abatement, United States, Canada, International Joint Commission, Lake Erie, Municipal wastes, Industrial wastes, Eutrophication, Phosphates, Nutrients, Spoil banks, Oil pollution, Thermal pollution, St. Lawrence River, Water pollution, Water quality, International waters, Water quality standards, Waste disposal, Waste treatment, Sewage effluents.

The United States and Canada have signed a Great Lakes Water Quality Agreement. Both general and specific water quality objectives are set forth in the Agreement. Some of the Water Quality Standards are stricter than existing state water quality standards. In many cases standards provide specific maximum amounts for particular substances. Additional funds will be appropriated by the United States government for the International Joint Commission and for municipal waste treatment programs. All commitments under this agreement are contingent upon new or continued congressional action. The agreement specifically deals with industrial and municipal wastes, eutrophication, Lake Erie, phosphates, agricultural pollution, pollution from vessels, sewage systems which combine sanitary and storm sewers, disposal of dredge spoils, oil and hazardous substances, thermal pollution and the International Joint Commission. The United States' costs of implementing control measures under the agreement will be approximately $2.7 to $3 billion for the next five years. Opening remarks of Prime Minister Trudeau and President Nixon are included. (Brackins-Florida)
W72-11964

SUNAPEE DAM CORP. V. ALEXANDER (LIABILITY FOR MAINTENANCE ASSESSMENTS).
181 A. 120-125 (N.H. 1935).

Descriptors: *New Hampshire, *Dams, *Lakes, *Maintenance costs, Rivers, Water rights, Streamflow, Operation and Maintenance, Legislation, Mills, Dam construction, Outlets, Assessments, Maintenance, Power head, Costs, Judicial decisions, Legal review.

Plaintiff dam corporation brought suit to determine validity of its assessment against defendants for maintenance costs of its dam. Defendants contested this action on the grounds that: (1) the vote levying assessment was invalid in that certain water power owners were not included or subject to the assessment when the vote was taken, and (2) that even if the vote were valid, it would not be applicable to them in that they were not members of the dam corporation. The Supreme court of New Hampshire found the defendants to be assessible in that the vote as taken was a valid act of the corporation in accordance with its charter. Furthermore, defendants were considered members of the corporation in that they were owners of water power in the river served by the dam. Since the vote was valid and defendants were members of the corporation, plaintiff's assessment for maintenance must be upheld. (Barnett-Florida)
W72-11965

BOROUGH OF WILKINSBURG V. SCHOOL DISTRICT (LIABILITY OF SCHOOL DISTRICT FOR ENCLOSURE OF STREAM).
298 Pa. 193 A. 77-81 (1929)

Descriptors: *Pennsylvania, *Sewers, *Ditches, *Surface drainage, Judicial decisions, Legal aspects, Water law, Local governments, Assessments, Costs, Conduits, Drainage, Open channels, Drainage systems, Sewage disposal, Closed conduits, Channels, Legal review.

Defendant school district owned a twelve acre tract with a school on it and an open stream passing through it. Plaintiff borough decided to cover this natural water course and empty all the surface water from the region into another outlet. Plaintiff brought this claim to assess defendant for benefits accruing from work done. THE Supreme Court of Pennsylvania held that, pursuant to state statute, a school district can be assessed only for those benefits arising from the building of a sewer or sewer connection. The court noted that the construction costs did not arise from the building of a sewer since the term 'sewer' means a large and generally underground passage or conduit for fluid or feculent matter, from a house or houses to some other locality, usually the place of discharge. In the present proceeding, the borough only directed the closing of the water course and its connection with an outlet for storm water, thus defendant could not be assessed for construction costs. (Johnson-Florida)
W72-11966

WOODRING V. CITY OF EASTON (LIABILITY FOR WATER DAMAGE FROM NEGLIGENCE DURING CONSTRUCTION OF ELECTRICAL CONDUITS).
164 A. 921-925 (Super. Ct. Pa. 1933).

Descriptors: *Pennsylvania, *Electrical networks, *Closed conduits, *Water injury, Judicial decisions, Legal aspects, Water law, Road construction, Excavation, Surface drainage, Drainage systems, Manholes, Floods, Surface runoff, Runoff, Storms, Rain water, Flood damage, Damages, Paving.

The street on which plaintiff's store was located was in the process of being improved by laying thereon a concrete surface. Defendant power company preceded the laying of the surface by constructing an underground conduit system to carry their electrical wires. Part of the system was a duct connecting a manhole with plaintiff's establishment. Defendant power company left the conduit going to plaintiff's basement uncapped at both ends, as they planned to install the wiring after completion of the street surface. The manhole cover was not in place when a heavy rainstorm occurred. Water flowed into the manhole and through the conduit into plaintiff's store. Plaintiff alleged the joint negligence of the power company and defendant paving contractor, who allegedly removed the cover. The jury found defendants jointly negligent in their actions and the Superior Court of Pennsylvania affirmed. (Johnson-Florida)
W72-11967

DIKLICH V. CITY OF JOHNSTOWN (MUNICIPAL LIABILITY FOR INADEQUATE SEWERS).
180 A. 41-44 (Super. Ct. Pa. 1935).

Descriptors: *Pennsylvania, *Drainage systems, *Storm runoff, *Water injury, Judicial decisions, Legal aspects, Water law, Sewers, Sewage disposal, Cities, Local governments, Surface runoff, Flooding, Rainfall, Water control, Flood control, Overflow, Drains, Culverts.

Plaintiff's property was flooded several times during heavy storms because the sewers were inadequate to handle the excess water. The property was located on the north side of the street and a railroad embankment ran along the other side of the street. The street had been filled several times so that the grade was raised approximately one foot in front of plaintiff's property. The topography of the area resulted in large quantities of storm water draining to a point in the street near the property of plaintiff. Plaintiff brought suit against defendant city for damages sustained by these floods. Plaintiff's allegations included negligence in maintaining catch-basins for the water and allowing private sewage to drain onto plaintiff's property. The Superior Court of Pennsylvania reversed the trial court's judgment for plaintiff. The court held that defendant was not legally required to provide a sewer for every property owner and that there was no evidence of negligence by defendant in filling the street. The court noted that there is no liability on the part of a municipal corporation for the flooding of private property from the mere inadequacies of gutters, drains, culverts, or sewers. (Johnson-Florida)
W72-11968

VAN RUYMBEKE V. PATAPSCO INDUSTRIAL PARK (CLAIMS RELATIVE TO ACCRETION).
276 A. 2d 61-74 (Ct. App. Md. 1971).

Descriptors: *Maryland, *Accretion (Legal aspects), *Ownership of beds, *Riparian land, Boundary disputes, Adjacent land owners, Equitable apportionment, Judicial decisions, Patent, Legislation, Navigable waters, Remedies, Riparian rights, Common law, Equity.

Plaintiff riparian landowners brought suit to eject defendant riparian landowners and holders of patent to submerged lands from land which allegedly accreted to plaintiffs' property. At trial the jury determined that the disputed land accreted to both plaintiffs' and defendants' property and judgement was entered in favor of plaintiffs for portions of the land which had accreted within the cove adjacent to plaintiffs' land. On appeal plaintiffs contended that the trial judge had erred in permitting the jury to determine whether any of the disputed land had accreted to defendants' property because defendants' patent was an infringement upon their riparian land and thus title to none of the accreted land could pass to defendants. The Court of Appeals of Maryland affirmed and held that where patent to submerged land was issued prior to enactment of statutes prohibiting underwater patents the trial judge did not err in per-

mitting the jury to determine whether any of the disputed land had accreted to patented land. The court further held that the proper measure of damages, when plaintiffs had made no claim for waste, was the rental value of the property. (Blank-Florida)
W72-11969

WRIGHT V. CITY OF ROCK ISLAND (MUNICIPAL LIABILITY FOR DRAINAGE OF SURFACE WATERS).
273 N.E.2d 83-86 (111 Ct. App. 1971).

Descriptors: *Rainfall disposition, *Natural flow doctrine, *Drainage systems, *Diversion, *Flood routing, Flood control, Flood flow, Sewers, Rainfall, Rainfall intensity, Legal aspects, Judicial decisions, drainage effects, Drainage engineering, Dams, Ravines, Storms, Storm drains, Storm water, Watercourses (Legal aspects).

Plaintiff property owners sued defendant city to recover for water damage to their residence, allegedly the result of defendant's diversion of surface waters from their natural course and failure to provide adequate drainage. The damage was caused as a result of rainfall coming over dams built to slow the descent of surface water through ravines. Drains had been constructed at each dam to drain water held by the dams. The drains had been found covered with debris after the rainfall. Plaintiffs contended that the drains were inadequate to handle even one year storms. Defendant maintained that the system was designed to collect the water before it reached plaintiffs' property and that the extraordinary rainfall in this instance was unforeseeable. The trial court granted defendant's motion for a directed verdict and the Appellate Court of Illinois affirmed. The court noted that the plaintiffs failed to prove that defendant diverted surface water onto plaintiffs' premises. It held further that, where a municipality provides ample sewers and drains to carry off all water likely to accumulate under ordinary conditions, the fact that sewers and drains prove inadequate to carry off all water from an extraordinary rain storm does not subject a municipality to liability for damages. (Ilkson-Florida)
W72-11970

STATE CONSTITUTIONS AND THE ENVIRONMENT,
Virginia Univ., Charlottesville. School of Law.
A. E. D. Howard.
Virginia Law Review, Vol 58, p 193-229, Feb. 1972. 158 ref.

Descriptors: *Virginia, *Legislation, *Constitutional law, *Legal review, *Judicial decisions, *Adoption of practices, Public rights, Water law, Legal aspects, Federal government, State governments, Decision making, Water management (Applied), Public benefits, Planning, Environment.
Identifiers: *Public trust, Standing.

Environmentalists and conservationists now seek to gain constitutional recognition of a right to a decent environment. Various proposals have been made to amend the Federal Constitution to guarantee this right, while some observers look to the courts to develop such a right from the existing Constitution. There has been action on another constitutional front--that of state constitutions. From the broad range of environmental provisions proposed or included in state constitutions, the following characteristic provisions are noted: statements of public policy; directives to legislatures to enact environmental legislation; directives to legislatures to acquire natural resources; authority to legislatures to act; restraints on disposition of public trust; disposition of environmental rights in individuals or in the people; provisions for citizens' suits; and tax advantages to encourage conservation. The Virginia Constitution is examined in terms of execution, mandate to agencies and officers, judicial reveiw, public trust and restraints on governmental action, and standing. Virginia's new constitution is an example of the trend toward placing environmental quality alongside the precepts of the original framers. Those who pursue legal solutions to environmental problems might make better and fuller use of their state constitutions. (Widman-Florida)
W72-11971

PUBLIC REGULATION OF WATER QUALITY IN VIRGINIA,
For primary bibliographic entry see Field 05G.
W72-11972

INDIVIDUAL LEGAL REMEDIES AGAINST POLLUTION IN ILLINOIS,
Illinois Inst. of Tech., Chicago. Kent Coll. of Law.
M. L. Leahy.
Loyola University Law Journal, Vol 3, No 1, p 1-18, 1972. 43 ref.

Descriptors: *Illinois, *Legal review, *Water pollution, *Air pollution, Legislation, Legal aspects, Constitutional law, Judicial decisions, Law enforcement, Water quality, Adoption of practices, Administrative agencies, State governments, Administration, Jurisdiction, Public health.
Identifiers: *Illinois Environmental Protection Agency.

The 1970 Illinois Constitution creates the right to a healthful environment and the standing for an individual to enforce that right. The political and social developments which led to the incorporation of this provision into the 1970 constitution are discussed. Of particular concern is the scope of the term 'healthful' as opposed to similar adjectives which could have been used. Also discussed is the extent to which state enabling legislation and home rule units will affect the right. The right is enforcable against private persons and government, but there is a question whether an individual can sue to force government to perform its duty under anti-pollution laws. The Illinois Environmental Protection Act is also discussed. This act permits a person to bring a complaint before the Pollution Control Board. Administrative organization under the Act is discussed, and case experience is analyzed. The scope of the constitutional and statutory rights are compared. The constitutional right is far broader since it is not limited to pollution; however, the constitutional right is limited to injury to health. The res jud cata problem between the statute and the constitution is also discussed. (Grant-Florida)
W72-11973

ADMINISTRATIVE, JUDICIAL AND NATURAL SYSTEMS: AGENCY RESPONSE TO THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
R. A. Liroff.
Loyola University Law Review, Vol 3, p 19-48, 1972. 125 ref.

Descriptors: *Administrative decisions, *Administrative agencies, *Decision making, *Legislation, Water law, Legal aspects, Regulation, Adoption of practices, Legal review, Judicial decisions, Political constraints, Comprehensive planning, Planning, Political aspects, Projects, Project planning, Environmental effects, Water resources development.
Identifiers: *National Environmental Policy Act.

The National Environmental Policy Act is an effort to overcome the ecological shortcomings of incremental agency decision making by requiring exposure of proposed projects to environmental considerations. No longer is it legitimate for agency statements to be merely rationalizations for actions; the decision making process will have to be raised to the point where ecological impacts are routinely considered and actually weighed. The Council on Environmental Quality was established by executive order in accordance with Title II of NEPA. The Council is given the responsibility of assessing environmental trends, developing national policies, and acting as advisor to the President. Unfortunately the Council was given a very small budget and only eighteen professional staffers. The Council has issued guidelines for agency compliance with NEPA. The diversity of NEPA cases indicates the large number of agency decision making systems to which the Act can be held applicable; yet it still is too soon to render a verdict on NEPA's administrative and judicial implementation. While two cases demonstrate the courts can vigorously enforce the Act, a brief overview of other NEPA cases suggests that judicial relief will not be unhesitatingly granted. (Brackins-Florida)
W72-11974

A PRELIMINARY SURVEY OF PUBLIC-RELATED AGENCIES IN HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
E. T. Morahan, and H. Yamauchi.
Available from the National Technical Information Service as PB-211 154, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. 55, May 1972, 93 p, 5 tab, 32 ref, 3 append, index. OWRR A-019-HI (1).

Descriptors: *Institutions, *Organizations, *Administrative agencies, Administration, *Governments, Management, Planning, Water policy, Economics, *Hawaii, *Water resources development, Institutional constraints.

The public water-related agencies of Hawaii may be regarded as only a portion of a complex institutional superstructure that functions in the water economy of the state. Conceptually, this institutional superstructure is just as much a part of the total water resources system in Hawaii as the physical sub-system itself. From a social viewpoint, the physical sub-system exists for the ultimate benefit of mankind who has, through experience in conflicts, systematically developed the necessary institutions to facilitate orderly development and use of water resources. In this sense, both the physical and institutional sub-systems make up the total integrated water resources system of the state.
W72-12100

AN APPRAISAL OF PLANS TO MEET THE FRESH WATER REQUIREMENTS OF THE MISSISSIPPI GULF COAST AREA,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W72-12103

COMMUNITY ORGANIZATION PROGRAMS AND RELATIONSHIPS IN WATERSHED DEVELOPMENT,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W72-12108

LEGAL ASPECTS OF WATER POLLUTION IN DELAWARE, MARYLAND AND VIRGINIA, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05G.
W72-12297

NEW ENGLAND RIVER BASINS COMMISSION ANNUAL REPORT FOR FISCAL YEAR 1971,
E. R. Stoler.

(1971). 52 p, 1 map, 7 illus, 10 photo.

Descriptors: *Administrative decisions, *New England, *Water control, *Environmental control, *Comprehensive planning, *Adoption of practices, Administrative agencies, Administration, Planning, Project planning, Coordination, Decision making, Management, Water management (Applied), Water allocation (Policy), Water policy, Institutions.
Identifiers: *New England River Basins Commission.

The New England River Basins Commission is a federal-state agency whose responsibilities extend to water and related land resources. The Commission accepts the interrelationship of water and land as a basic concept. How it is attempting to implement this concept is illustrated, problems, accomplishments, and ongoing programs are discussed, and the relationships of federal and state land use planning programs as they affect the region are assessed. Activities discussed include evaluation of a proposed nuclear generating facility at Seabrook, flood hazard area management, Boston Harbor coordination, investigation of the Connecticut River Basin, recommended priorities for 1972-1976, drainage research, coastal zone management and planning, and endorsement of the Allagesh Wilderness Waterway. Future projects include a Southeastern New England study, Long Island Sound study, further research on the Connecticut River Basin, investigation of problems in areas of power and the environment, and an integrated attack on the Nashua River aimed at ultimate total restoration. Recent land use policy developments in the area and pending federal legislation with its implications for the New England region are described. Appendixed are lists of Commission membership, staff, publications, and a financial summary. (Widman-Florida)
W72-12298

POLLUTION OF THE SEAS BY CRUDE OIL--A PROPOSAL FOR EFFECTIVE REMEDIAL ACTION,
For primary bibliographic entry see Field 05G.
W72-12300

THE REFUSE ACT OF 1899: KEY TO CLEAN WATER,
R. Sandler.
American Bar Association. Journal, Vol 58, p 468-471, 1972. 3 ref.

Descriptors: *Rivers and Harbors Act, *Law enforcement, *Pollution abatement, *Legislation, Legal aspects, Watercourses (Legal aspects), Judicial decisions, Water quality standards, Water pollution, Water pollution control, Federal government, Administration, Regulation, Administrative agencies, Penalties (Legal), Permits, Wastes, Waste disposal, Industrial wastes, Navigable waters, Chemical wastes.
Identifiers: *Refuse Act.

The Refuse Act has emerged as the primary pollution abatement statute on the federal level. Recent judicial decisions have held that the government can sue to enjoin violations of the Act. Since it is a criminal statute violations may be investigated by a Grand Jury. Most defendants are corporations and do not enjoy a Fifth Amendment privilege. Thus the Grand Jury can subpeona the corporation's officials and question them under oath as to what chemicals and refuse the plant discharges. This has proved to be a significant investigative-enforcement tool. Although the Act provides for a maximum fine of only$2,500, courts have allowed prosecution of multiple counts, recognizing each day as a separate violation. The Act sets no standards, thus courts have adopted the most practical standard possible--maximum feasible abatement under present technology. There can be no more explicit mandate than is found in the Refuse Act, nor is there a more workable scheme of enforcement than is now evolving under the present statute. (Brackins-Florida)
W72-12301

ENVIRONMENTAL LAW--THE REFUSE ACT,
For primary bibliographic entry see Field 05G.
W72-12302

EXPANSION OF THE ALASKA WATER LABORATORY,
Congress, Washington, D.C.; and House, Washington, D.C.
N. Begich.
Congressional Record, Vol. 118, No. 76, E 4891-E 4892 (daily ed.) May 10, 1972. 2 p.

Descriptors: *Legislation, *Alaska, *Laboratories, *Cold regions, Research and development, Federal government, Research facilities, Project feasibility, Project benefits, Water resources development, Environmental control, Environment, Economic justification, Governmental interrelations, Expansion, Research priorities, Projects, On-site investigations.

The Hon. Nick Begich of Alaska comments on the Alaska Water Laboratory, which is a research effort of the Federal Environmental Protection Agency for the study of cold region environmental management. This research program is essential for the responsible development of Alaska, and the state seeks expansion of the project. Included is a joint resolution of the Alaska State Legislature relating to increased cold stress research at the Alaska Water Laboratory. In supporting this expansion the resolution stresses the following considerations: the laboratory is the only one of its kind; the cold climate influences on the environment, and the mostly undefined methods of managing resources in cold climates; the significant influence of cold stress on the factors and systems necessary to the maintenance of a quality environment throughout a major part of North America; and the concern and effort of both the citizenry of Alaska and the Nation in instituting and maintaining measures essential to sound management and environmental protection. (Widman-Florida)
W72-12303

THE LAW OF DRAINAGE,
North Dakota Univ., Grand Forks. School of Law.
For primary bibliographic entry see Field 04A.
W72-12304

UNITED STATES V. BOYD (RIPARIAN OWNER BECOMES OWNER OF ACCRETIONS TO ITS LOTS WHICH EXTEND LAKEWARD).

458 F. 2d 1252-1255 (6th Cir. 1972).

Descriptors: *United States, *Accretion (Legal aspects), *Boundaries (Property), *Riparian rights, Legal aspects, Water law, Judicial decisions, Boundary disputes, Adjacent land owners, Lake Michigan, Water rights, Riparian land, Water level fluctuations, Lake shores, Land farming.

Plaintiff United States brought suit to quiet title to and obtain possession of about thirty acres of land abutting Lake Michigan. Title was claimed by an individual whose title originated in a government patent issued in 1849. In the years between the patent issuance and the date of the deed of the individual claiming title, there was an accretion of land lakeward, the thirty acres now contested. The individual contestants were granted only the accretion. The government contended that the grantors had no title to the accreted lands to convey to the individual contestants. The United States Sixth Circuit Court of Appeals held that a riparian owner becomes the owner to all accretion to its lands. The Court held that the government owned the land to which the accretion occurred and that to vest title to the thirty acres in the individuals would destroy the Government's right of access to the lake as a riparian owner. Therefore the Court reversed the District Court and remanded the case for further proceedings consistent with this opinion. (Brackins-Florida)
W72-12305

JACKLOVICH V. INTERLAKE, INC. (QUI TAM ACTION MAY NOT BE MAINTAINED UNDER RIVERS AND HARBORS ACT).
458 F.2d 923-927 (10th Cir. 1972).

Descriptors: *United States, *Rivers and Harbors Act, *Watercourses (Legal aspects), *Pollution abatement, Legislation, Legal aspects, Judicial decisions, Water pollution, Water pollution control, Industrial wastes, Penalties (Legal), Waste disposal, Water pollution sources, Law enforcement, Wastes, Federal government.
Identifiers: *Refuse Act of 1899, *Qui tam actions.

Plaintiff private citizen sued under the Refuse Act of the Rivers and Harbors Act of 1899 in a qui tam action to impose a fine upon defendant steel mill. The United States Attorney had decided not to prosecute defendant. Plaintiff alleged that defendant was discharging refuse matter from its steel mill into the Little Calumet River. Plaintiff further asserted that his qui tam action was justified by prior case law. Defendant moved that the complaint be dismissed for failure to state a cause of action. The United States Court of Appeals for the Seventh Circuit held that only the United States government may bring and prosecute an action to impose a penalty under the provision of the Rivers and Harbors Act providing for imposition of criminal fines for violations and which does not expressly authorize qui tam actions. The court held that since plaintiff's right to recover half the fine depended upon a conviction in proceedings brought by the government, plaintiff was remediless here; the United States Attorney could not be compelled to initiate a criminal action against defendant. Therefore the District Court decision was affirmed. (Brackins-Florida)
W72-12306

MCMILLEN DEVELOPMENT CORP. V. BULL (ALTERATION OF DRAINAGE FLOW BY UPPER LAND OWNER ONTO LOWER LAND).

188 S.E.2d 491-493 (Ga. 1972).

Descriptors: *Georgia, *Drainage patterns, *Drainage systems, *Subsurface drainage, Legal aspects, Judicial decisions, Watercourses (Legal aspects), Water law, Drainage, Drainage effects, Adjacent landowners, Flow, Flow alteration, Subsurface flow, Streamflow, Surface water.
Identifiers: *Nuisance (Legal aspects).

Plaintiff lower landowner used defendant upper landowner for damages and an injunction to prohibit defendant from allowing debris to accumulate and remain in a stream flowing through plaintiff's property, and from continuing to clog and stop the natural flow of water through the underground drainage system in the stream running through such property. Defendant denied these allegations. The Georgia Supreme Court held that one land proprietor has no right to concentrate and collect surface waters and thus cause them to be discharged upon the land of a lower proprietor in greater quantities, or in a manner differently from that in which the water would be received by the lower estate if it simply ran down upon it by the law of gravitation. Here the evidence amply showed that the acts of the defendant constituted a nuisance which would continue during every period of heavy rainfall in recurrence of the injury. Therefore the Supreme Court affirmed the grant

of the interlocutory injunction by the lower court. (Brackins-Florida)
W72-12307

POOLE V. GUSTE (LIABILITY FOR ALTERING DRAINAGE PATTERNS).

262 So.2d 339-348 (La. 1972).

Descriptors: *Louisiana, *Easements, *Drainage water, *Prescriptive rights, Drainage, Drainage effects, Water law, Legal aspects, Judicial decisions, Surface drainage, Runoff, Adjacent land owners, Canals, Watercourses (Legal aspects), Drainage area, Drainage practices, Legal review.
Identifiers: Injunctions (Prohibitory).

Plaintiff landowner sued for damages and injunctive relief against defendant adjacent landowner who built levees obstructing drainage flow from plaintiff's land onto defendant's land. In 1916 the predecessors in title of the parties agreed to the construction of a drainage canal running from plaintiff's to defendant's land. Prior to construction of the canal the natural drainage of surface waters was from plaintiff's land onto defendant's. Plaintiff contended that its estate enjoyed a drainage servitude through the canal on defendant's property. Defendant contended plaintiff had an adequate remedy of law, thus an injunction was improper; that he would be denied due process if property rights of the plaintiff's estate are recognized; and that plaintiff should furnish his own drainage. The Louisiana Supreme Court held the evidence supported the lower court's finding that plaintiff's estate enjoyed a servitude of drain, in part natural and in part prescriptive, onto defendant's adjoining land. The court ruled that defendant was not entitled to erect obstacles to drainage of waters from the dominant estate even in order to protect the servient estate from tidal flow. (Brackins-Florida)
W72-12308

AN ACT....RELATING TO WATER POLLUTION CONTROL, WATER SUPPLY AND SEWER SEPARATION PLANNING ASSISTANCE AND GRANTS.

Vt. Pub. Acts No. 97 (1971).

Descriptors: *Vermont, *Legislation, *Water pollution control, *Grants, *Sewage districts, Water supply, State governments, Municipal wastes, Administrative agencies, Regulation, Construction, Priorities, Technology, Contracts, Administrative decisions, Sewage disposal, Sewage treatment.

The act first enumerates the procedure required to form a consolidated sewer district and provides that such a body shall be eligible to receive state aid. The act provides for aid to municipalities for water supply, pollution abatement, sewer separation, and engineer planning. Requirements for payment and repayment, priorities and limitations, appeal of decisions, and administrative regulations are set forth. Construction grants in aid for specified water supply, pollution abatement, and sewer separation projects are provided. The act makes provisions for the method of obtaining grants, priorities to be followed, appeal, and administrative regulations. The act provides for technical and other services to municipalities and details the method of application, form of contracts to be used, eligibility, and limitation. (Widman-Florida)
W72-12309

ENVIRONMENTAL PROTECTION ACT OF 1971.
Conn. Public Act No. 96 (1971).

Descriptors: *Connecticut, *Legislation, *Environmental effects, *Public rights, *Legal aspects, Legal review, Administrative decisions, Adoption of practices, Equity, Administrative agencies, State governments, Planning, Regulation, Ecology, Jurisdiction.
Identifiers: Public trust doctrine.

After a brief policy statement the Act authorizes citizen suits for such declaratory and equitable relief necessary to protect the public trust in the air, water, and other natural resources of the state from unreasonable pollution, impairment or destruction. After the plaintiff has made a prima facie showing of conduct likely to adversely affect the environment the defendant may prove, by way of an affirmative defense, that considering all relevant circumstances there is no reasonable alternative and that such conduct is in fact reasonable. The court may grant temporary and permanent relief, or may impose such conditions on the defendant as are required to protect the public trust. The court may remand the parties to such proceedings as are necessary to determine the legality of the defendant's conduct. Where judicial review is available as to any other proceeding the court originally taking jurisdiction shall maintain jurisdiction for purposes of judicial review. The Act authorizes intervention by third parties. No conduct having an adverse environmental effect shall be approved if there is a feasible alternative. The Act shall be supplementary to existing administrative and regulatory procedures provided by law and in any action maintained under this Act the court may remand the parties to such procedures. (Widman-Florida)
W72-12310

WATERS--PERMITS FOR NEW DISCHARGES.

Conn. Public Act No. 163 (1971).

Descriptors: *Connecticut, *Legislation, *Permits, *Discharge (Water), Administrative decisions, Legal review, Legal aspects, Administrative agencies, State governments, Water pollution, Water management (Applied), Standards, Management, Water pollution control, Effluents, Water law.

This act provides that if, upon receipt of an application for a permit for new discharges into state waters the commission finds that such discharge would not cause pollution, it shall issue a permit. If the commission finds that such discharge would cause pollution, it shall require the applicant to submit plans and specifications of a proposed system to treat such discharges. If the commission finds that the proposed system will protect state waters from pollution, it shall notify the applicant of its approval, and when such system is installed in full compliance with the approval the commission shall issue the permit. No permit shall be allowed for any discharge which would be below the highest standard set by the act. If the commission finds that the proposed system does not protect state waters it shall promptly notify the applicant of the denial and reasons therefore. Such applicant shall have a right to a hearing and an appeal therefrom. (Widman-Florida)
W72-12311

WATER POLLUTION CONTROL-TREATED SUBSTANCES-DISCHARGE.
Conn. Public Act No. 191 (1971).

Descriptors: *Connecticut, *Legislation, *Water pollution control, *Discharge (Water), State governments, Legal aspects, Rivers, Law enforcement, Penalties (Legal), Sewage effluents, Administrative agencies, Adoption of practices, Tertiary treatment.

This act regulates the discharge of treated substances into certain streams or rivers. The act provides that no person shall discharge into class A waters of the state sewage or any other effluent which is less than tertiary treated. No person shall discharge into the Salmon river or any of its tributaries any sewage or any other effluent which is less than tertiary treated. Any person violating these sections shall be subject to the penalties of section 25-31 of the general statutes. For purposes of the act, 'person' means any individual, partnership, association, firm, corporation or municipality, and includes any officer or governing or managing body of any partnership, association, firm, corporation or municipality. (Widman-Florida)
W72-12312

WATER POLLUTION CONTROL--PERMITS FOR NEW DISCHARGES--HEARING.
Conn. Public Act No. 346 (1971).

Descriptors: *Connecticut, *Effluents, *Discharge (Water), *Legislation, *Permits, Administrative agencies, Adoption of practices, Waste water disposal, Waste water treatment, Treatment facilities, Legal aspects, Water resources development, Water pollution, State jurisdiction, Environmental effects, Law enforcement.

The Act requires that the Connecticut Water Resources Commission hold a hearing on all applications for a discharge permit between 30 and 60 days after receipt thereof. After the hearing the Commission must issue the permit if it finds that the discharge would not cause pollution of any state waters. If it finds that pollution would result it shall require the applicant to submit plans and specifications of its effluent treatment system. If the Commission finds that the proposed treatment system will protect the state waters it shall issue a permit upon installation of the treatment system. If the Commission determines that the proposed treatment system will not be satisfactory it must notify the applicant and the applicant shall have the right to a hearing. Any person or municipality aggrieved by an abatement order of the Commission may, after a hearing, appeal the final determination of the Commission. The court shall determine if the Commission acted arbitrarily, unreasonably, or contrary to law. Provisions are made for an expeditious certification of proper questions of law to the State Supreme Court for review. (Grant-Florida)
W72-12313

CONSTITUTIONAL LAW--FEDERAL PREEMPTION OF STATE REGULATORY AUTHORITY--FEDERAL GOVERNMENT HAS SOLE AUTHORITY UNDER ATOMIC ENERGY ACT TO REGULATE RADIOACTIVE WASTES DISCHARGED FROM NUCLEAR POWER PLANTS--NORTHERN STATES POWER CO. V. MINNESOTA,
For primary bibliographic entry see Field 05G.
W72-12314

JUDICIAL RECOGNITION OF THE SUBSTANTIVE REQUIREMENTS OF THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
For primary bibliographic entry see Field 05G.
W72-12316

A STRUCTURAL MODEL FOR A WORLD ENVIRONMENTAL ORGANIZATION: THE ILO EXPERIENCE,
For primary bibliographic entry see Field 06G.
W72-12317

SOME PROBLEMS OF WATER RESOURCE MANAGEMENT IN VIRGINIA: A PRELIMINARY EXAMINATION,
College of William and Mary, Williamsburg, Va.
For primary bibliographic entry see Field 06B.
W72-12318

THE POLLUTION FIGHT BEFORE THE U.S. COURTS,
Michigan Univ., Ann Arbor. School of Law.
J. L. Sax.
UNESCO Courier, Vol 24, p 20-23, July 1971. 2 photo.

Descriptors: *Legal review, *Public rights, *Judicial decisions, *Administrative decisions, Adoption of practices, Administrative agencies, Decision making, Planning, Political aspects, Court decisions, Control, Governmental interrelations, Coordination, Governments, Legal aspects, Project planning.

Significant developments are occurring in the area of environmental litigation. Private citizens are bringing numerous lawsuits as members of the public against the very governmental agencies which are themselves supposed to be protecting the public interest. Such lawsuits are indications of a citizens' revolt against official protection of the public interest. The recent oil leakage at Santa Barbara, California, is used as an example. Regulatory agencies have an interest and perspective of their own which is frequently at odds with that of significant segments of the public whose interest the agency is supposed to be protecting. Thus citizens have been turning increasingly to the courts because the judiciary offers an opportunity to bring a fresh and uncommited perspective, an outsider's perspective, to environmental problems. The goal of such litigation is to move questionable environmental decision making into a forum where issues of policy must be made and articulated openly, and where legislators must assess the political consequences of one position over another. A great deal of rethinking about laissez-faire attitudes and assumptions about the process of government is needed. (Widman-Florida)
W72-12320

WATER POLLUTION,
American Univ., Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-12321

THE FEDERAL GOVERNMENT AND THE ENVIRONMENT,
Senate, Washington, D.C.
G. S. McGovern.
Current History, Vol 59, p 82-83, 110, August 1970.

Descriptors: *Penalties (Legal), *Environmental control, *Federal government, *Legislation, *Legal aspects, Administrative decisions, Federal budget, Legal aspects, Pollutants, Social aspects, Decision making, Adoption of practices, Governments, Regulation, Planning, Public rights, Legal review.

Pollution of our environment is already so extensive that the federal government must play a major role in confronting this national problem. Congress has created a legislative framework for improving our environment. Among the most important laws adopted in recent years are the Water Resources Act of 1964, the Water Resources Planning Act of 1965, the Highway Beautification Act of 1965, the Clean Air Act of 1965, the Air Quality Act of 1967, the Clean Water Restoration Act of 1966, the Solid Waste Act of 1965, and the National Environmental Policy Act of 1969. New life must be breathed into the law by the appropriation of adequate funds. In addition, this positive program must be accompanied by stiffer penalties against industrial and municipal discharge into lakes and rivers. The author and Senator Philip Hart (D. Mich.) have proposed the Environmental Protection Act of 1970. The act would authorize any person to bring suit in federal court against any person or organization which is causing pollution. The court would be empowered to order action to be taken that would end the offending pollution once the plaintiff proved his case. This act would strengthen the right of individuals to use the federal government's judicial system to protect their own environment. (Widman-Florida)
W72-12322

FROM POLLUTION ABATEMENT TO QUALITY CONTROL,
Senate, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-12323

UNITED STATES AND U.S.S.R. TABLE REVISED DRAFT TREATY BANNING EMPLACEMENT OF NUCLEAR WEAPONS ON THE SEABED,
J. F. Leonard.
Department of State Bulletin, Vol 62, p 663-667, 1970. append.

Descriptors: *Treaties, *International waters, Water resources, Beds, Beds under water, International law, Foreign waters, Water policy, Water law, Oceans, Law of the sea, International compacts, Regulation, Governments, United Nations, United States.
Identifiers: USSR.

The United States and the Soviet Union have been developing a treaty banning emplacement of nuclear weapons and other weapons of mass destrution on the seabed, the ocean floor, and the subsoil thereof. The United Nations Conference of the Committee on Disarmament has promulgated a second revised draft treaty which represents a compromise agreement among the participants. The treaty exempts from prohibition a twelve-mile seabed zone, the territorial waters of a coastal state. A number of minor changes were made in the international procedures for checking violations of the treaty; the treaty provides for observation and consultation to resolve disputes arising under the treaty, or a state party may refer the matter to the security council. A review conference after five years is also provided for in order to review the operation of the treaty. Provisions are also included for withdrawal from the treaty by a state party if the supreme interests of the nation are jeopardized. The treaty shall enter into force after approval by the General Assembly and the signing by twenty-two governments. (Brakins-Florida)
W72-12324

FARMINGTON RIVER POWER CO. V. FEDERAL POWER COMMISSION (AUTHORITY OF FEDERAL POWER COMMISSION TO REQUIRE LICENSING OF DAM IN NON-NAVIGABLE WATERS).

455 F.2d 86-91 (2nd Cir. 1972).

Descriptors: *United States, *Hydroelectric project licensing, *Dams, Non-navigable waters, Hydroelectric plants, Legal aspects, Judicial decisions, watercourses (Legal aspects), Legislation, Regulation, Administrative agencies, Legal review, Water law, Rivers and Harbors Act, Federal government, Dam construction.
Identifiers: *Federal Water Power Act, *Federal Power Comm., Licenses, Interstate commerce.

Plaintiff power company sought review of an order of defendant Federal Power Commission requiring plaintiff to obtain a license to maintain its dam across a nonnavigable stream. The dam was built in 1925. The Commission contended that the Federal Water Power Act of 1920 required plaintiff to obtain a license, and alternatively, that a 1935 Amendment to the Act, requiring the filing of a declaration of intent prior to constructing a project in nonnavigable waters, should be given retroactive effect against plaintiff. Then if the Commission should determine that the project would affect interstate commerce, it could require licensing. The Second Circuit Court of Appeals held that the 1920 Act does not require the licensing of a project in nonnavigable waters, even if it might affect interstate commerce, and that the 1935 Amendment was not intended to have retroactive effect. Thus the court held that the Commission was without authority to require the plaintiff to obtain a license to maintain its dam and vacated the order of the Commission. (Brackins-Florida)
W72-12325

GULF OIL CORP. V. TUG GULF EXPLORER (DUTY OF SUBMARINE PIPELINE OWNER TO AVOID RUPTURES).

337 F. Supp. 709-717 (E.D. La. 1971).

Descriptors: *United States, *Negligence, *Pipelines, *Oil spills, Legal aspects, Judicial decisions, Permits, Water law, Law of the Sea, Navigable waters, Navigation, Water pollution sources, Oil industry, Oceans, Oil pollution, Accidents, Ships.

Plaintiff owners of an oil pipeline and a derrick barge sued defendant tug owner for damages occasioned by the pipeline's rupture. Defendant's tug was towing a barge engaged by plaintiff pipeline owner to work in the construction of a platform near a submarine pipeline. Due to bad winds and seas the barge drifted and its anchor became entangled with the pipeline. Consequently the pipeline broke, causing an oil spill. Plaintiffs contended that the damage was a result of the tug's negligence. The United States District Court for the Eastern District of Louisiana held that an owner of a submarine pipeline has a continuing duty to maintain the pipeline at least three feet below the water bottom in accordance with a permit issued to it by statutory authority. The evidence established that the plaintiff was negligent in failing to warn navigators of the current location of the pipeline and in not maintaining the pipeline below the water bottom. Judgment was entered in favor of defendants. (Brackins-Florida)
W72-12326

UNITED STATES V. 1,629.6 ACRES OF LAND, MORE OR LESS, IN THE COUNTY OF SUSSEX, STATE OF DELAWARE (A RIPARIAN LANDOWNER CANNOT BE MADE NON-RIPARIAN BY ACCRETION).
335 F.Supp. 255-277 (D. Del. 1971).

Descriptors: *United States, *Riparian rights, *Boundaries (Property), *Accretion (Legal aspects), *Delaware, Riparian land, Erosion, Boundary disputes, Avulsion, Water rights, Legal aspects, Water law, Judicial decisions, Ownership of beds, Beds under water, Adjacent landowners, Eminent domain, Condemnation, Compensation, Navigable waters, Channels, Prescriptive rights, Artificial watercourses, Low-water mark.

Plaintiff United States commenced a condemnation suit during which the District Court in Delaware had to determine ownership of disputed land between the two defendants, adjacent property owners, for purposes of establishing just compensation. A main issue involved the ownership of land formed by accretion. The eastern property owner claimed title to the land asserting that it initially attached to his land. The western property owner refuted this and contended that the requirement that an alluvium be contiguous is not absolute and may be avoided when a court must do so to maintain an individual's riparian boundary. The Court held that a riparian landowner cannot be made non-riparian by accretion; regardless of the manner in which alluvium accretes or to whom it initially attaches, the riparian owner in front of whose land it forms gets title to it. Thus, the Court allocated the alluvium to the western property

owner in order to preserve his riparian rights, and ordered a special commission to calculate the appropriate compensation in accord with the holding. (Brackins-Florida)
W72-12327

ORAL PROCEEDINGS--APPROACHES TO OIL POLLUTION RESPONSIBILITY (PACEM IN MARIBUS CONVOCATION AT VALLETTA, MALTA--1971).
For primary bibliographic entry see Field 05G.
W72-12328

KALMAN V. HUTCHESON (FLOWAGE RIGHTS).
276 A.2d 260-264 (N.H. 1971).

Descriptors: *New Hampshire, *Easements, *Alteration of flow, *Mill dams, *Riparian rights, *Riparian land, Legal aspects, Judicial decisions, Ownership of beds, Artificial use, Competing uses, Obstruction to flow, Recreation, Riparian waters, Water management (Applied), High water mark, Boundary disputes, Ponds.
Identifiers: *Flowage rights.

Plaintiff riparian landowner brought action to require removal of obstructions to flow of a brook. Defendant riparian land owners and successors to dam sites and flowage rights filed an answer requesting that plaintiff remove a fence on defendants' land. Plaintiff claimed that right to flow the pond area was acquired by defendants' predecessors in title for the purpose of operating a mill and that their flowage rights could not be maintained for any other purpose. Additionally plaintiff claimed that whatever flowage rights the defendants had were lost by abandonment. The master found for the defendants and the Supreme Court of New Hampshire affirmed. The court held that the evidence showed a long history of the water being maintained at an even higher level than at trial, that defendants had made prompt repairs to the dam, and that defendants had at times used the pond for recreational purposes; therefore, plaintiff's claim of abandonment was denied. The court also ruled that although defendants' predecessors in title had acquired flow rights for the purpose of mill operations, it is well settled that an easement may be maintained for a purpose not contemplated when it was created. (Blank-Florida)
W72-12329

GENERAL STATEMENT OF PRINCIPLES TO BE INCLUDED IN STATE WATER RIGHTS LAWS.
American Society of Civil Engineers, New York. Committee on Water Laws.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR2, p 317-322, June 1972.

Descriptors: *Water rights, *Appropriation, *Adjudication procedure, State jurisdiction, Groundwater, Water quality, Controlled drainage, Prior appropriation.

This is a consensus report that has been in preparation since March, 1965. Its primary purpose is to allow and encourage others to enter in formalized Discussion. After the Discussion is closed the Committee will consider all suggestions before preparing a final statement. Items covered include policy objectives, vested rights, fundamental principles of priority, water filings, appropriation limited to specific quantity, completion of work, proof of beneficial use, adjudication, forfeiture, change in point of diversion, eminent domain, groundwater, water quality, drainage requirements, safety of structures, administration and interstate water resources. The principle of priority should be followed in all circumstances, limitations should be placed on the use of water in exercising basic rights and time limits should be set for beneficial use. Other main points made are that groundwater appropriation should follow the same general principles as surface water, states should set quality standards and interstate water resources should be governed by interstate compacts. (Casey-Arizona)
W72-12361

6G. Ecologic Impact of Water Development

WATER: LIVING MILIEU,
State Coll. of Agronomical Science, Gembloux (Belgium).
For primary bibliographic entry see Field 05G.
W72-11804

MONITORING FOR EFFECTIVE ENVIRONMENTAL MANAGEMENT,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 05A.
W72-11921

ENVIRONMENTAL QUALITY AND THE NEED FOR ELECTRIC POWER--LEGISLATIVE REFORMS TO IMPROVE THE BALANCING PROCESS,
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-11940

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-11949

MAINTENANCE OF THE FLUSHING BAY AND CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-11951

T OR C--WILLIAMSBURG ARROYOS WATERSHED, NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.
For primary bibliographic entry see Field 08A.
W72-11952

SMALL BOAT HARBOR ON THE SOUTH SHORE OF LAKE ONTARIO AT OAK ORCHARD HARBOR, NEW YORK (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 08A.
W72-11954

MYERS CHUCK HARBOR, MYERS CHUCK, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08A.
W72-11955

ALTERNATE DISPOSAL AREA FOR GRAND HAVEN HARBOR, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 05G.
W72-11956

PROPOSED SEWAGE TREATMENT FACILITIES, SOLDOTNA, ALASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 05D.
W72-11957

UNION CREEK WATERSHED PROJECT, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-11958

MILL CREEK LAKE, MILL CREEK, SCIOTO RIVER BASIN, DELAWARE AND UNION COUNTIES, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W.Va.
For primary bibliographic entry see Field 08A.
W72-11959

PHYSICAL ENVIRONMENT OF THE NATIONAL REACTOR TESTING STATION, IDAHO--A SUMMARY,
Geological Survey, Washington, D.C.
R. L. Nace, M. Deutsch, and P. T. Voegeli.
Available from GPO, Washington, DC 20402, Price $1.00. Geological Survey Professional Paper 725-A. 38 p, 8 fig, 1 plate, 10 tab, 22 ref, append.

Descriptors: *Data collections, *Hydrologic data, *Idaho, *Climatic data, *Environment, Ecology, Water resources, Surface waters, Groundwater, Hydrogeology, Climatology, Meteorology.
Identifiers: *National Reactor Testing Station (Idaho).

The U. S. Geological Survey undertook a study in 1948 of the geologic and hydrologic features of potential sites for construction and operation of a National Reactor Testing Station (NRTS). Areal geologic mapping and detailed stratigraphic studies of lithologic units were carried on with special attention to hydrology. These studies were aided by an exploratory drilling program which resulted in completion of 42 test hoses by 1956. Other field investigations consisted of geophysical exploration, gamma-ray logging, and experimental terrestrial electropotential surveying. Laboratory determinations included chemical and radiometric analyses of groundwater and mineralogic, hydrologic, hydrologic, hydraulic, and geochemical characteristics of rock materials. The plain consists largely of comparatively young volcanic rocks interbedded with lacustrine, eolian, and alluvial sediments. The NRTS has no well-defined integrated surface-water drainage system and it is not crossed by perennial streams. Landforms of the plain consist of volcanic features, alluvial features, lake floors and playas, and eolian features. The climate of the Snake River Plain in the vicinity of the NRTS is semiarid. Water for use on the NRTS ordinarily is obtained from wells. Water uses include reactor cooling and moderating, cooling and shielding for temporary storage of spent nuclear-fuel elements, washing and decontaminating, chemical processing, landscape maintenance, culinary and sanitary use, and fire protection. As of 1968, annual pumpage was about 2 billion gallons, of which about 50% was consumptively used. (Knapp-USGS)
W72-12026

NATURAL AREAS,
W. H. Moir.
Science, Vol 177, No 4047, p 396-400, August 4, 1972. 32 ref.

Descriptors: *Natural resources, *Land use, *Forest management, *Governmental interrelations, Planning, Legislation, Monitoring, Conservation, Ecosystems, Watershed management, Pollution abatement.

Identifiers: *Natural areas, Land and Water Conservation Fund Act, Landscape change.

Natural areas are defined as they are envisioned by many scientists; some of the forces that have advanced or opposed natural areas as a basis for policies of land use are examined; and uses that can be made of the unique kind of scientific information they contain are discussed. Natural areas play a crucial role in the rapidly changing landscape for, while harboring valuable species, they also serve as bench marks in evaluating landscape change. Characteristics of natural areas are described and various policy statements and definitions are given. The role of the Forest Service in developing a program of management of forested lands from the time there was no official policy (1922) until the 1960's when a marked upsurge of interest came about, which produced a long list of conservation legislation including the Wilderness Act of 1964 and the Land and Water Conservation Fund Act of 1964, is presented. Natural areas are seen as environmental monitoring systems for measuring various ecosystems. (Lang-USGS)
W72-12039

ECOCIDE AND THOUGHTS TOWARD SURVIVAL.

James E. Freel and Associates: Palo Alto, Calif., 1971. 202 p.
Identifiers: Advances, Books, Ecocide, *Ecology, Smog, Survival, *Technology.

This book is one of a new series from the Center for the Study of Democratic Institutions at Santa Barbara, California prepared especially for use as a college reader. It deals with the ecological problems created by modern technological advances and the resultant depletion of natural resources. The contents are divided into 2 parts, the environmental crisis and thoughts toward survival. The following papers are included: Ecocatastrophe, by H. Wheeler; An inventory of disaster, by P. R. Ehrlich and J. P. Holdren; The ecologist's role and the non-solution of technology, by W. Murdoch and J. Connell, Federal policy and the ecological crisis, by W. O. Douglas; and Beware the technological experts, by J. W. Gofman and A. R. Tamplin. The following contributions were presented in part 2, thoughts toward survival: Planning - so there will be a future, by K. E. F. Watt; the elimination of smog, by E. Contini; environment and the law, by W. M. Kitzmiller; cooperations, government and the environment, and the environmental bandwagon, by A. King. No lists of references or indices are provided.—Copyright 1972, Biological Abstracts, Inc.
W72-12261

A STRUCTURAL MODEL FOR A WORLD ENVIRONMENTAL ORGANIZATION: THE ILO EXPERIENCE,
L. D. Levien.
The George Washington Law Review, Vol. 40, p. 464-495, 1972. 102 ref.

Descriptors: *International law, *Administrative agencies, *Adoption of practices, *Pollution, Legal aspects, Political aspects, Technology, Political constraints, Institutional constraints, Decision making, Standards, Oceans.

A need exists for a world environmental organization to monitor and regulate pollution. How a prototype world environmental organization (WEO) could be patterned after the International Labor Organization (ILO) is illustrated. ILO history is discussed. Similarities between ILO and WEO include a central information source and similar goals of raising member nation standards. There are also several differences between the two: ILO has a human rights aspect not applicable to WEO, WEO must function in non-sovereign areas, and the two would have different methods of enforcing standards and different concepts of liability. Structurally ILO is a tripartite body in the sense that government, employers, and labor from each member nation are represented. This framework could be readily adapted to establish a WEO. Standard setting is another facet of ILO which is readily adaptable. ILO furnishes technical assistance to underdeveloped member nations. Although there are many differences in the type of assistance offered, WEO would also have to furnish such aid to be viable. (Grant-Florida)
W72-12317

THE FEDERAL GOVERNMENT AND THE ENVIRONMENT,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-12322

CHIEF JOSEPH DAM (ADDITIONAL UNITS), COLUMBIA RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08C.
W72-12330

TULATIN PROJECT, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-12331

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-12332

BIRON PROJECT NO. 2192 ON THE WISCONSIN RIVER IN WOOD AND PORTAGE COUNTIES, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Consolidated Water Power Co., Wisconsin Rapids.
For primary bibliographic entry see Field 08C.
W72-12333

CAMERON-CREOLE WATERSHED, LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-12334

LONG BRANCH LAKE, EAST FORK, LITTLE CHARITON RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-12335

EAST GREENACRES UNIT, PRAIRIE DIVISION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho.
For primary bibliographic entry see Field 08A.
W72-12336

LOANS TO BE MADE BY THE FARMERS HOME ADMINISTRATION TO RURAL WATER SYSTEM NO. 1, HOSPERS, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Farmers Home Administration, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12337

DISPOSAL OF PANTEX SEWAGE EFFLUENT HOLDING RESERVOIR PORTION OF AEC PANTEX ORDNANCE PLANT IN AMARILLO, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
General Services Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-12338

CLAYTON LAKE, JACKFORK CREEK, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W72-12339

MUDDY CREEK RESERVOIR, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08D.
W72-12340

BEAVER DRAINAGE DISTRICT, OREGON--PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08C.
W72-12341

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-12342

TOO MANY PEOPLE ON THE COLORADO RIVER,
Arizona Daily Star, Tucson.
For primary bibliographic entry see Field 05G.
W72-12349

07. RESOURCES DATA

7A. Network Design

NATIONAL WATER DATA PROGRAM,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
O. M. Hackett.
Journal of the American Water Works Association, Vol 58, No 7, p 786-792, July 1966. 8 ref.

Descriptors: *Data processing, *Hydrologic data, *Information retrieval, *Networks, *Data collections, *Planning, Water resources development, Variability, Water Resources Research Act, Water Resources Planning Act, Water Quality Act, Hydrology.
Identifiers: Federal Water Project Recreation Act, *Data inventory, *Data network, *Data needs, *Data system, Information levels, Sampling theory, River basin planning.

The purpose of the national water data network is to meet the needs of federal agencies and others for information on the location, quantity, quality, availability, time variation and use of water resources. Three principal steps are involved: (1) the inventory of existing data and data activities, (2) establishment of data needs, and (3) design of a system to fill these needs efficiently. (Flack-AWWARF)
W72-11892

INHERENT ERRORS IN PERPENDICULAR ALLOCATION OF OVERLAPPING CHROMATOGRAPHIC PEAKS,
Osaka Univ. (Japan). Dept. of Applied Chemistry.
For primary bibliographic entry see Field 02K.
W72-12168

A MONTE CARLO STUDY OF SOME SMALL SAMPLE PROPERTIES OF TESTS FOR SPECIFICATION ERROR,
Michigan State Univ., East Lansing. Dept. of Economics.
For primary bibliographic entry see Field 07C.
W72-12183

VERIFICATION ERROR IN SINGLE SAMPLING INSPECTION PLANS FOR PROCESSING SURVEY DATA,
Bureau of the Census, Suitland, Md. Statistical Research Div.
For primary bibliographic entry see Field 07C.
W72-12184

THE ABSOLUTE SAMPLE SIZE IS WHAT COUNTS,
General Electric Corporate Research and Development, Schenectady, N.Y.
G. J. Hahn.
Quality Progress, Vol 5, No 5, p 18-19, May 1972.

Descriptors: *Statistical methods, Mathematical studies, *Quality control, Equations, Sampling, Size, Reliability, Population, Variability.
Identifiers: *Random sampling, Precision, Confidence interval.

In random sampling it is more significant to rely upon both the sample result and a confidence interval rather than using the sample result as an absolute value. This is true because sampling variation or defects may cause the results to differ from true values. From the statistical equation, the square root of the quantity 1 minus the sample size divided by the population size, it can be seen that precision increases roughly with the square root of the sample size. If the sample is selected randomly from the population, the size of the population is not important unless the sample is an appreciable proportion of it (greater than 10 percent). Therefore it is the absolute size of the sample and not its size relative to that of the population that counts. For example, in a population of 1000 (N sub 1) 10 percent of the sample would contain 100 observations (n sub 1) while in a population of 100,000 (N sub 2) a one percent sample represents 1,000 observations (n sub 2). A shorter confidence level and, therefore, a more precise estimate of the population proportion is obtained from N sub 2. (Mackan-Battelle)
W72-12185

CAMP STREAM IHD EXPERIMENTAL BASIN NO. 12,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 02E.
W72-12374

7B. Data Acquisition

APPLICATION OF WATER TEMPERATURES TO THE PROBLEM OF LATERAL MIXING IN THE GREAT BEAR MACKENZIE RIVER SYSTEM,
British Columbia Univ., Vancouver. Dept of Geography.
For primary bibliographic entry see Field 02E.
W72-11746

A CAPACITOR-TYPE RAIN GAUGE WITH DC OUTPUT AND IMPROVED FLOW CHARACTERISTICS,
Bell Telephone Labs., Inc., Holmdel, N.J. Crawford Hill Lab.
For primary bibliographic entry see Field 02B.
W72-11748

REGRESSION UPDATING,
Bell Telephone Labs., Inc., Murray Hill, N.J.
J. M. Chambers.
Journal of the American Statistical Association, Vol. 66, No. 336, p 744-748, December 1971. 2 tab, 12 ref.

Descriptors: *Statistical models, *Regression analysis, Mathematical studies, Equations, Model studies, Quality control, Mathematical models, Methodology.
Identifiers: *Updating, Accuracy.

Numerically acceptable procedures are provided for adding and deleting rows from a regression model. Whereas the addition of a row is numerically stable, deletions are inherently unstable. The methods and relative accuracies of both procedures are discussed and an example with listings included. (Mackan-Battelle)
W72-11799

ADSORPTION-FREE MEASUREMENTS ON STREAMING RADIOACTIVE SOLUTIONS,
Chalmers Univ. of Technology, Goteborg (Sweden). Div. of Nuclear Chemistry.
For primary bibliographic entry see Field 05A.
W72-11803

AN IMPROVED OPTIMUM CONTROL ALGORITHM FOR A CLASS OF WATER POLLUTION PROBLEMS,
Newark Coll. of Engineering, N.J.
For primary bibliographic entry see Field 05G.
W72-11807

A SIMPLE ASSEMBLY FOR FREEZE-DRYING OF TISSUE SAMPLES,
Michigan Univ., Ann Arbor. Upjohn Research Center for Clinical Pharmacology.
F. Medzihradsky.
Laboratory Practice, Vol 21, No 2, p 115, February 1972. 1 fig, 1 ref.

Descriptors: *Freeze drying, *Laboratory equipment, Equipment, Design, Construction, Bioassay, Freezing, Drying, Instrumentation.
Identifiers: *Sample preparation, *Biological samples, Tissue.

An arrangement that can be used in preparing low temperature freeze-dried samples can be easily assembled from equipment often present in biochemical labs. The requirements are: a low temperature chest, vacuum pump, manifold type freeze-drying pot, vapor trap, and vacuum gauge. Inside the chest, the freeze-drying pot is placed on an elevated stand for convenient attachment to a teflon pipe leading to the outside where a metal 'T'-piece provides a side arm of the vacuum line leading to the McLeod gauge. All connections are made using thick wall tygon tubing. The vapor trap and vacuum gauge are placed on a cart with the vacuum pump on the lower shelf. The chest temperature is set to minus 40 degrees C and the temperature gradient is established by placing crushed dry ice into the freeze-drying pot. The vapor trap is filled with dry ice or a dry ice-acetone mixture. The assembly has proved to be efficient, reliable, and convenient. A schematic diagram of this assembly is presented. (Mackan-Battelle)
W72-11835

MINI COMPUTER SYSTEM FOR SHIPBOARD SAMPLING,
Oregon State Univ., Corvallis. Dept. of Oceanography.
H. Curl, Jr., and P. Becker.
Oceanology International, Vol 7, No 1, p 34-36, January 1972.

Descriptors: *Computers, *Sampling, *Ships, *Data collections, *Data storage and retrieval, Instrumentation, Data processing, Electronic equipment, Research equipment, Salinity, Temperature, Reliability, Monitoring, Primary productivity, Biological properties, On-site investigations, Automation.

A compact, reliable, and self-contained on-line data computer system for shipboard sampling consists of a PDP 8/L CPU with a random access disc file. The major source of data for the system comes from a Bissett-Berman Model 9040 Salinity/Temperature/Depth system, modified to provide a fourth channel of data from an optional external sensor on the 200-lb 'fish'. The 'fish' also is calibrated to only 200 m, the area of biological interest. Since chemical parameters are measured in some types of biological work, a Technicon Auto-Analyzer is to be interfaced directly to the CPU. Water for the analyzer comes from the fish location via a submerged pump and hose. All subsurface data are conveyed by a hose/cable which provides power to the fish and the pump, and transmits water and S/T/D FM analog signals to the deck. The hose/cable is handled by a power-block/storage drum system. This system is patterned after tuna seine net handling gear with control of the cable centered in a remotely located power block. This system is electric/hydraulic powered to provide maximum speed control with optimal power availability; modification for on-line CPU control at a later time also is simplified. A strap-in seat for hands-free operation is included as well as a voice data logging channel for comments and notes. Primary inputs to the CPU are via one or two 16-channel A/D multiplexers and an ASR 33 teletype/paper-tape punch/reader. With a channel-to-channel sampling time of 30 microseconds maximum, virtually simultaneous monitoring of all data channels is possible. Long-tenure benefits are reflected in prediction and estimation of biological productivity which aid in long-term studies of the relationships between fish catch and primary productivity. (Snyder-Battelle)
W72-11841

A BASKET FOR WASHING BENTHOLOGICAL SAMPLES,
Fish and Wildlife Service Ashland, Wis.
J. H. Selgeby.
Transactions of the American Fisheries Society, Vol 100, No 3, p 590-591, July 1971. 2 fig.

Descriptors: *Bioindicators, Apparatus, *Benthic fauna, Methodology, Pollutant identification, Filters, Oligochaetes, Diptera, Bottom sampling.
Identifiers: *Washing basket, *Benthological samples.

An apparatus is described for washing benthological samples without damaging delicate organisms and with a significant reduction in time required. (Katz-Washington)
W72-11859

USE OF A MAGNETIC TAPE CASSETTE RECORDER WITH AN ON-LINE GC DATA SYSTEM,
Eastman Kodak Co., Rochester, N. Y. Industrial Lab.
J. T. Frazer, and B. T. Guran.
Journal of Chromatographic Science, Vol. 9, no. 12, p 718-721, December 1971. 8 fig, 1 ref.

Descriptors: *Data storage and retrieval, Instrumentation, Computers, *Gas chromatography, Data transmission, Laboratory equipment.

Identifiers: *Tape recorders, Cassette tape recorders.

By interfacing a cassette tape recorder with an on-line gas chromatography data system, an economical extension of the system's capability has been provided. The hardware interface allows the cassette to function under control of the priority interrupt system in the computer. The software written allows storage of GC report data on cassette, and retrieval of that data for further processing by background programs. Use of the cassette to obtain summary reports of GC data, and as a means for storage and retrieval of system programs is described. (Mackan-Battelle)
W72-11930

A NEW COMPUTING INTEGRATOR FOR CHROMATOGRAPHY,
Vidar Corp., Mountain View, Calif.
J. D. Hettinger, J. R. Hubbard, J. M. Gill, and L. A. Miller.
Journal of Chromatographic Science, Vol. 9, No. 12, p 710-717, December 1971. 16 fig, 4 ref.

Descriptors: *Chromatography, *Automation, *Data processing, Analytical techniques, Computers, Digital computers, Instrumentation, Data storage and retrieval, Equipment, Laboratory equipment.
Identifiers: Computing integrator, Sensitivity.

The concept of a new Computing Integator for Chromatography is described. The computing integrator is a firmware driven digital system incorporating the latest innovations in solid-state memories and computer architecture. Up to four chromatographs can be automated simultaneously. The analog signals from each chromatograph are digitized in channel modules so that transmission to and multiplexing within the processor are both digital. Operating parameters are also input in digital form. The random-access and read-only-memories in the processor and the digital data make possible nonhorizontal baseline corrections, tangential peak splitting, maintenance of optimum peak and baseline detection sensitivity and noise rejection, and post run calculations. Compared with digital integrators the computing integrator has better peak detection and noise rejection because run parameters are always at the optimum value, and memory allows data scooping. Memory also allows versatile baseline correction techniques. There is also capability for result calculation and method storage. Compared with computer-based data systems, the computing integrator has better noise suppression because of the digital transmission and digital multiplexing. It can be easily installed with any chromatograph, and no electrometer cleanup is required. It is very easy to operate because all run parameters are digital and in chromatographic terms. Entry and maintenance cost are significantly lower. (Mortland-Battelle)
W72-11932

APPLICATION OF AERIAL METHODS IN GROUNDWATER STUDIES,
For primary bibliographic entry see Field 02F.
W72-12023

THE PRECIPITATION MEASUREMENT PARADOX--THE INSTRUMENT ACCURACY PROBLEM,
For primary bibliographic entry see Field 02B.
W72-12032

INTERPRETATION OF AERIAL PHOTOGRAPHS FOR GEOMORPHOLOGICAL RESEARCH,
For primary bibliographic entry see Field 07C.
W72-12036

A DEVICE FOR SAMPLING IMMEDIATELY ABOVE THE SEDIMENT-WATER INTERFACE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-12299

HYDROLOGIC INTERPRETATIONS BASED ON INFRARED IMAGERY OF LONG ISLAND, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-12373

APPLICATION OF THE FINITE ELEMENT METHOD TO REGIONAL WATER TRANSPORT PHENOMENA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W72-12381

7C. Evaluation, Processing and Publication

STATISTICAL PROCESSING OF LONG-TERM OBSERVATIONS OF GROUNDWATERS,
Ceskoslovenska Akademie Ved, Brno. Geograficky Ustav.
For primary bibliographic entry see Field 02F.
W72-11744

WATER RESOURCES INVESTIGATIONS IN OREGON, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 4 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Oregon, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, On-site investigations, Water temperatures, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Oregon are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 361 primary, secondary, and water management streamflow stations; 844 groundwater observation wells; and 96 water quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, average annual precipitation, and average annual runoff. A map, scale 40 mi to the inch shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Oregon in June 1968. (Woodard-USGS)
W72-11750

OBJECTIVE CRITERIA FOR THE EVALUATION OF CLUSTERING METHODS,
Massachusetts Inst. of Tech., Cambridge.
W. M. Rand.
Journal of the American Statistical Association, Vol. 66, No. 336, p 846-850, December 1971. 5 tab, 9 ref.

Descriptors: *Statistical methods, Approximation method, Numerical analysis, Monte Carlo method, Data collections, Quality control, Sampling.
Identifiers: *Clustering methods, *Performance evaluation, Sensitivity.

There have been many approaches to the problem of clustering data, however, lack of objective criteria has made interpretation of their results difficult. Several criteria are proposed to isolate specific aspects of method performance. These include retrieval of 'natural' clusters, sensitivity to resampling (perturbation), and stability in the presence of new data. These criteria depend on a measure of likeness between two different clusterings of the same set of data; the measure essentially considers how each pair of data points is assigned in each clustering. (Long-Battelle)
W72-11798

AN IMPROVED OPTIMUM CONTROL ALGORITHM FOR A CLASS OF WATER POLLUTION PROBLEMS,
Newark Coll. of Engineering, N.J.
For primary bibliographic entry see Field 05G.
W72-11807

MINI COMPUTER SYSTEM FOR SHIPBOARD SAMPLING,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 07B.
W72-11841

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA - WATER YEAR 1971.
Wyoming Univ., Laramie. Water Resources Research Inst.

Available from the National Technical Information Service as PB-211 082, $6.00 paper copy, $0.95 in microfiche. Water Resources Series No 27, March 1972. 301 p. OWRR A-001-WYO (54).

Descriptors: *Humidity, *Temperature, Computer programs, *Data collections, *Data processing, *Climatological data, *Wyoming.

Temperature and relative humidity data that have been reduced from hygrothermograph charts and precipitation data from recording and non-recording precipitation gages are presented in tabular form. Four readings per day at 0600, 1200, 1800 and 2400 hours and the maximum and minimum are presented. The mean, maximum, and minimum temperatures are also shown graphically. The reduced data are transferred to punch cards for computation and tabulating by the University of Wyoming's digital computer. The card format and computer program are presented in WyoWRRI Water Resources Series No. 8.
W72-11881

NATIONAL WATER DATA PROGRAM,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07A.
W72-11892

QUANTITATIVE ANALYSIS OF RESERVOIR AND STREAM YIELDS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 04A.
W72-11895

SELECTED DATA ON PUBLIC SUPPLIES OF THE 100 LARGEST CITIES IN THE UNITED STATES, 1962,
Geological Survey, Wash., D.C. Water Resources Div.
For primary bibliographic entry see Field 03D.
W72-11905

WATER RESOURCES OF THE CENTER HILL LAKE REGION, TENNESSEE.
Geological Survey, Nashville, Tenn.
For primary bibliographic entry see Field 02E.

W72-11978

ADEQUACY OF HYDROLOGIC RECORDS FOR PARAMETER ESTIMATION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9128, p 1387-1393, August 1972. 4 tab, 5 ref, append.

Descriptors: *Data collections, *Simulation analysis, *Stochastic processes, *Monte Carlo method, *Statistical models, Mathematical models, Probability.
Identifiers: Error analysis.

Monte Carlo simulation can be used to determine the probability of errors of various magnitudes produced by stochastic models and how these error probabilities change as the number of observations used in determining the parameters of the stochastic model change. The simulation technique is simple, easy to apply and produces results that are easy to interpret. The step-by-step procedure is outlined. A stochastic model of monthly streamflow is used to illustrate the procedure and demonstrate that a table of error probabilities as a function of the number of observations available can be produced. (Knapp-USGS)
W72-11991

PARAMETER ESTIMATION FOR FIRST--ORDER AUTOREGRESSIVE MODEL,
Instituto Geografico Nacional, Guatemala City.
For primary bibliographic entry see Field 02E.
W72-11999

WATER RESOURCES INVESTIGATIONS IN SOUTH CAROLINA, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *South Carolina, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Sediment transport, On-site investigations, Water quality, Water temperatures, Water level fluctuations, Bibliographies, Network, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in South Carolina are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 82 primary, secondary, and water management streamflow stations; 111 groundwater observation wells; and 17 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, average annual runoff, long term water-table changes and discharge of the principal rivers. A map, scale 23 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in South Carolina in October 1968. (Woodard-USGS)
W72-12001

WATER RESOURCES INVESTIGATIONS IN OKLAHOMA, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Oklahoma, *Inter-agency cooperation, Surface waters, Groundwater, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Runoff, Sediment transport, Water temperature, On-site investigations, Precipitation (Atmospheric), Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U. S. Geological Survey in Oklahoma are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 160 primary, secondary, and water management streamflow stations; 254 groundwater observation wells; and 35 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, discharge of the principal rivers, and the chemical quality of the rivers. A map, scale 35 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Oklahoma in July 1968. (Woodard-USGS)
W72-12002

WATER RESOURCES INVESTIGATIONS IN OHIO, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Ohio, *Inter-agency cooperation, Surface waters, Surveys, Groundwater, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, On-site investigations, Water quality, Water temperature, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Ohio are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 176 primary, secondary, and water management streamflow stations; 240 groundwater observation wells; and 89 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, discharge of the principal rivers, and the dissolved solids in surface waters. A map, scale 42 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Ohio in September 1968. (Woodard-USGS)
W72-12003

WATER RESOURCES OBSERVATORY STREAMFLOW DATA - WATER YEARS 1965 THROUGH 1971,
Wyoming Univ., Laramie. Water Resources Research Inst.
L. E. Allen, and V. E. Smith.
Available from the National Technical Information Service as PB-211 126, $3.00 in paper copy, $0.95 in microfiche. Wyoming Water Resources Series No 28, May 1972. 92 p. OWRR-A-001-Wyo (55).

Descriptors: *On-site data collections, *Hydrologic data networks, *Streamflow, Data processing, *Wyoming.

Data from water level recorders and rated stream sections are presented for stations operated by the Wyoming Water Resources Research Institute. The reduced data are processed through the University of Wyoming's digital computer. Program output presented includes station identification, mean daily flows in second-feet, total monthly flows in second-foot-days, mean monthly flows in second feet, monthly discharges in acre-feet, and annual flow in acre-feet for each water year. The stream gaging network is primarily on the drainages of Nash Fork and Libby Creeks, tributaries of the Little Laramie River; the Medicine Bow River and certain of its tributaries; and on the Laramie River irrigation diversions therefrom north of Laramie, Wyoming. The latter area is supplemented by USGS stations above the below the study area. The streamflow gages have been located to measure the runoff pattern from high mountain watersheds, as well as to provide measurements for inflow-outflow studies of agricultural consumptive use.
W72-12005

INTERPRETATION OF AERIAL PHOTOGRAPHS FOR GEOMORPHOLOGICAL RESEARCH,
Ye. N. Azbukina.
Trans. available from the National Technical Information Service as NASA TTF-624, $3.00 in paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Technical Translation NASA TT F-624, April 1972. 79 p, 22 fig, 16 ref, 3 append. (Translation of Deshifrirovaniye Aerofotosnimkov dlya Geomorfologicheskikh Issledovaniy, Leningrad University Press, Leningrad, 1969.).

Descriptors: *Aerial photography, *Terrain analysis, *Photogrammetry, *Mapping, *Geomorphology, Data collections, Erosion, Topography.
Identifiers: *USSR.

This monograph describes the application of aerial photograph interpretation in field and office geomorphological research and photo interpretation for describing relief types and forms, their origin, and interrelationships with geological structure. Aerial photographs of relief forms illustrate the various landscape conditions in different regions of the Soviet Union. (Knapp-USGS)
W72-12036

SUBMERSIBLE WATER QUALITY MONITORING EQUIPMENT,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05A.
W72-12058

GEOPHYSICAL MAPPING OF THE WATER TABLE IN EOCENE SEDIMENTS: FEASIBILITY AND RELIABILITY EVALUATION,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 02F.
W72-12104

THE RIVER BASIN MODEL: ASSESSMENT DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12122

THE RIVER BASIN MODEL: PLANNING AND ZONING DEPARTMENT.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12123

THE RIVER BASIN MODEL: THE TRANSPORTATION SECTIOR.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-12124

A MONTE CARLO STUDY OF SOME SMALL SAMPLE PROPERTIES OF TESTS FOR SPECIFICATION ERROR,
Michigan State Univ., East Lansing. Dept. of Economics.
J. Ramsey, and R. Gilbert.
Journal of the American Statistical Association, Vol 67, No 337, p 180-186, March 1972. 4 tab, 31 ref.

Descriptors: *Monte Carlo Method, *Specifications, Statistical methods, Model studies, Mathematical models, *Quality control, Testing, Sampling, Least squares method, *Data processing.
Identifiers: *Errors.

Tests for the specification errors of omitted variables, incorrect functional form, simultaneous equation problems, and heteroskedasticity previously developed by the author are further considered. Regression, Rank, and Bartlett's M Specification Error Tests are discussed and specification of the models used in the Monte Carlo experiments provided. Monte Carlo methods are used to examine the statistical independence of the test statistics, the small sample power of the tests under various alternatives, and the effect on the tests of using ordinary least squares instead of Theil residuals. (Snyder-Battelle)
W72-12183

VERIFICATION ERROR IN SINGLE SAMPLING INSPECTION PLANS FOR PROCESSING SURVEY DATA,
Bureau of the Census, Suitland, Md. Statistical Research Div.
G. Minton.
Journal of the American Statistical Association, Vol 67, No 337, p 46-54, March 1972. 3 fig, 5 tab, 16 ref.

Descriptors: *Sampling, *Inspection, *Surveys, *Data processing, Statistical methods, *Quality control, Mathematical studies, Equations, Measurement, Evaluation, Standards.
Identifiers: *Errors.

Measurement and verification errors seriously affect the quality of processing survey data. Formulas are provided to assess the effect of inefficient inspection and correction on the power of the sampling plan to distinguish between acceptable and unacceptable quality levels, on average outgoing quality, and on costs. Emphasis is placed on the error of classifying defectives as nondefectives (Type II) made by both inspectors (called 'verifiers') of sample items and by correctors of items in rejected lots. Type I errors are considered for conditions peculiar to preparing data for machine processing in which nondefective items are regarded as defectives and changed to incorrect ones. (Snyder-Battelle)
W72-12184

TRITIUM CONTAMINATION OF THE ENVIRONMENT (UBER DIE TRITIUMKONTAMINATION DER UMWELT),
Kernforschungszentrum, Karlsruhe (West Germany).
L. A. Koenig, and M. Winter.
Paper presented at the Commission of the European Communities International Symposium, Radioecology Applied to the Protection of Man and His Environment, Rome, Sept. 1971. 14 p, 4 tab, 16 ref.

Descriptors: *Tritium, *Water quality control, *Monitoring, *Nuclear wastes, Radioactivity, Effluents, Nuclear powerplants, Radioecology, Water analysis, Radioactivity techniques, Water pollution sources, Pollutant identification, Meteoric water, *Path of pollutants.

Tritium uptake by man should be monitored to maintain surface and groundwater quality, especially in view of the possible future development of fusion reactors. Measurement without prior concentration is recommended and described (the 'Insta-Gel' cocktail, internal scintillant). Since tritium in air is largely in the form of tritiated water, in this case sampling by collection on a cold finger is recommended. The authors' results for surface-, ground-, and rainwater are compared with those of others. Concentrations ranged from 0.4-1.4 pCi/ml, and the average dose to man was about 0.1 mrem/year. Although the air moisture in certain Karlsruhe laboratories reached greater than 3pCi/ml, the maximum dose from this source was about 0.01 mrem/year. (Most of the dose is from world wide contamination from nuclear testing.) (Bopp-ORNL)
W72-12195

OPTIMIZATION TECHNIQUES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12227

APPLICATIONS OF LINEAR PROGRAMMING, OR LINEAR POTPOURRI,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12230

LINEAR PROGRAMMING: GENERAL CONCEPTS AND METHODS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12231

DYNAMIC PROGRAMMING CONCEPTS AND APPLICATIONS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12233

NONLINEAR PROGRAMMING AND SENSITIVITY ANALYSIS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-12235

MODEL HYDROGRAPHS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W72-12376

APPLICATION OF HARRILL'S EQUATION TO A LIMESTONE AQUIFER,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 02F.
W72-12380

08. ENGINEERING WORKS

8A. Structures

AZOTEA TUNNEL INSTRUMENTATION PROGRAM, SAN JUAN-CHAMA PROJECT, NEW MEXICO,
Bureau of Reclamation, Denver, Colo.
W. H. Ortel.
Bureau of Reclamation Report REC-ERC-71-49, Dec 1971. 41 p, 7 fig, 3 dwg, 2 tab, 26 chart, 2 ref, append.

Descriptors: *Tunnel linings, *In situ tests, *Instrumentation, *Movement, Rocks, Rock mechanics, Joints (Geology), Tunnel design, Geology, Sedimentary rocks, Engineering geology, Expansive clays, On-site tests, Measurement, Extensometers, Tunnels.
Identifiers: *Concrete linings, Shotcrete, Test results, Rock slope stability, Azotea Tunnel (N Mex), San Juan-Chama Project, Colorado River Storage Project.

An instrumentation program for Azotea Tunnel, San Juan-Chama Project, was developed to evaluate tunnel stability. The program included rock movement measurements, concrete lining measurements, and a lining per formance test. No rock movement pattern relating to the overburden, rock type, or jointing could be detected. Large movements occurred where local fallout was common. At depths of 800 ft or more, horizontal and vertical diameters converged; at lesser depths, an elliptical shape developed with the vertical diameters converging and the horizontal diameters diverging. The concrete lining instrumentation showed concrete shrinkage away from the rock and deformation of the lining into a slightly elliptical shape. Except in the shotcreted section, the joint meters indicated the rock was placing a load on the lining. Strain meters measured the strain induced by the rock. From the strains, the concrete stresses could be computed. Results from the shotcreted section suggest that the shotcrete protected the shale and prevented changes in the stability of the rock mass. The lining performance test showed the expansive characteristics of the shale and their effect on the lining. Pressures developed in the shale were sufficiently high to cause cracking and relatively large movements in the concrete lining. (USBR)
W72-11787

USING SOIL MECHANICS IN OCEAN ENGINEERING,
Dames and Moore, Los Angeles, Calif.
J. C. Wilson.
Oceanology, Vol. 7, No. 2, p. 29-33, Feb 1972. 6 photo, 2 tab.

Descriptors: *Foundations, *Construction, Soil mechanics, Ocean bottom, Piles (Foundations), Offshore platforms, Fills, Islands, Settlement (Structural), Slope stability, Sampling, Trafficability, Oceanography, Surveying, Airports.
Identifiers: *Underwater foundations, *Underwater construction, Liquefaction, Piston samplers, Sediment sampling, Submarine cables, Sediment pipelines, Offshore structures, Underwater structures, Undersea aqueduct (Collective).

Soil mechanics problems encountered in ocean-related engineering projects are as varied as those encountered onshore. Typical oceanic soil problems include: (1) design and installation of piles for offshore platforms or bulkheads; (2) design and installation of pipelines and their anchorages; (3) design and construction of fills for airports, islands, and additional port storage; (4) analysis of slope stability of navigation channels and pipeline trenches; (5) analysis of scour potential around piles and bridge piers; (6) assessment of sea floor trafficability for ocean construction

and mining vehicles; and (7) analysis of possible effects of undersea earthquakes. Predicting the bearing capacity of a pile 4 ft in dia. and 35 times heavier than an average size pile is a challenging oceanic soils problem. Profiles of the ocean floor can be determined using high-frequency reflection techniques. The least disturbed soft soil samples have been recovered using an actuated piston-type sampler. Understanding the geological factors that created the soil conditions of a site is very helpful to offshore soils engineers. (USBR)
W72-11791

HURRICANE FLOOD PROTECTION AND BEACH EROSION CONTROL PROJECT REVOLVING FUND.
For primary bibliographic entry see Field 06E.
W72-11944

WYNOOCHEE DAM AND LAKE, WYNOOCHEE RIVER, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 798F, $3.00 in paper copy, $0.95 in microfiche. September 15, 1971. 46 p, 1 plate, 8 tab.

Descriptors: *River basin development, *Flood control, *Water supply, *Dam construction, Water allocation (Policy), Recreation, *Washington, Multiple-purpose projects, Water resources development, Watershed management, Irrigation water, Industrial use (Water), Domestic water, Wildlife habitats, Aquatic habitats, Fish management, Water requirements.
Identifiers: *Environmental Impact Statements, *Grays Harbor (Wash).

The Wynoochee Project in Grays Harbor County of southwestern Washington involves construction of a multipurpose concrete gravity dam. The Wynoochee River originates as a precipitous stream on the southern slopes of the Olympic Mountains. Wynoochee Lake will provide 35,000 acre-feet of water storage for flood control and assure a 385 c.f.s. flow during low flow period for fishery enhancement and irrigation and for diversion by the city of Aberdeen for industrial and domestic use. Adverse environmental effects include the loss of 5.4 miles of resident stream fish habitat and anadromous trout spawning and rearing area; inundation of 1,140 acres of big game habitat; loss of timber, other vegetation and habitat for wildlife other than big game; and the appearance of buildings in a former wild valley. The only known alternative at this time would be abandonment of the project. The project is in accord with the projected demand for water and land in this area for recreation, agriculture, commercial fishery production, and industry in Aberdeen. Comment has been solicited and received from appropriate federal, state, and local agencies. (Waldron-Florida)
W72-11949

T OR C--WILLIAMSBURG ARROYOS WATERSHED, NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C. Watershed Planning Div.

Available from the National Technical Information Service as PB-204 090D, $3.00 in paper copy, $0.95 in microfiche. November 8, 1971. 9 p, 2 fig.

Descriptors: *New Mexico, *Environmental effects, *Flood control, *Watershed management, Flood plains, Erosion control, Flood protection, Sediment yield, Administrative decisions, Multiple-purpose projects, Comprehensive planning, Channel improvement, Rio Grande River, Land development, Floodways, Pipelines, Retardants, Flood frequency.
Identifiers: *Environmental Impact Statements, *Williamsburg Arroyos Watershed (N.M.).

This watershed project will reduce floodwater and sediment damage to urban and agricultural land in and near Truth or Consequences and Williamsburg, New Mexico. The plan includes conservation land treatment, four floodwater retarding structures, channel and pipeline, and about 0.6 mile of floodway. The project will reduce erosion, reduce sediment carried by the Rio Grande, reduce floodwater and sediment damages by about 98%, protect homes and commercial properties from a 1% chance storm event, reduce mosquito breeding places, protect municipal water wells from flood damage, and permit development of flood plains for homes and businesses. Adverse environmental effects include the elimination of agricultural use and wildlife habitat on land to be used for dams and spillways; temporary interruption of agricultural and wildlife use of rangeland in the sediment and detention pools of planned structural measures; and relocation of one home, powerline, ranch road and street. Alternatives considered include conservation land treatment alone, flood proofing of existing improvements and zoning undeveloped areas, public land acquisitions of flood-prone areas, and continuing present flood plain use and trends. (Widman-Florida)
W72-11952

SMALL BOAT HARBOR ON THE SOUTH SHORE OF LAKE ONTARIO AT OAK ORCHARD HARBOR, NEW YORK (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-199 636D, $3.00 in paper copy, $0.95 in microfiche. May 26, 1971. 7 p, 2 map.

Descriptors: *Environmental effects, *Breakwaters, *Jetties, *Lake Ontario, *Dredging, Recreation, Safety, Channel improvement, Fish establishment, Fish stocking, Turbidity, Currents (Water), Harbors, Economic feasibility, Administrative agencies, *New York.
Identifiers: *Environmental Impact Statements, *Oak Orchard Harbor (N.Y.).

This project would provide for construction of a small-boat harbor on the south shore of Lake Ontario, New York. The project calls for construction of parallel jetties, an off-shore detached breakwater, and dredging of an entrance channel. It also provides for installation of recreational fishing facilities on the jetties. The project would result in temporary loss of some 10 acres of bottom biota and increased turbidity during construction. The construction of a small-boat harbor at any other location would be more costly and would have at least an equally adverse environmental impact. To abandon the project would not provide the needed safe harbor and would forego about $80,000 in net benefits. The project will not have any significant impact on the long-term productivity of the area. (Waldron-Florida)
W72-11954

MYERS CHUCK HARBOR, MYERS CHUCK, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-199 638D, $3.00 in paper copy, $0.95 in microfiche. May 28, 1971. 11 p, 1 map.

Descriptors: *Alaska, *Environmental effects, *Harbors, *Breakwaters, Tidal effects, Economic feasibility, Administrative agencies, Project planning, Clams, Aquatic productivity, Fish management, Coastal structures, Barriers, Sea walls, Concrete structures.
Identifiers: *Environmental Impact Statements, *Myers Chuck (Alas).

Myers Chuck is a small natural harbor located on the eastern shore of Clarence Strait in southeastern Alaska. The presently authorized project would consist of a breakwater 700 feet long which would result in closing the southern entrance of the harbor. The project would provide a harbor of refuge for fish and enhance the economy of the local community. There would be a loss of about 900 square yards of clam habitat and a decrease in tidal circulation. There would also be an increased possibility of harbor icing and accumulation of debris. A long-term loss of productivity will occur as a result of removing clam bed habitat from production. The only alternatives to the proposed project would be no project at all or construction of the breakwater at a different site. The project would result in an irretrievable loss of clams and an irretrievable expenditure of manpower. (Waldron-Florida)
W72-11955

UNION CREEK WATERSHED PROJECT, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-206 620F, $3.00 in paper copy, $0.95 in microfiche. February 1972, 31 p, 2 map, 2 tab.

Descriptors: *South Dakota, *Environmental effects, *Conservation, *Flood protection, *Channel improvement, Watershed management, Stabilization, Multiple-purpose projects, Erosion control, Sedimentation, Administrative agencies, Water management (Applied), Retardance, Land management, Land development.
Identifiers: *Environmental Impact Statements, *Union Creek (S.D.).

The project proposes conservation land treatment measures and four floodwater retarding structures, 13 grade stabilization structures, and 1.6 miles of channel improvement in Union County, South Dakota. The project will reduce erosion rates and protect 4,800 acres of upland from land destruction and depreciation. Floodwater and sediment damages will be reduced by 80 percent. The sediment entering Lake Nixon will be reduced 18,700 tons annually and the sediment leaving the watershed will be reduced 80 percent. The floodwater retarding and grade stabilization pools provide recreational opportunities and increase the habitat for waterflow and aquatic furbearers. Increased and improved vegetative cover will provide more and better upland wildlife cover. Adverse environmental effects include inundation of about 5 miles of intermittent stream channel, 40 acres of cropland, and 55 acres of grassland. Agricultural and wildlife use will be periodically interrupted in the floodwater detention pools. The use of 50 acres of land in dams, spillways, and grade stabilization structures will be temporarily lost to agriculture and wildlife until the areas are re-vegetated. Many alternatives were considered, but were considered unacceptable. (Widman-Florida)
W72-11958

MILL CREEK LAKE, MILL CREEK, SCIOTO RIVER BASIN, DELAWARE AND UNION COUNTIES, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W.Va.

Available from the National Technical Information Service as PB-200 949D, $3.00 in paper copy, $0.95 in microfiche. March 29, 1971. 13 p.

Descriptors: *Ohio, *Environmental effects, *Dam construction, *Flood control, Water quality control, Recreation facilities, sedimentation, Alternate planning, Administrative agencies, Multiple-purpose projects, Planning, Flood protection, Project planning, Water quality control, Storage, Reservoirs.

Identifiers: *Environmental Impact Statements, *Mill Creek Lake, Ohio.

The project involves construction and operation of a dam and other facilities for flood control, recreation, and water quality control on Mill Creek in Delaware County, Ohio. Environmental impacts include regulation of downstream flow, conversion of stream and upland to a lake, entrapment of sediment, and change of land use in the lake area. Adverse environmental effects include loss of farm lands and some aquatic and terrestrial habitat and relocation of persons now occupying and using the lands to be acquired. Alternatives include developments or combinations of developments such as other reservoirs with storage capacity for similar services, local flood protection works, non-structural flood damage controls, recreational development of the stream and nearby lands, recreational development elsewhere, more stringent requirements for treatment of wastes from existing and prospective development, and no action. Irretrievably lost will be a reach of the natural stream, the land which will be inundated, and any archeological and historic records not recovered prior to filling of the pool. (Widman-Florida)
W72-11959

PLASTIC PIPELINES FOR LIVESTOCK WATER IN NORTHWEST NEBRASKA,
Soil Conservation Service, Rushville, Nebr.
For primary bibliographic entry see Field 04A.
W72-12082

HYDRAULIC STRUCTURE FOR RESISTING WAVE ACTION,
J. Stolk, Jr. and J. H. Stolk.
U.S. Patent No. 3,548,600, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 4, p. 1349, December 22, 1970.

Descriptors: *Patents, *Shore protection, *Beach erosion, Coasts, Hydraulic structures, Waves (Water), *Embankments.

This hydraulic structure comprises an embankment having thereon a heap of concrete blocks, each of which is a six-sided quandrangular prism. Each edge of each block is at least one meter in length and not more than 10 per cent longer than any other edge of the block. Each side of each block has therein at least one opening the area of which is at least 1 per cent of the total area of the side, the total area of the openings in each side being from 4 to 10 per cent of the total area of the side. Leading inward from each opening is a passage which has a substantially uniform cross-sectional area equal to the area of the opening, and which is connected to a passage leading inward from the opposite side and to passages leading inward from at least some of the adjacent sides of the block. The weight of each block is at least 70 per cent of the weight of a solid block of the same size, and the blocks are dropped at random in the heap with the sides of different blocks facing in different directions. (Sinha-OEIS)
W72-12128

TULATIN PROJECT, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.

Available from the National Technical Information Service as PB-199 327D, $3.00 in paper copy, $0.95 in microfiche. May 24, 1971. 35 p, 1 map.

Descriptors: *River basin development, *Flood control, *Multiple-purpose reservoirs, *Environmental effects, Water demand, Water storage, *Oregon, Administrative agencies, Fish conservation, Recreation, Water resources development, Multiple-purpose projects, Fish management, Land resources, Economic feasibility, Storage capacity.
Identifiers: *Environmental Impact Statements, *Tulatin River (Ore).

Present streamflow in the Tulatin River is inadequate to meet constantly increasing seasonal water requirements and for the preservation of fish life in the river. The plan of development will provide regulatory storage in Scroggins Reservoir and provide flood control and increased recreational and fishery development. Development of the multupurpose project will improve the socioeconomic environment through a more efficient use of the water and related land resources. The project will be an integral part of the future development of other basin resources. Some of the existing beauty of the Scroggins Reservoir area will be lost by inundation but the creation of a still-water recreation area in this setting will result in a scenic landscape with values of its own. There are no known alternative means of utilizing the land and water resources that would provide equivalent economic, social, and environmental benefits at comparable costs. (Waldron-Florida)
W72-12331

CAMERON-CREOLE WATERSHED, LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-202 446F, $3.00 in paper copy, $0.95 in microfiche. February 22, 1972. 73 p.

Descriptors: *Louisiana, *Environmental effects, *Flood protection, *Levees, *Channel improvement, Watershed management, Alternate planning, Coordination, Comprehensive planning, Adoption of practices, Multiple-purpose projects, Water distribution (Applied), Water management (Applied), Project planning, Project purposes, Nutrients.
Identifiers: *Environmental Impact Statements, *Cameron-Creole Watershed (Louisiana).

This project would include 19 miles of levee, 35 miles of channels, and 6 water control structures in the Cameron-Creole Watershed, Louisiana. The proposed structural and land treatment measures will provide flood protection. Management of water control structures will prevent future deterioration of marsh and improve the vegetative condition. Water control structures will be designed and managed to allow the passage of marine organisms, shrimp, and fish into and out of marsh nursery areas, maintain optimum water levels and control salinity ranges. Channel improvement will provide outlets for removal of excess water during periods of high rainfall and for improved distribution of water for beneficial purposes. The modified plan will not achieve the nutrient and organism exchange that now occurs; however, water circulation will improve. An additional 11,300 acres will be available to estuarine forms during normal water conditions. Alligatorweed is expected to increase and may interfere with boat travel. Some competition may develop between waterfow (geese) and cattle for some species of vegetation. Alternatives include land treatment only, construction of a sill or lock in the Calcasieu River, levee around private land and no action. (Widman-Florida)
W72-12334

LONG BRANCH LAKE, EAST FORK, LITTLE CHARITON RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-201 518F, $3.00 in paper copy, $0.95 in microfiche. October 1971. 50 p, 2 map, 6 tab.

Descriptors: *Environmental effects, *Missouri, *Flood control, *Dam construction, Multiple-purpose projects, Channel improvement, River basins, River basin development, Recreation, Fish conservation, Wildlife conservation, Water supply, Water quality control, Area redevelopment, Land use, Non-structural alternatives, Wildlife habitats.
Identifiers: *Environmental Impact Statements, *Macon (Missouri), *Long Branch Lake (Missouri).

The Long Branch Lake project was authorized by the Flood Control Act of 1965 and is now in preconstruction planning. The project was authorized to include flood control, water supply, recreation, fish and wildlife conservation, and water quality control in the Little Chariton River basin. Significant channelization has already been carried out in the lower basin to reduce flooding. The completed project will encourage intensified agricultural practices downstream and residential and commercial development. The lake will inundate 2,430 acres of land, eliminate 20 miles of river and associated habitat, and adversely affect forest cover and fish and wildlife habitat. Alternatives to the project include alternative lake sites, small impoundments in upstream areas, nonstructural measures, channelization, and no action. The short-term uses engendered by the project would enhance the long-term productivity of the basin. Comment was solicited and received from appropriate federal, state and private agencies. (Waldron-Florida)
W72-12335

EAST GREENACRES UNIT, PRAIRIE DIVISION, RATHDRUM PRAIRIE PROJECT, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho.

Available from the National Technical Information Service as PB-205 351D, $3.00 in paper copy, $0.95 in microfiche. December 22, 1971. 19 p, 1 map.

Descriptors: *Environmental effects, *Irrigation programs, *Wells, *Pumping plants, Pipelines, Water demand, Domestic water, Idaho, Recreation, Fishing, Multiple-purpose projects, Reservoir storage, Water supply, Irrigation, Rural areas, Land use, Groundwater, Water pollution control, Fish conservation, Wildlife conservation.
Identifiers: *Environmental Impact Statements, *Kootenai County (Ida).

The East Greenacres Unit is located in Kootenai, Idaho, and its principal features would include construction of wells and pumps to provide a water supply for irrigation, domestic and livestock uses; construction of a buried pipe distribution system to deliver water to users within the district; and development of two additional public recreation access sites. As a result of the irrigation development contemplated by the project, the existing socio-economic base of the area will improve substantially. Adverse environmental effects include loss of 16 acres of agricultural land required for rights-of-way for pumping complexes, short-term alteration of existing ecology due to construction activities, and some visual impact of storage tanks. Alternatives to the proposed project include no project, rehabilitation of the existing distribution system and supplemental groundwater pumping. (Waldron-Florida)
W72-12336

CLAYTON LAKE, JACKFORK CREEK, OKLAHOMA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.

Available from the National Technical Information Service as PB-200 810D, $3.00 in paper copy, $0.95 in microfiche. May 4, 1971. 15 p.

Descriptors: *Environmental effects, *Dam construction, *Multiple-purpose reservoirs, *Water supply, Flood protection, Multiple-purpose projects, Fish conservation, Oklahoma, Recreation, Administrative agencies, Wildlife conservation, Water conservation, Wildlife habitats, Non-structural alternatives, Flood control, Water resources development, Watershed management.
Identifiers: *Environmental Impact Statements, *Jackfork Creek (Okla), *Clayton Lake (Okla).

The project would consist of construction of a flood control, water supply, recreation, and fish and wildlife lake located in Pushmataha and Latimer Counties, Oklahoma. There will be a significant reduction in annual flood damages in the area downstream from the dam. Water supply will be provided for the immediate area and also for distant urban areas where water resources are inadequate. Maintenance of the conservation pool will inundate 14,360 acres including cropland, open pasture, and woodlands. This land also provides food and cover for wildlife. Development of a lake project with storage will result in a change of land use from low-production agricultural activities to public uses associated with an attractive body of water and its surrounding area. Alternatives to the proposed project include channel improvement, watershed treatment, upstream retention lakes, non-structural action, and 'no development'. (Waldron-Florida)
W72-12339

8B. Hydraulics

DRAG REDUCTION DEGRADATION OF DILUTE POLYMER SOLUTIONS IN TURBULENT TUBE FLOW,
Notre Dame Univ., Ind. Coll. of Engineering.
N. D. Sylvester, and S. M. Kumor.
Available from NTIS, Springfield, Va. 22151 - AD734-676 $3.00 paper copy; 95 cents microfiche. Technical Report No THEMIS-UND-71-6, November 1971. 55 p, 15 fig, 4 tab, 77 ref, append. ONR Contract N00014-68-A-0152.

Descriptors: *Turbulent flow, *Flow friction, *Tubes, *Drag, *Polymers, Hydraulics, Model studies, Analytical techniques, Fluid mechanics, Dynamics, Flow resistance, Roughness (Hydraulic), Viscosity, Velocity, Flow rates, Mathematical studies.

A recycle tube flow experiment was used to investigate drag reduction characteristics of polymer solutions (Separan AP 30). Experimental pressure gradient and flow rate measurements were made as a function of time. From these data, friction factor-time plots on log-log coordinates were constructed, all of which exhibited three distinct regions: (1) at short times, a constant friction factor given by a maximum drag reduction equation; (2) a linear region in which the friction factor increases with time; and (3) at long times, an asymptotic nonlinear approach of the polymer solution friction factor toward the solvent friction factor. Correlations are presented relating the process time maximum drag reduction exists and the process time significant drag reduction exists (20 + 5%) to the polymeric and system flow variables. Correlations are also presented relating the real time maximum drag reduction exists for a solution under continuous turbulent flow and the real time significant drag reduction exists for a solution under continuous turbulent flow, to viscosity, concentration, and velocity. (Woodard-USGS)
W72-11739

SEICHES OF SYDNEY HARBOR, N. S.,
Department of the Environment, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02E.
W72-11747

MOMENTUM TRANSFER FROM A JET TO A VORTEX,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Ingenieria.
E. Levi.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol. 1, Paris, France, p 127-134, Aug-Sept 1971. 4 fig, 2 ref.

Descriptors: *Momentum transfer, *Vortices, *Fluid mechanics, Rotational flow, Eddies, Laboratory tests, Cyclones, Tornadoes, Hydraulics, Flow, Momentum.
Identifiers: *Entrances (Fluid flow), Centripetal force, Mexico.

Unlike wake vortices, drain and inlet vortices, cyclones, and tornadoes cannot be explained as being friction effects, but are a result of an unstable process, which starts when an accelerated or decelerated jet contacts a body of stagnant fluid. This hypothesis is corroborated as follows: A part of the jet momentum gives rise to the centripetal force working in the vortex; consequently, a specified dimensionless group, containing both jet and vortex characteristic parameters, must keep a constant value. The condition is verified by 3 different experimental vortices: (1) arising behind a rectangular orifice set across a laboratory channel; (2) produced in a tank by a jet issued from a vertical nozzle; or (3) produced in a tank by a jet issued from an oblique nozzle. (USBR)
W72-11784

APPLICATION OF THE FINITE-ELEMENT METHOD FOR SIMULATION OF SURFACE WATER TRANSPORT PROBLEMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 02E.
W72-11866

TEMPERATURE EFFECTS IN LOW-TRANSPORT, FLAT-BED FLOWS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 02J.
W72-11986

EFFECTS OF INFLOW CONDITION ON HYDRAULIC JUMP,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
H. J. Leutheusser, and V. C. Kartha.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9088, p 1367-1385, August 1972. 8 fig, 2 tab, 16 ref, append. NRCC Grant A-1541.

Descriptors: *Hydraulic jump, *Supercritical flow, Hydraulic models, Critical flow, Froude number, Transition flow, Turbulent flow, Boundary layers, Shear drag.

The jump phenomenon is affected by the condition of inflow of the supercritical stream. Based on an unconventional concept of longitudinal extent, the hydraulic jump in a horizontal, smooth-walled channel of rectangular cross section is studied both analytically and experimentally. Jumps with developed inflow are longer, lower, and subject to higher and more uniformly distributed skin friction than jumps with undeveloped inflow. Jumps with undeveloped inflow have shear distributions which reveal a tendency toward separation with increasing Froude number. The trend is verified by the observed behavior of jumps with undeveloped inflow at Froude number as large as 30. Semi-empirical, closed-form relationships between sequent depth ratio and Froude numbers are derived and checked against experimental evidence. (Knapp-USGS)
W72-11998

RESISTANCE COEFFICIENTS FOR STEADY SPATIALLY VARIED FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
B. C. Yen, H. G. Wenzel, Jr., and Y. N. Yoon.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY8, Paper 9107, p 1395-1410, August 1972. 3 fig, 3 tab, 7 ref, append. OWRR B-043-ILL (4) and B-018-ILL (5).

Descriptors: *Open channel flow, *Overland flow, *Flow resistance, Darcy-Weisbach equation, Rainfall-runoff relationships, Steady flow, Roughness (Hydraulic), Non-uniform flow.
Identifiers: Spatially varied flow.

In spatially varied flow the three coefficients in Weisbach f form are the resistance coefficients. They are the frictional resistance coefficient, the dissipated energy coefficient, and the total head-loss coefficient. In general these three coefficients are not equal whether there is later flow or not. Only for steady uniform flow without lateral flow are these three coefficients equal to one another and to the corresponding f in the Moody diagram. Theoretical solution of steady two-dimensional Stokes flow with lateral flow is obtained to show the difference among these three coefficients. Experimental data for steady two-dimensional sheet flow under simulated rainfall were also analyzed to illustrate numerically the variations of these coefficients. In practice, hydraulic engineers should keep in mind the difference in these different resistance coefficients, to avoid unnecessary errors. (Knapp-USGS)
W72-12043

FLOW CHARACTERISTICS WITHIN A CHANNEL BOUNDARY OF COARSE MATERIALS,
Mississippi State Univ., State College. Water Resources Research Inst.
J. C. McWhorter, J. B. Allen, and Y. K. Tang.
Available from the National Technical Information Service as PB-211 150, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, Completion Report, July 1972, 22 p, 10 fig, 1 ref. OWRR A-057-MISS (1).

Descriptors: *Channel flow, *Boundaries (Surfaces), *Linings, *Flow characteristics, *Gravels, Boundary layers, Channel flow.

The effects of bed slope, relative thickness of a gravel layer, and relative size of gravel on a dimensionless velocity profile were determined. By study and comparison of the several profiles acquired, it was shown that the gravel layer was effective in shifting the zone of relatively high velocity gradient away from the absolute channel bottom. Also, an increase in relative size of gravel significantly increased the relative velocity within the gravel layer.
W72-12106

8C. Hydraulic Machinery

OPERATING EXPERIENCE WITH THE VANCOUVER ISLAND PLUS OR MINUS 260-KV HVDC SUBMARINE LINK,
British Columbia Hydro and Power Authority, Vancouver.
W. Chin, A. H. Csepe, and D. L. McDonald.
Proceedings, American Power Conference, Vol. 33, p. 1063-1072, 1971, 3 fig, 4 tab, 11 ref.

Descriptors: *Direct current, *Converters (Electrical), Electrical insulation, High voltage, Rectifiers, Transmission (Electrical), Electric power, Cathodes, Anodes, Performance, Flashover.
Identifiers: *Terminal facilities (Electrical), *Submarine cables, *Interconnected systems, Ground return, Power interchange, Canada, Vancouver (Canada), Cable terminations, Sea electrodes, Outages, Operating personnel.

The operational experience gained from the plus or minus 260-kv HVDC monopolar system, which began commercial operation in July 1968 between mainland Canada and Vancouver Island, is discussed. The system uses an earth return and operates in parallel with a previously installed 138-kv a-c interconnection. The 45.7-mi-long d-c interconnection consists of 20.2 mi of submarine cable and 25.2 mi of overhead line. Of three 280-kv, 600-amp, d-c cables, one is a spare. Each of the 2 converter stations has 2 mercury-arc valve groups; each group consists of 6 main valves and a bypass. Each valve group is rated 130 kv, 1200 amp, 156 mw, resulting in a pole rating of 260 kv, 1200 amp, 312 mw. Except for an additional smoothing reactor, two 50-mvar synchronous condensers, and a third harmonic a-c filter, the Vancouver Island Terminal equipment is identical to Arnott. Operating performance of the converter stations, the anode and cathode installations, and operating staff requirements are reviewed. (USBR)
W72-11783

PNEUMATIC BARRIER AND BEACH POLLUTION,
AMF Technical Center, Stamford, Conn.
For primary bibliographic entry see Field 05G.
W72-12076

DEVICE FOR CONTROL AND PREVENTION OF COAST EROSION,
Fyens Saekkekompagni A.S. (Denmark). (assignee).
E. Nielsen.
U. S. Patent No. 3,538,711, 3 p, 11 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 880, No 2, p 413, November 10, 1970.

Descriptors: *Patents, *Shore protection, *Beach erosion, Coasts, Erosion, Waves (Water).

Perforated or pervious flexible tubes or hoses are laid out in lengths and filled selectively with sand and small stones without any binding agent. A flexible pumping hose is run into the tube, sealing the end of the tube which is laid first anchoring this end to the seabed, keeping the rest of the tube afloat and eventually sealing the tube when the filling has been completed. (Sinha-OEIS)
W72-12156

CHIEF JOSEPH DAM (ADDITIONAL UNITS), COLUMBIA RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-199 458D, $3.00 in paper copy, $0.95 in microfiche. May 11, 1971. 11 p, 2 map, 1 dwg.

Descriptors: *Powerplants, *Columbia River, *Environmental effects, *Generators, *Fishkill, Grand Coulee Dam, Hydroelectric power, Supersaturation, Hydroelectric plants, Washington, Rocky Mountain Region, Nitrogen compounds, Tailwater, Administrative agencies, Riparian land, *Washington.
Identifiers: *Environmental Impact Statements, Bridgeport (Wash), *Chief Joseph Dam (Wash).

The proposed project would expand the powerhouse and generating capabilities of Chief Joseph Dam on the Columbia River near Bridgeport, Washington, and would increase the depth of the forelay by 10 feet. Installation of 11 additional generating units in spaces already provided would balance the project's hydraulic capacity with Grand Coulee Dam. This balance would minimize spillage of surplus water and reduce supersaturated nitrogen conditions, which now contribute to fish mortalities downstream. The project would result in more frequent fluctuations of tailwater. Installation of the additional generating units will enhance the long term environment by reducing downstream occurrence of supersaturated nitrogen. The only alternative would be no action. (Waldron-Florida)
W72-12330

BIRON PROJECT NO. 2192 ON THE WISCONSIN RIVER IN WOOD AND PORTAGE COUNTIES, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Consolidated Water Power Co., Wisconsin Rapids.

Available from the National Technical Information Service as PB-199 320D, $3.00 in paper copy, $0.95 in microfiche. December 31, 1971. 19 p, 3 append.

Descriptors: *Environmental effects, *Wisconsin, *Permits, *Turbines, *Electric powerplants, Hydroelectric plants, Hydroelectric power, Administrative agencies, Project benefits, Flood control, Recreation, Fish management, Electric power, Wildlife conservation, Federal government, State governments, River regulation, Reservoir operation.
Identifiers: *Environmental Impact Statements, *Wisconsin Rapids (Wis).

Consolidated Water Power Company has applied for a new license for the hydroelectric project located on the Wisconsin River near the city of Wisconsin Rapids. The project's reservoir supplies water to turbines located at the mill of Consolidated Papers, Inc. Continued operation of the project under a new license would have a minimal impact on the environment since this is a fully developed, run-of-the river project, operated in conjunction with other reservoirs and powerplants to provide maximum flood control, recreation, fish, and wildlife conservation. The project, based on actual experience since 1854, would continue to furnish significant benefits to the long-term productivity of the area. There are no known adverse environmental effects that would be caused by the continued operation of the project. The only alternatives to the proposed plan would call for either a takeover by the federal government or removal of the project's facilities and return of the river to its natural state. The continued operation of the project under license would involve no irreversible or irretrievable commitment of resources. (Waldron-Florida)
W72-12333

BEAVER DRAINAGE DISTRICT, OREGON--PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-200 793D, $3.00 in paper copy, $0.95 in microfiche. June 25, 1971. 19 p, 1 map.

Descriptors: *Pumping plants, *Flood protection, *Levees, *Environmental effects, Discharge lines, Drains, Hydraulics, Fish conservation, Aquatic environment, Wildlife conservation, Land use, Engineering structures, Project planning, Drainage systems, Specific capacity, Land management, *Oregon.
Identifiers: *Environmental Impact Statements, *Columbia County (Ore).

The project would involve the construction of a new pumping station of increased capacity, relocating the discharge lines of a second existing pumping station, constructing a new tide box with a positive closure gate-well structure, and raising and reinforcing the existing main levee and installing toe drains as required. The project is located in Columbia County, Oregon. The project will increase the food protection capabilities of the existing protective works and increase effectual land use within the area. Construction activities will temporarily disbcate some fish and smaller species of wildlife. An estimated 25 acres of land required for project right-of-way will be restricted in use to prevent a reduction in effectiveness of the levee. Alternatives to the project are minor changes in the layout or design of drainage and pumping facilities or no action at all. Planning of the authorized project is being accomplished in coordination with interested federal and state agencies. (Waldron-Florida)
W72-12341

AN AUTOMATED SURFACE IRRIGATION VALVE,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering; and Murphy (Frank W.) Manufacturers, Tulsa, Okla.
P. E. Fischbach, and R. Goodding, II.
Agricultural Engineering, Vol. 51, No. 11, p 584-585, November 1971. 5 fig.

Descriptors: *Irrigation systems, *Irrigation engineering, *Automatic control.
Identifiers: *Surface irrigation valves.

If any part of an individual surface irrigation system fails, it appears best that all valves automatically open to let the water flow down all furrows of the fields involved until repairs can be made. Electric controls for automated surface irrigation systems with a reuse system have been developed. In the irrigation controller a time clock, relays, time-delay relays and stepping relays control small 3-way solenoid valves that control the air to the automatic valves. The automated valve connects to a riser on a buried pipeline or a tee in a supply line. Gated pipe is connected to the valve to distributed water down the furrows. The dimensions and placement of the valve assembly are described and diagrammed. Field tests in which 15 valves were satisfactorily used are described. (Casey-Arizona)
W72-12355

8D. Soil Mechanics

USING SOIL MECHANICS IN OCEAN ENGINEERING,
Dames and Moore, Los Angeles, Calif.
For primary bibliographic entry see Field 08A.
W72-11791

UPLIFT RESISTANCE OF ANCHOR BAR, PRESSED PLATE, AND SCREW ANCHOR FOOTINGS IN SILTY SAND,
Bureau of Reclamation, Denver, Colo.
J. M. Horner.
Bureau of Reclamation Report REC-ERC-71-40, Oct. 1971. 41 p, 43 fig, 2 tab, 9 ref, append.

Descriptors: *Foundations, *Loads (Forces), *Movement, On-site investigations, Transmission towers, Dune sands, Soil properties, Lateral forces, Soil mechanics, Soil tests, Soil strength, Shear strength, Transmission lines, Earth pressure, Foundation investigations.
Identifiers: *Pull-out tests, *Uplift resistance, Anchored footings, Fort Thompson-Grand Isld Trans Line, Screw anchor footings, Pressed plate footings.

The Bureau of Reclamation tested 17 full-size transmission tower footings in dune sand. An uplift load was applied to each footing and vertical and horizontal movements and rotations were measured. The footing types tested were: (1) anchor bar--a concrete cap connected to 4 reinforced grout columns, (2) pressed plate--a steel plate and stem placed in compacted soil, and (3) screw anchor--a concrete cap connected to 3 or 4 steel screw anchors. Generally, screw anchor footings were the most resistant to movement under load, followed by the pressed plate, and

then the anchor bar. Three individual vertical anchor bar columns also were tested. Analyses indicated these columns resisted more than 3 times the predicted uplift loads. The results appear to indicate that lateral pressures in the dune sand increased considerably as the columns moved through the soil. Further research is needed to accurately predict the movement of footings under uplift loads. (USBR)
W72-11793

MUDDY CREEK RESERVOIR, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Information Service as PB-202 903D, $3.00 in paper copy, $0.95 in microfiche. November 16, 1970. 19 p, 3 illus, 5 tab, append.

Descriptors: *Flood control, *Environmental effects, *Earth dams, *Reservoir operation, Natural streams, Land development, Project benefits, Turbidity, *Pennsylvania, Dam construction, Recreation, Project planning, Land use, Silting, Productivity.
Identifiers: *Environmental Impact Statements, *Teepleville (Penn).

This dry-bed reservoir project would require construction of a rolled earth embankment dam located near Teepleville, Pennsylvania. This detention type dam represents completion of the coordinated French Creek Basin reservoir. The project would permit full realization of designed flood protection of three reservoir systems. Project construction would result in the loss of a small portion of existing stream at dam site and 1,210 acres of land would be subject to periodic inundation. There will be a temporary increase in stream turbidity and siltation during construction. The increased flood protection could encourage increased agricultural usage and reduce lands available for wildlife protection. Long-term productivity will be served by providing outdoor recreation opportunity for public use. Alternatives considered include construction of a large multiple purpose reservoir and no action. (Waldron-Florida)
W72-12340

BEAVER DRAINAGE DISTRICT, OREGON--PROPOSED IMPROVEMENTS, FLOOD PROTECTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08C.
W72-12341

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Information Service as PB-200 792D, $3.00 in paper copy, $0.95 in microfiche. April 9, 1971. 25 p, 2 map.

Descriptors: *Environmental effects, *Dam construction, *Multiple-purpose projects, *Flood control, Erosion control, Rockfill dams, Natural streams, Rock mechanics, Reservoirs, Rural areas, *Oregon, *California, Recreation, Irrigation practices, Crop production, Land use, Administrative agencies.
Identifiers: *Environmental Impact Statements, *Applegate River, Oregon.

This project calls for construction of a multiple-purpose dam and lake project in Jackson County, Oregon, and Siskiyou County, California. The plan of improvement provides for a rockfill embankment dam and will result in the substitution of a dam and lake for about five miles of free-flowing river and adjacent valley floor. The project will, by serving flood control and irrigation needs, provide for an early increase in future agricultural productivity. There will be a change of some surrounding project lands from remote and unspoiled areas to intensive recreational activity. The project will reduce downstream floods, debris accumulation and loss of topsoil. Alternatives to the project are dam construction at other sites or no action. (Waldron-Florida)
W72-12342

8E. Rock Mechanics and Geology

AZOTEA TUNNEL INSTRUMENTATION PROGRAM, SAN JUAN-CHAMA PROJECT, NEW MEXICO,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08A.
W72-11787

8G. Materials

A SURVEY OF THE PRINCIPLES OF METALLIC CORROSION AND ITS CONTROL IN SALINE WATERS,
Commonwealth Scientific and Industrial Research Organization, Garden City (Australia). Div. of Mineral Chemistry.
For primary bibliographic entry see Field 03C.
W72-11759

8I. Fisheries Engineering

BIOLOGICAL BASIS FOR THE COMMERCIAL SIZE OF THE SEA TROUT SALMO TRUTTA MORPHA LACUSTRIS OF THE GREAT LAKES OF NORTHERN KARELIA,
D. K. Khalturin.
Vopr Ikhtiol, Vol 11, No 3, p 464-470, 1971.
Identifiers: *Fish management, *Commercial fish, Biology, Karelia, Lakes, Legislation, Salmo trutta morpha lacustris, Size, Trout, USSR, Fish stocking.

During the past decade catches of S. trutta morpha lacustris in the Karelian lakes forming the basin of the White Sea have been rapidly decreasing. This has been largely due to irrational management of the lakes and lack of adequate guidance in fish breeding. The White Sea Biological Station of the Karelian Branch of the Academy of Science of the USSR had made a series of recommendations to the Supreme Soviet of the Karelian ASSR for rigidly enforced laws governing fish size and limits on catches, and management of the fish industry in order to alleviate the situation.--Copyright 1972, Biological Abstracts, Inc.
W72-11848

CHANGES IN BLOOD LACTIC ACID CONCENTRATIONS IN ALEWIVES (ALOSA PSEUDOHARENGUS) DURING PASSAGE THROUGH A POOL AND WEIR FISHWAY,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
C. L. Dominy.
J Fish Res Bd Can. Vol 28, No 8, p 1215-1217. 1971. Illus.
Identifiers: *Alewives, Alosa-Pseudoharengus, *Blood, Fishway, *Lactic-Acid, Passage, Pool, Weir.

Blood lactic acid concentration of anadromous A. pseudoharengus sampled during their upstream migration through a pool and weir fishway was not extremely high (46.7 mg/100 ml) and the degree of exercise exhibited during ascent was judged to be moderate. For fish that were subjected experimentally to severe exercise, the concentration (108.7 mg/100 ml) was more than 5 times that for rested fish (18.9 mg/100 ml). Of the 3 groups of fish sampled directly from the fishway pools, only 1 had an average concentration that differed significantly from that for the rested state.--Copyright 1972, Biological Abstracts, Inc.
W72-12252

TULATIN PROJECT, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-12331

CAMERON-CREOLE WATERSHED, LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-12334

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

AN INDEPENDENT STUDY COURSE IN WATER RESOURCES,
Southern Illinois Univ., Carbondale. Dept. of Conservation and Outdoor Education.
P. F. Nowak.
Journal of Environmental Education, Vol. 1, No. 3, Spring 1970. 2 p.

Descriptors: *Education, *Water resources, *Social aspects, *Training, Environment.

The adult segment of the American population has had little environmental education and it is resultingly ill-equipped to confront the environmental problems of the day. Even youth are receiving only a haphazard smattering of educational experiences dealing with environmental issues. Dr. W.B. Stapp of the University of Michigan formed a group to develop an independent correspondence course in environmental conservation. A water resources course was created as an experimental segment of this total program in order to evaluate the innovated concepts upon which the course was based. The course materials consisted of a text and a series of activities which were designed to integrally provide a total environmental picture to the student. A set of course evaluation materials are described which provided a picture of the students and their educational gains in the course. The students, who were evenly split between male and female and had an average age of 38.3 years, showed a 44.6% increase in their general knowledge of water resources and a 35% increase in their knowledge of local community water resources. It seems evident that environmental education programs for adults are needed and wanted. (Casey-Arizona)
W72-12350

9C. Research Facilities

EXPANSION OF THE ALASKA WATER LABORATORY,
Congress, Washington, D.C.; and House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-12303

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication AND Distribution

BIBLIOGRAPHY OF SALINE WATER CONVERSION LITERATURE,
Rocketdyne, Canoga Park, Calif.
For primary bibliographic entry see Field 03A.
W72-12044

LEGAL ASPECTS OF WATER POLLUTION IN DELAWARE, MARYLAND AND VIRGINIA, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05G.
W72-12297

10F. Preparation of Reviews

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF INORGANIC MERCURY,
National Inst. of Environmental Health Sciences, Research Triangle Park, N.C.
For primary bibliographic entry see Field 05A.
W72-11797

MERCURY IN THE ENVIRONMENT. A TOXICOLOGICAL AND EPIDEMIOLOGICAL APPRAISAL,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 05C.
W72-11842

THE PESTICIDE MANUFACTURING INDUSTRY-CURRENT WASTE TREATMENT AND IDISPOSAL PRACTICES,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-12009

OCEANOGRAPHY OF THE NEARSHORE COASTAL WATERS OF THE PACIFIC NORTHWEST RELATING TO POSSIBLE POLLUTION.
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-12190

GROUNDWATER POLLUTION IN ARIZONA, CALIFORNIA, NEVADA, AND UTAH,
Fuhriman, Barton and Associates, Provo, Utah.
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For primary bibliographic entry see Field 01A.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 21
NOVEMBER 1, 1972

W72-12389 -- W72-13088

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
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VOLUME 5, NUMBER 21
NOVEMBER 1, 1972

W72-12389 -- W72-13088

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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2A. General

PROGRAM FOR ESTIMATING RUNOFF FROM INDIANA WATERSHEDS PART II. ASSEMBLY OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
H. T. Lee, D. Blank, and J. W. Delleur.
Available from the National Technical Information Service as PB-211 543, $3.00 in paper copy, $0.95 in microfiche. Purdue University Water Resources Research Center Technical Report No 33, p 29 May 1972. 15 fig, 2 tab, 27 ref, append. OWRR-B-008-IND (8).

Descriptors: *Hydrologic data, *Rainfall-runoff relationships, *Drainage patterns, *Topography, Geomorphology, Data storage and retrieval, Watersheds, Hydrographs, Networks, Model studies, Indiana, *Small watersheds.
Identifiers: Geomorphologic data, Data bank, Drainage network, Stream network.

Banks of hydrologic and geomorphologic data are presented for Indiana small watersheds and some applications of these data are discussed. Four major types of data were collected. They are: the rainfall, and the runoff data which were collected for 55 watersheds, and the drainage networks and the topography data which were collected for 34 of these watersheds. The data were recorded first on computer cards. They were printed, plotted and checked. Then they were loaded on four different magnetic tapes. The first contains the single storm rainfall excesses and the direct runoffs. The second contains the single storm rainfalls and the runoff hydrographs. The third contains the plan-form of the stream networks. The fourth contains the elevation contours of the watersheds. These data banks are useful in hydrograph analysis, estimation of instantaneous hydrographs, and identification and calibration of hydrologic models for runoff estimation. They have potential applications in drainage design, and development and management of water resources in general.
W72-12392

OCEANIC PART OF THE HYDROLOGICAL CYCLE,
Laevastu, L. Clarke, and P. M. Wolff.
World Meteorological Organization Reports on IMO/IHD Projects, Report No 11, 1969. 71 p, 9 tab, 63 ref.

Descriptors: *Hydrologic cycle, *Evaporation, *Precipitation (Atmospheric), *Hydrologic budget, *Oceans, Sea water, Atmosphere, Weather patterns, Meteorology, Weather forecasting, Reviews, Synoptic analysis, Transfer, International Hydrological Decade.
Identifiers: Water vapor transport.

The present state of knowledge of evaporation and precipitation at sea and the transport of moisture from the oceans to the continents is reviewed, with emphasis on the practical aspects of the oceanic part of the cycle. Formulas for computation of evaporation are presented and examples of isoptic and climatological evaporation charts are given. Precipitation at sea is discussed mainly from a climatological point of view. The discussion of the transport of water vapor across the continental boundaries reviews briefly the source regions, amounts, and seasonal variations. The possibilities of extended hydrometeorological and hydrological forecasts and outlooks are outlined. The gaps in knowledge of the oceanic part of the hydrological cycle are listed for stimulation of further research. (Knapp-USGS)
W72-12416

HYDROLOGY OF MOUNTAIN RIVERS (VOPROSY GIDROLOGII GORNYKH REK),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12434

THE EFFECT OF FORESTS ON THE WATER BALANCE OF DRAINAGE BASINS,
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 04C.
W72-12442

LITTER PRODUCTION BY OAK-MOUNTAIN MAHOGANY CHAPARRAL IN CENTRAL ARIZONA,
Forest Service, (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
C. P. Pase.
USDA Forest Service Research Note RM-214, 1972, 7 p., 5 fig.

Descriptors: *Litter, *Chaparral, *Watershed management, *Biomass, Retention, Brush, Oak trees, *Arizona.
Identifiers: *Forest floor, Mountainmahogany, Quercus, Cercocarpus.

Annual litter fall from shrub live oak was 192 g/m2 crown area on southerly slopes, and 138 g on northerly slopes. For the chaparral community as a whole, southerly aspects produced 193 g/m2 crown areas and northerly aspects, 215 g. Most litter fell during late spring and early summer, least in fall and early winter. Forest floor varied from 9.2 to 27.1 metric tons per ha. Maximum water retained against free drainage was 4.8 mm under shrub live oak and 5.1 mm under Pringle manzanita. (Pase-Forest)
W72-12812

HYDROLOGIC BUDGET OF THE POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. G. Evans.
M.S. Thesis, 1971, 235 p. 13 tab, 23 fig, 124 ref. OWRR B-043-COLO (1).

Descriptors: *Hydrologic budget, *Irrigation operation and maintenance, *Water management (Applied), *Water demand, *Model studies, *Colorado, Irrigated lands, Irrigation canals, Irrigation water, Water utilization, Return flow, Reservoirs, Groundwater mining, Water transfer, Farm management, Surveys, Aerial photography, Mapping, Classification, Computer programs, Diversions, Water shortage, Water conveyance, Surplus water, Consumptive use.
Identifiers: *Cache la Poudre Valley (Colorado).

Uncoordinated construction of privately financed irrigation facilities in the Cache la Poudre Valley has a very large impact upon the agricultural economy of Colorado. The very high utilization of irrigation water is reflected by intensive use of return flows, interconnected regulatory surface storage facilities, groundwater mining and an exchange system characterized by duplication of facilities and inefficient operation. A water-related land use survey was made of the irrigated section of the valley, including aerial photography, map preparation, categorization and breakdown into canal systems. A hydrologic budget was programmed involving irrigated lands and quantitative effects of water diversions under conveyance and application efficiencies. Irrigation demand, water surpluses, and deficits were computed for each canal on a mean monthly and mean annual basis. Crop requirements are being adequately met, with some local areal deficiency and surplus. (Popkin-Arizona)
W72-12822

2B. Precipitation

A SYNOPTIC CLIMATOLOGY FOR SNOWSTORMS IN NORTHWESTERN NEVADA,
National Weather Service, Reno, Nev. Weather Service Office.
For primary bibliographic entry see Field 02C.
W72-12432

DISTRIBUTION AND VARIABILITY OF ANNUAL PRECIPITATION ON THE KOLKHIDA LOWLAND (RASPREDELENIYE I IZMENCHIVOST' GODOVYKH OSADKOV NA TERRITORII KOLKHIDSKOY NIZMENNOSTI),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12437

METEOROLOGICAL EFFECTS OF THE HEAT AND MOISTURE PRODUCED BY MAN,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 05A.
W72-12464

APPLIED CLIMATOLOGY--AN OLD DISCIPLINE FACES A DYNAMIC FUTURE,
Delaware Univ., Newark. Dept. of Geography.
J. R. Mather.
Professional Geographer, Vol 24, No 2, p 137-141, May 1972. 4 ref.

Descriptors: *Climatology, *Application methods, *Planning, Climatic data.
Identifiers: *Applied climatology, *Multidisciplinary studies.

Applied climatology is the scientific analysis of a statistical collective of individual weather conditions directed toward a useful application for an operational purpose. Although the discipline has a long and illustrious history, it really came into its own during World War II, when climatic information and interpretation was so important for strategic purposes. Since then, the real developments have been related almost entirely to weather forecasting and weather modification rather than to the development of possibly more useful applications for operational purposes. Applied climatology is a multidisciplinary field cutting across many of the bounds of traditional geography. Two examples of the wide range of applications are given: Thornthwaite's use of climatic schedules for irrigated crop planting purposes in Seabrook, N.J., and the work of the Olgyays in championing the idea of adjusting house design and orientation to climatic potentials. It is felt that the field has a promising and useful future. (Casey-Arizona)
W72-12506

ON THE MEDITERRANEAN CLIMATIC REGIME OF WEST PAKISTAN,
Institut Francais, Pondichery (India).
V. M. Meher-Homji.
Archiv fur Meteorologie, Geophysik und Bioklimatologie, Series B: Climatology, Bioclimatology, Radiation Research, Vol 19, No 3, p 277-286, 1971. 3 fig, 3 tab, 11 ref.

Descriptors: *Rainfall, *Seasonal, *Climatic zones, *Arid lands, Climatic data, Mapping, Geographical regions, Statistical analysis, Foreign lands.
Identifiers: *Mediterranean climates, *Climatic classification, *Coefficient of variation.

The Indo-Pakistan subcontinent contains a number of rainfall regimes: tropical, tropical dissymetric, bixeric, irregular, axeric, and Mediter-

ranean. The latter climate is defined as one having a mild, rainy winter in which crop growth is not inhibited. The intensity of estival dryness determines the degree of Mediterraneity. Three categories are mapped: pure mediterranean (no summer rainfall), attenuated mediterraneity (greater than 40% rainfall in the hot season) and moderate mediterraneity (less than 40% summer rain on the average). Using the coefficient of variation of rainfall and the numbers of rainy days during cool seasons and hot seasons, the various rainfall regimes are recognized and geographically mapped. Various transitional regimes are discussed. (Casey-Arizona)
W72-12510

DISTRIBUTION OF TOTAL DAILY ATMOSPHERIC PRECIPITATION AND ITS EFFECTIVENESS (RASPREDELENIYE ATMOSFERNYKH OSADKOV PO SUTOCHNYM SUMMAM I VOPROS OB IKH EFFEKTIVNOSTI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
A. A. Rode.
Pochvovedeniye, No 11, p 83-92, November 1971. 1 fig, 6 tab, 3 ref.

Descriptors: *Precipitation (Atmospheric), *Effective precipitation, *Rainfall disposition, *Distribution patterns, Soil-water-plant relationships, Root systems, Root zone, Soil moisture, Moisture content, Mositure availability, Evaporation, Seasonal, Variability, Geographical regions.
Identifiers: *USSR, *European USSR, *Ukraine, *Soil hydrology.

Calculation of the amount of precipitation occurring in the USSR during the warm season (April-September) in the form of daily precipitation amounts was based on data of 149 meteorological stations in 12 regions of the European USSR and 13 regions in the Asiatic part of the USSR, exclusive of mountain areas and the Siberian Far North. Twenty-four-hour precipitation less than 1 mm is negligible, varying between 2% and 9% of the warm-season total and averaging only 4%. Daily precipitation amounts of less than 5 mm vary between 15% and 45% of the totals and average 29%. Twenty-four-hour precipitation in the 5- to 10-mm range varies between 19% and 31%, averaging 24%, and that in excess of 10 mm varies between 30% and 65%, averaging 47%. Effectiveness of precipitation is examined from both the hydrologic and biological standpoints. A daily amount of precipitation equal to daily evaporation is proposed as a conditional boundary between hydrologically effective and ineffective precipitation. Biologically effective precipitation must be judged on the basis of moisture content of upper soil layers and amount of small roots and root hairs in them. Only the amount of precipitation which is actually available to the root environment should be regarded as biologically effective. (Josefson-USGS)
W72-12695

NITROGE, PHOSPHORUS, AND POTASSIUM CONTENT IN ATMOSPHERIC PRECIPITATION IN BELORUSSIA (POSTUPLENIYE AZOTA, FOSFORA I KALIYA S ATMOSFERNYMI OSADKAMI V BELORUSSII),
Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR).
I. A. Yushkevich, N. I. Turenkov, and I. A. Alekseychik.
Pochvovedeniye, No 11, p 70-74, November 1971. 5 tab, 3 ref.

Descriptors: *Soil chemistry, *Precipitation (Atmospheric), *Nitrogen compounds, *Phosphorus, *Potassium, Meteorology, Weather, Rain, Rainfall intensity, Snow, Temperature, Average, Monthly, Seasonal, Annual.
Identifiers: *USSR, *Belorussia, *Nitrate nitrogen, *Ammonia nitrogen.

Investigations were conducted in Kurasovshchina in southwest Minsk in 1965-70 and in nearby Shchemyslitsa in 1965-66 and 1968-69 to study the content of nitrogen, phosphorus, and potassium in atmospheric precipitation. Average annual precipitation in the region is 622 mm, of which about 75% is rain and about 25% solid and mixed precipitation. The nitrate nitrogen content in atmospheric precipitation depends mainly on rainfall intensity. Summer showers and steady autumn rains contain less nitrate nitrogen than light rains and snowfalls. The concentration of ammonia nitrogen is strongly affected by temperature and is higher in the precipitation of the warm season. The average monthly nitrate nitrogen content at Kurasovshchina during the period of observations varied between 0.22 mg/liter and 0.31 mg/liter. In the Kurasovshchina area, the average annual amount of bound nitrogen delivered to the soil with atmospheric precipitation was 6.45 kg/ha and in the Shchemyslitsa region, 5.43 kg/ha. The amount of phosphorus delivered to the soil by precipitation was small, averaging about 0.4 kg of P205/ha annually, regardless of the season. The K20 content in atmospheric precipitation depends on weather conditions and is highest in summer precipitation following dry and windy periods, decreasing considerably with the approach of fall humid weather and with the establishment of a snow cover. At Kurasovshchina, the average annual amount of K20 delivered to the soil by precipitation was 4.56 kg/ha and at Shchemyslitsa, it was 4.03 kg/ha, varying during individual years between 3.26 kg/ha and 6.11 kg/ha. (Josefson-USGS)
W72-12696

FLORIDA CUMULUS SEEDING EXPERIMENT FOR DROUGHT MITIGATION, APRIL-MAY 1971,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 03B.
W72-12705

PRECIPITATION SCAVENGING (1970).
For primary bibliographic entry see Field 05B.
W72-12752

RADAR OBSERVATIONS OF CONVECTIVE STORM CIRCULATION AND ITS RELATION TO PRECIPITATION SCAVENGING,
National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
For primary bibliographic entry see Field 05B.
W72-12753

SCAVENGING OF TRACER IN SEVERE STORMS,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 05B.
W72-12754

INTERACTIONS OF CLOUD CONDENSATION NUCLEI AND ICE NUCLEI WITH CLOUD AND PRECIPITATION ELEMENTS: A REVIEW,
Washington Univ., Seattle. Dept of Atmospheric Sciences.
For primary bibliographic entry see Field 05B.
W72-12755

ENTRY OF FREEZING NUCLEI INTO PRECIPITATION,
Wyoming Univ., Laramie. Natural Resources Research Inst.
For primary bibliographic entry see Field 05B.
W72-12756

IN-CLOUD SCAVENGING ANALYSIS FRO COSMOGENIC RADIONUCLIDE MEASURE MENTS,
Battelle-Pacific Northwest Labs., Richlan Wash.
For primary bibliographic entry see Field 05B.
W72-12757

STABLE ELEMENTS OF THE ATMOSPHER AS TRACERS OF PRECIPITATION SCAVEN ING,
Battelle-Pacific Northwest Labs., Richlan Wash.
For primary bibliographic entry see Field 05B.
W72-12758

CONCENTRATION VARIATION OF SOM TRACE METALS IN PRECIPITATION FRO GREAT PLAINS THUNDERSTORMS,
Chadron Atmospheric Research Inst., Nebr.
For primary bibliographic entry see Field 05B.
W72-12759

SCAVENGING OF SOLUBLE DYE PARTICLE BY RAIN,
Battelle-Pacific Northwest Labs. Richland, Wash
For primary bibliographic entry see Field 05B.
W72-12761

COLLECTION EFFICIENCIES OF RAINDRO FOR SUBMICRON PARTICULATES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05B.
W72-12762

COLLECTION EFFICIENCY OF WATE DROPLETS IN AGCL AEROSOL,
Clarkson Coll. of Technology, Potsdam, N. Dept. of Chemistry; and Clarkson Coll. Technology, Pottsdam, N.Y. Inst. of Colloid a Surface Science.
For primary bibliographic entry see Field 05B.
W72-12763

COLLECTION EFFICIENCY IN WASHOUT I RAIN,
Berg (T. G. Owe), Inc., Garden Grove, Calif.
For primary bibliographic entry see Field 05B.
W72-12764

CONTINUOUS CHARGED CLOUD-PARTICL SAMPLER,
Manchester Univ. (England). Dept. of Physics.
For primary bibliographic entry see Field 05B.
W72-12766

PULSED-LASER HOLOGRAPHY FOR ANAL SIS OF PARTICLE SIZE AND DISTRIBUTION
Battelle-Pacific Northwest Labs., Richla Wash.
For primary bibliographic entry see Field 05B.
W72-12767

THERMAL-DIFFUSION CHAMBERS CLOUD-NUCLEI COUNTERS,
Missouri Univ., Rolla. Graduate Center for Cl Physics Research.
For primary bibliographic entry see Field 05B.
W72-12768

AUTOMATIC SEQUENTIAL RAIN SAMPL FOR SCAVENGING STUDIES,
Argonne National Lab., Ill. Radiological Phys Div.
For primary bibliographic entry see Field 05B.
W72-12769

FFECTS OF SOLUBILITIES OF GASES ON HEIR SCAVENGING BY RAINDROPS,
attelle-Pacific Northwest Labs., Richland, Vash.
or primary bibliographic entry see Field 05B.
/72-12770

ABORATORY INVESTIGATIONS ON VASHOUT OF TRACE GASES,
rankfurt Univ. (West Germany). Institut fuer Meteorologie und Geophysik.
or primary bibliographic entry see Field 05B.
/72-12771

UROPEAN INTEREST IN ACIDIC RECIPITATION: A REVIEW,
attelle Memorial Inst., Seattle, Wash. Research enter.
or primary bibliographic entry see Field 05B.
/72-12773

CAVENGING OF SO2 BY CONVECTIVE TORMS,
esearch Council of Alberta, Edmonton.
or primary bibliographic entry see Field 05B.
/72-12775

HEORY OF DIFFUSIVE AND IMPACTIVE CAVENGING,
orth American Rockwell Corp., Thousand Oaks, alif. Science Center.
or primary bibliographic entry see Field 05B.
'72-12778

TTACHMENT OF TRACE SUBSTANCES ON TMOSPHERIC AEROSOLS,
exas Univ., Austin.
or primary bibliographic entry see Field 05B.
'72-12779

ECENT CALCULATIONS OF COLLISION EF-CIENCIES,
niversity Coll., London (England). Dept. of athematics.
or primary bibliographic entry see Field 05B.
72-12780

OCESSES INFLUENCING EVOLUTION OF ROPLET OR AEROSOL SPECTRUM,
itional Center for Atmospheric Research, ulder, Colo.
r primary bibliographic entry see Field 05B.
72-12781

ORETIC PROCESSES IN SCAVENGING,
ttelle-Pacific Northwest Labs., Richland, ish.
r primary bibliographic entry see Field 05B.
72-12783

ECIPITATION SCAVENGING IN A LARGE-LOUD DIFFUSION CODE,
lifornia Univ., Livermore. Lawrence Radiation b.
r primary bibliographic entry see Field 05B.
'2-12784

AVENGING OF AEROSOLS BY RAIN: A NU-RICAL STUDY,
M Scientific Center, Palo Alto, Calif.
primary bibliographic entry see Field 05B.
2-12785

E OF NATURAL RADIOACTIVITIES TO TIMATE LARGE-SCALE PRECIPITATION AVENGING,
SA Research Labs., Silver Spring, Md. Air ources Lab.
For primary bibliographic entry see Field 05B.
W72-12787

SCAVENGING PREDICTION USING RATIOS OF CONCENTRATIONS IN AIR AND PRECIPITATION,
Division of Biology and Medicine (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-12788

THROUGHFALL AND STEMFLOW RELATIONSHIPS IN SECOND-GROWTH PONDEROSA PINE IN THE BLACK HILLS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. K. Orr.
USDA, Forest Service Research. Note RM-210, 1972, 7 p.

Descriptors: *Throughfall, *Stemflow, *Ponderosa pine trees, *Canopy, *Interception, Precipitation, Hydrology, Forecasting, *South Dakota.
Identifiers: *Throughfall-canopy relationships, *D.b.h.-stemflow relationships, Net rainfall, Second-growth ponderosa pine forest, *Black Hills.

Results demonstrate use of canopy density to adjust throughfall, and diameter, breast high (d.b.h.) to adjust stemflow, though both are primarily dependent on gross rainfall. Combining the two relationships, an equation for estimation of net rainfall under Black Hills conditions is presented. (Orr-Forest Service)
W72-12813

AGROMETEOROLOGICAL INVESTIGATIONS OF HEAT BALANCE AND WATER BALANCE IN AGRICULTURAL FIELDS: II. COMPONENTS OF THE WATER BALANCE,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
For primary bibliographic entry see Field 03F.
W72-12888

MEASUREMENT AND DISTRIBUTION OF RAINFALL IN PINE STANDS OF THE VACCINIUM VITIS-IDAEA AND V. MYRTILLUS TYPES,
L. Raid.
Sb Nauchn Tr Est S-Kh Akad. 60. p 8-18. 1969.
Identifiers: Distribution, Rain gages, Interception, *Measurement, Pine G, Rain, *Rainfall, Spruce G, Stands, USSR, Vaccinium myrtillus D, Vaccinium vitis idaea D.

In pure Vaccinium vitis-idaea type (VV) pine forests, 3-4 rain gauges are adequate, whereas in the VV and V. myrtillus type pine forests with spruce underwood 8-12 rain gauges are required. The amount of rainfall intercepted by tree crowns and its distribution in the stands depends on composition and density of the stand, structure of the crown, as well as on the amount and intensity of precipitation. In pure pine forests, crowns intercepted 24-28% of precipitation during the growth season, 33-34% in forests with spruce underwood, and up to 36.6% in 2-storied stands. The amount of rainfall varies within a comparatively wide range, depending on the place of measurement; in pure pine forests the difference between the amount of precipitation in the individual rain gauges was 18.5-26.4%, whereas with the presence of spruce underwood it was 34.9-35.9%.--Copyright 1972, Biological Abstracts, Inc.
W72-12917

2C. Snow, Ice, and Frost

SALINITY CALCULATIONS FROM IN SITU MEASUREMENTS,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 02L.
W72-12427

A SYNOPTIC CLIMATOLOGY FOR SNOWSTORMS IN NORTHWESTERN NEVADA,
National Weather Service, Reno, Nev. Weather Service Office.
B. L. Nelson, P. M. Fransioli, and C. M. Sakamoto.
National Oceanic and Atmospheric Administration Technical Memorandum NWS WR-73, February 1972. 23 p, 16 fig, 2 tab, 10 ref.

Descriptors: *Snowfall, *Climatology, *Classification, *Nevada, *Snow surveys, Meteorological data.
Identifiers: *Snowstorms.

A climatological aid is presented for forecasting snow in northwestern Nevada. A total of 112 snowstorms affecting Reno, Lovelock, or Winnemucca over a 10-year period were analyzed. Five separate categories were defined and are discussed. A separate discussion of the unusual thunderstorm-snowstorm occurrence on May 20-21, 1971, is included. The storms were typed using mean storm tracks for the United States after Bowie and Weightman. The North Pacific Storm Track was interpreted to be the path of cyclones moving inland from northern California, Washington, and Oregon and was broken down into three types: (1) a north Pacific cyclone tracking across Washington or Oregon with no wave development along the front; (2) a north Pacific cyclone tracking southeasterly across Nevada; and (3) a north Pacific cyclone with wave development along the frontal system. Cyclones that move inland from southern California (type 4) were categorized as a South Pacific Storm Track moving inland into California and tracking across southern Nevada. Snowfall that does not conform to one of the other four storm tracks was classified as type 5. Over 80% of the snowstorms were associated with the three types of North Pacific Storm Track. (Woodard-USGS)
W72-12432

EVALUATION OF AVALANCHE HAZARDS IN THE VICINITY OF MZHAVETSKALI AND AVALANCHE CONTROL TECHNIQUES (OTSENKA LAVINNOY OPASNOSTI V RAYONE MZHAVETSKALI I ZASHCHITA OT LAVIN),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12440

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W72-12548

BIOLOGICAL SEWAGE TREATMENT IN A COLD CLIMATE AREA,
Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05D.
W72-12564

MICROBIOLOGIC INDICATORS OF THE EFFICIENCY OF AN AERATED, CONTINUOUS-

-DISCHARGE, SEWAGE LAGOON IN NORTHERN CLIMATES,
North Dakota Univ., Grand Forks. School of Medicine.
For primary bibliographic entry see Field 05D.
W72-12565

DISINFECTION AND TEMPERATURE INFLUENCES,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W72-12566

DETERMINATION OF THE WATER EQUIVALENT OF SNOW COVER--METHODS AND EQUIPMENT.
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Trans available from the National Technical Information Service as TT 70-50093, $3.00 in paper copy, $0.95 in microfiche. Israel Program for Scientific Translations, Jerusalem, L. K. Vershinina, and A. M. Dimaksyan, editors, 1971. 142 p. (TT 70-50093, Translated from Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 178, Leningrad, 1969).

Descriptors: *Snow surveys, *Snow cover, *Water equivalent, *Depth, *Aerial photography, Remote sensing, Radiation, Gamma rays, Meteorology, Topography, Water balance, Water table, Soil moisture, Ice, Watersheds (Basins), Physiographic provinces, Instrumentation, Equipment, Measurement, Analytical techniques.
Identifiers: *USSR, *Snow depth, *Snow density, *Snow courses, Water-balance method, Radiometers.

This collection contains 11 papers dealing with aerial photographic snow-depth measurements, based on attenuation of the natural gamma radiation of the earth by snow cover. Data are given on snow surveys performed on the ground and on snow depths as observed from the air. Computed water equivalents of snow are compared with water equivalents reported by radiotelemetering snow gages. Snow-survey operations conducted in 1964-68 in different physiographic provinces of the USSR will provide data for locating snow courses and for designing new snow-survey systems. (Josefson-USGS)
W72-12697

ENTRY OF FREEZING NUCLEI INTO PRECIPITATION,
Wyoming Univ., Laramie. Natural Resources Research Inst.
For primary bibliographic entry see Field 05B.
W72-12756

SCAVENGING BY SNOW AND ICE CRYSTALS,
Illinois Inst. of Tech., Chicago.
For primary bibliographic entry see Field 05B.
W72-12760

SLAB AVALANCHING AND THE STATE OF STRESS IN FALLEN SNOW,
Washington Univ., Seattle.
C. B. Brown, R. J. Evans, and E. R. LaChapelle.
Journal of Geophysical Research, Vol 77, No 24, p 4570-4580, August 20, 1972. 8 fig, 2 tab, 8 ref.

Descriptors: *Avalanches, *Shear strength, *Shear stress, *Snowpacks, Snow, Mass wasting, Mechanical properties, Yield strength.
Identifiers: *Shear failure (Slab avalanches), *Slab avalanches.

The initial state of stress in fallen snow may be calculated by considering incremental gravity loading of the accreting snow slab. It is postulated that slab avalanche release is initiated by a reduction of shear strength on a critical layer to a value below that of the existing shearing stress. The manner of top tensile failure, side shear failure, and either buckling or shear compression failure at the lower end of the slab is described. These results provide avalanche dimensions that are lower bounds on those occurring naturally. (Knapp-USGS)
W72-12867

ICE THICKNESS OBSERVATIONS, NORTH AMERICAN ARCTIC AND SUBARCTIC, 1968--69, 1969-70,
Cold Regions Research and Engineering Lab., Hanover, N.H.
M. A. Bilello, and R. E. Bates.
Army Cold Regions Research and Engineering Laboratory Special Report 43, Part 6, June 1972. 97 p, 6 fig, 2 tab, 19 ref, 2 append. DA Task 4A061102B52E02.

Descriptors: *Ice cover, *Arctic, *North America, *Sea ice, *Iced lakes, Ice breakup, Rivers, Data collections, Investigations, Measurement, Alaska, Cold regions.
Identifiers: *Ice thickness, Ice formation.

This is the sixth in a series of reports on lake and river ice and land-fast sea-ice thicknesses observed throughout the North American arctic and subarctic during 1968-69 and 1969-70 seasons. Information on ice surface conditions, dates of first ice, freeze-over and breakup, and measurements of ice thickness made on the second voyage of the S. S. Manhattan are also included. Continued reports from the Alaska National Guard Network on ice thickness measurements on lakes and rivers in the remote regions of interior Alaska are presented. Analyses are made of maximum observed ice thicknesses reported during the two winters in North America. (Woodard-USGS)
W72-12868

EFFECT OF FOREST AND FOREST BELTS ON THE SNOW COVER IN THE CENTRAL POLESIE IN THE UKRAINIAN SSR,
F. S. Komarov, and P. V. Lytvak.
Nauk Pr Zhytomyr Sil'S'Kohospod Inst. 16, p 77-82, 1969.
Identifiers: *Shelterbelts, Snow cover, Forests, Frozen ground, *Snow management, Soils, Ukrainian-SSR.

Investigations were carried out on forest and field plots protected by forest belts. In the middle-aged stands snow was deposited evenly. A stable snow cover is preserved in the forest for about 90 days. In 1962-1965 the highest accumulation occurred in the forest belts. The snowdrift on the windward side was 1.5-4.2 times and on the leeward side 2.0-9.2 times the height of the trees. The actively protected zone of the forest belt was 20.1% of the entire field. The snow density in forest belts was 1.2 times and in the field 1.4 times higher than in the forest. Freezing of the soil in the field was several times greater than in the forest and forest belts. In the forest, snow persists 5/10 days longer, and in the forest belts 10-15 days longer than in the field.--Copyright 1972, Biological Abstracts, Inc.
W72-12915

2D. Evaporation and Transpiration

WATER USE EFFICIENCY IN PLANT GROWTH AND AMBIENT CARBON DIOXIDE LEVEL,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 03B.
W72-12391

PROBLEMS OF EVAPORATION ASSESSMENT IN THE WATER BALANCE,
C. E. Hounam.
World Meteorological Organization Reports on WMO/IHD Projects, Report No 13, 1971. 80 p, 2 fig, 4 tab, 95 ref.

Descriptors: *Water balance, *Evaporation, *Energy budget, Data collections, Heat balance, Lysimeters, Soil moisture, Rmote sensing, International Hydrological Decade.

In computing water balances, whether for large or small areas, a major factor in the equation is evaporation. The problem of obtaining an estimate of evaporation from an area is a very difficult one in most instances, and is often simplified by using representative point estimates in catchments and subcatchments. Various methods are given for measuring point evaporation, which can be used to obtain the data needed for an assessment of the total evaporation from an area. Particular attention is given to the factors affecting the spatial variation in evaporation, and to the networks of instruments required. Accurate estimates of evaporation and aerial and satellite photography can be used in water balances for very large areas of the world. (Knapp-USGS)
W72-12415

OCEANIC PART OF THE HYDROLOGICAL CYCLE,
For primary bibliographic entry see Field 02A.
W72-12416

EVAPORATION LOSS NOW REPORTED DAILY,
National Weather Service, Lubbock, Tex.
For primary bibliographic entry see Field 03F.
W72-12515

WATER USE STUDIES ON FORAGE GRASSES IN NORTHERN NEVADA,
Nevada Agricultural Experiment Station, Reno and Agricultural Research Service, Reno, Nev Soil and Water Conservation Research Div.
A. S. Dylla, D. M. Stuart, and D. W. Michener.
Nevada University Agricultural Experiment Station T10. 56 p, May 1972. 26 fig, 23 tab, 10 ref.

Descriptors: *Evapotranspiration, *Efficiencies *Arid lands, *Grasses, Evaporation pans, Estimating equations, Solar radiation, Forage grasses Plant groupings, Climatic data, Micrometeorology, Irrigation practices, Root zone, Saline soils Nevada.
Identifiers: *Water use efficiencies.

This report covers 3 years of water use studies o 3 native meadow grass species (saltgrass, sedge and bluejoint) growing in evapotranspiration (ET tanks at Winnemucca, Nevada. Additionally, years of study were devoted to 2 native forag grasses (tall wheatgrass and alta fescue). Th sedges and saltgrass were grown under seasona high water table treatments only, while the othe species were also given surface irrigation treat ments. Ratios of measured ET in the tanks to mea sured pan evaporation, measured net radiation an calculated ET from meteorological data by th methods of Van Bavel, Blaney-Criddle and Olivie were graphed against growing season month for 1 week and 4-week periods. The highest correlatio with measured ET was obtained with the Va Pavel combination model, but the Olivier model the simplest in use when pan evaporation data a available. The sedges used the most water of th wet meadow group, followed by bluejoint and sal grass. Under irrigation, tall wheat grass used mo than alta fescue but bluejoint used the most. Su face irrigations produced the highest water use e ficiencies because they kept soil root zone salini levels below 4 mmhos/cm (saturated extract co ductivity). Saltgrass, sedges and bluejoint showe the highest water use efficiencies under high s

salinity levels. The highest water use efficiency attained was 171 lb hay/acre-inch by bluejoint and sedges. (Casey-Arizona)
W72-12522

EVALUATION OF TRANSPIRATION SUPPRESSANTS AS AN ALTERNATIVE TO THE ERADICATION OF SALTCEDAR THICKETS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 03B.
W72-12523

PHENOMENON OF WATER VAPOR ABSORPTION FROM INTERCELLULAR SPACE OF LEAVES,
L. N. Babushkin.
Izv Akad Nauk SSSR Ser Biol. 3. p 389-397. 1970. Illus. English summary.
Identifiers: *Absorption, *Water vapor, Carbon dioxide, Concentration, Intensity, Leaves, Space.

Water vapor absorption occurs simultaneously with leaf transpiration. Water absorption depends on the CO2 content in the intercellular spaces. Maximum absorption intensity is observed under optimal CO2 content. The deviation of the CO2 from the optimum to both sides leads to a decrease in vapor absorption intensity. The average value of the vapor absorption comprises 20-40% of the total amount of vapor which is formed in the intercellular space. The water vapor absorption from the intercellular space is a biological process, and carries out important physiological functions.--Copyright 1972, Biological Abstracts, Inc.
W72-12684

CONVECTIVE SALT ACCUMULATION IN THE CAPILLARY FRINGE PRODUCED BY SOIL-WATER EVAPORATION (KONVEKTIVNOYE SOLENAKOPLENIYE V KAPILLYARNOY KAYME, VYZVANNOYE ISPARENIYEM POCHVENNYKH VOD),
Institut Gidrodinamiki, Novosibirsk (USSR).
V. I. Pen'kovskiy.
Pochvovedeniye, No 11, p 137-140, November 1971. 3 fig, 2 ref.

Descriptors: *Salts, *Soil water, *Capillary action, *Capillary fringe, *Evaporation, Saturation, Moisture content, Water table, Groundwater, Porous media, Porosity, Mathematical studies, Mathematical models, Equations.
Identifiers: *USSR, Capillary rise.

The use of a mathematical model to study accumulation of salts where there is evaporation in the capillary fringe between the water table and the maximum height of capillary rise is discussed. Equations are developed to determine critical groundwater depth, total evaporation from the zone of aeration, and moisture distribution in the capillary fringe. Stratification of various types of salts in the capillary fringe is investigated and graphed on the basis of mathematical techniques. (Josefson-USGS)
W72-12691

THROUGHFALL AND STEMFLOW RELATIONSHIPS IN SECOND-GROWTH PONDEROSA PINE IN THE BLACK HILLS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02B.
W72-12813

A TEST OF THE POTENTIAL ACCURACY OF THE WATER-BUDGET APPROACH TO ESTIMATING EVAPOTRANSPIRATION,
McGill Univ., Montreal (Quebec). Dept. of Geography; and McMaster Univ., Hamilton (Ontario). Dept. of Geography.
W. R. Rouse, and R. G. Wilson.
Agricultural Meteorology, Vol 9, No 5/6, p 421-446, March 1972. 16 fig, 6 tab, 14 ref.

Descriptors: *Micrometeorology, *Evapotranspiration, *Estimating equations, *Water balance, *Energy budget, On-site data collections, Solar radiation, Soil temperature, Soil environment, Hydraulic gradient, Soil moisture.
Identifiers: *Net radiation, *Bowen ratio, *Potential evapotranspiration, *Matric potential.

Although the water-budget approach to determining evapotranspiration has the advantage of simple, easy measurement, its reliability has been questioned. This study focuses particularly on the reliability of measured soil moisture change. Latent heat of evaporation (LE) is the point of intersection between energy-budget and water-budget, so one approach may be used in testing the accuracy of the other. Using neutron attenuation and gravimetric techniques, soil moisture changes were measured for 1- and 4-day periods in a corn field. Hydraulic head gradients and soil moisture characteristics and capillary conductivities were also obtained. Measurements of net radiation, soil heat flow and Bowen ratios allowed for energy-budget calculations. Both a water budget error analysis and the experimental results lead to the conclusion that the water-budget cannot accurately estimate evapotranspiration on a daily basis due to many potentially large errors. The conditions necessary for accurate determinations are described and discussed. (Casey-Arizona)
W72-12832

A CRITICAL STUDY OF EVAPORATION BY PENMAN'S METHOD DURING THE GROWING SEASON OF VEGETATION IN THE ARID ZONE OF INDIA,
Jodhpur Univ. (India). Dept. of Mathematics.
A. Krishnan, and R. S. Kushwaha.
Archiv fur Meteorologie, Geophysik and Bioklimatologie, Series B: Climatology, Bioclimatologies, Radiation Research, Vol 19, No 3, p 267-276, 1971. 2 fig, 3 tab, 14 ref.

Descriptors: *Evapotranspiration, *Arid lands, *Estimating equations, *Evaporation pans, *On-site data collections, Correlation analysis, Regression analysis, Agroclimatology, Energy budget, Winds.
Identifiers: *Potential evapotranspiration, *India.

Jodhpur is in an arid region of low and highly variable rainfall and high evaporation. The storage and planned use of monsoon-fed reservoirs would benefit from accurate evaporation estimations. The potential evaporation calculated from Penman's equation was compared with measurements from a U.S.A. open pan evaporimeter obtained during the growing season of 1963 and 1964. Using 5-day mean values, the data indicated that Penman's method very much underestimated evaporation values. Using correlation coefficients, it was shown that under the arid zone conditions of Jodhpur, the aerodynamic term of Penman's equation was much more significant in determining evaporation than the energy balance term. The 1 and 4 weightages of the aerodynamic and energy balance terms of the original equation were revised to 0.61 and 1.13 as per observed values. (Casey-Arizona)
W72-12843

DROUGHT IN ARIZONA: A DROUGHT IDENTIFICATION METHODOLOGY AND ANALYSIS,
Arizona Univ., Tucson. Dept. of Economic and Business Research.
D. Steila.
1972. 65 P, 34 FIG, 13 TAB, 68 REF.

Descriptors: *Droughts, *Evapotranspiration, *Hydrologic budget, *Arizona, *Moisture stress, Rainfall, Model studies, Probability, Seasonal, Analytical techniques.
Identifiers: Potential evapotranspiration, Precipitation deficit.

Drought must be recognized as a frequently occurring phenomenon within Arizona. Its patterns of occurrence are complex, varying significantly in intensity, frequency, and duration from year to year. Analysis of Arizona drought records indicates that drought is not limited in either time or space, that at any given time drought status is dependent on prior moisture status, and that areas of most intense aridity are less likely to experience major negative moisture status departures. Patterns of expected monthly drought occurrence are established. The Shear-Steila Drought Index, utilizing the Thornthwaite technique as a base, appears consistently to reflect environmental changes, paralleling actual environmental moisture status. Further application of the model should aid in clarifying plant-moisture status relationships, identify threshold drought index values of significance in fire-hazard forecasting, and add to the understanding of the interrelationships that constitute area character. (Paylore-Arizona)
W72-12852

SAMPLING TO ESTIMATE MEAN LEAF TEMPERATURES AND TRANSPIRATION RATES IN VEGETATION CANOPIES,
San Diego State Coll., Calif.
P. C. Miller.
Ecology. Vol 52, No 5: p 885-889. 1971. Illus.
Identifiers: Balance, Energy budget, Canopies, Energy, Equations, *Leaves, Orientation, Rates, *Sampling, Sun, Temperatures, *Transpiration, Vegetation.

The measurement of leaf temperatures at different levels in the canopy is important for clarifying the relative contributions of each level to the energy balance, evapotranspiration, and primary production of the total canopy. Frequency mean leaf temperatures at each level will be adequate for the study. Since individual leaf temperatures vary at each level, more than one leaf temperature must be measured to estimate mean leaf temperature. A procedure is outlined for deciding the number of leaves at each level required to estimate the mean leaf temperature within specified accuracies. The procedure involves first calculating expected in sunlit leaf temperatures due to differing orientation to the sun and leaf resistance, sunlit leaf temperatures with the energy-budget equation, then estimating the variation to be solved for the number of sunlit leaves to be measured, and finally, calculating the total number of leaves to be measured at each level in order to have an adequate sample of both sunlit and shaded leaves. The number of leaves calculated by this procedure should be considered the minimum number of leaves to be measured because of other causes of variation in leaf temperatures.--Copyright 1972, Biological Abstracts, Inc.
W72-13011

2E. Streamflow and Runoff

A PROGRAM FOR ESTIMATING RUNOFF FROM INDIANA WATERSHEDS PART II. ASSEMBLY OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W72-12392

STREAMFLOW CHARACTERISTICS OF THE POTOMAC RIVER,
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 04A.
W72-12401

SEDIMENT TRANSPORT AND DEPOSITION, WALNUT AND PACHECO CREEKS, CONTRA COSTA COUNTY, CALIFORNIA, AUGUST 1965-APRIL 1970,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-12409

SURFACE WATER IN DUVAL AND NASSAU COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. Anderson.
Geological Survey Open-file Report 72007, 1972. 65 p, 19 fig, 1 tab, 11 ref.

Descriptors: *Surface water availability, *Water resources, *Florida, *Streamflow, Rainfall, Runoff, Evapotranspiration, Floods, Estuaries, Tidal effects, Temperature, Humidity, Winds, Hydrologic data, Basic data collections, Discharge measurement, Flow rates.
Identifiers: Duval County (Fla), *Nassau County (Fla).

The potential surface-water supplies from streams in Duval and Nassau Counties, Florida are enormous. Average unit runoff from the two counties is about 50% greater than that from the State as a whole. Runoff from about 12,000 square miles is available, yet surface water is little used except for cooling purposes and recreation. The chief reason for not using surface water is the availability of more than sufficient supplies of groundwater, chiefly from the Floridan aquifer. Other reasons include extreme variability in flow rates with discharges remaining very low or zero for long periods and contamination of supplies by pollutants or sea water. The source of surface water in the area is rainfall and water from the St. Johns and St. Marys rivers. Rainfall averages 51.5 inches of which about 60% returns to the atmosphere by evapotranspiration. Little of the rain seeps downward to the Floridan aquifer except in Yellow Water Creek basin. Four areas exist in which the peak rates of flow caused by specific rainfalls are distinctly different. Floods in the tide-affected areas are important in that storm tides can cause inundation of large areas not otherwise subject to flooding. (Woodard-USGS)
W72-12419

KANSAS STREAMFLOW CHARACTERISTICS. PART 9, MEAN ANNUAL RUNOFF AS RELATED TO CHANNEL GEOMETRY OF SELECTED STREAMS IN KANSAS,
Kansas State Geological Survey, Lawrence.
E. R. Hedman, and W. M. Kastner.
Kansas Water Resources Board Technical Report No 9, January 1972. 25 p, 9 fig, 2 tab, 12 ref.

Descriptors: *Streamflow, *Runoff, *Channel morphology, *Kansas, Hydrologic data, Data collections, Ephemeral streams, Perennial streams, Curves, Regression analysis, Equations, Rating curves, Correlation analysis.
Identifiers: Run-off-channel geometry relationship.

Measurements of the channel geometry of gaged streams in Kansas where mean annual flow is known were analyzed by multiple regression. The analyses provided equations relating mean annual runoff to channel geometry for perennial and ephemeral streams, and mean annual runoff to channel geometry, basin area, and precipitation for perennial streams. Equations for perennial streams were developed from the records of 45 gaging stations in Kansas. Equations for ephemeral streams were developed from the records of five gaging stations in Kansas and 13 in North and South Dakota. The equations can be used to estimate the mean annual runoff at ungaged sites. For perennial streams the standard error from a curvilinear equation using dimensions of channel geometry alone was 35%; the standard error from a linear equation using the dimensions of channel geometry, basin drainage area, and precipitation was 20%. For ephemeral streams the standard error from a curvilinear equation and also a linear equation using dimensions of channel geometry alone was 42%. (Woodard-USGS)
W72-12423

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1970,
Geological Survey, Austin, Tex.
D. E. Ferguson.
Geological Survey Open-file Report (Texas District), March 1972. 275 p, 16 fig, 14 tab, 1 ref.

Descriptors: *Hydrologic data, *Basic data collections, *Urban hydrology, *Rainfall-runoff relationships, *Texas, Floods, Streamflow, Stream gages, Discharge measurement, Flow rates, Rain gages, Peak discharge, Storms.
Identifiers: *Houston (Tex).

Basic hydrologic data were collected in the Houston urban area for the 1970 water year (October 1969 to September 1970) primarily to determine the effect of urban development on flood peaks and volume. Rainfall for the year was unevenly distributed. Individual station totals ranged from 32.2 inches at the Houston City rain gage to 58.1 inches at the Houston Alief rain gage. The comparison of accumulated monthly rainfall is shown for the 1970 water year over four widely separated drainage basins with the 30-year average (1931-60) at the Houston FAA Airport rain gage. Emphasis is given to the storms of May 1, 15-16, 21, and 30-31 when moderately heavy amounts of rain fell. Because the rains were frequent and had low intensities and long durations, they were the most significant storms of the current year. The largest amount of rainfall for an individual storm was 6.3 inches. This rainfall occurred on May 15 at the station Greens Bayou at U.S. Highway 75. (Woodard-USGS)
W72-12430

HYDROLOGY OF MOUNTAIN RIVERS (VOPROSY GIDROLOGII GORNYKH REK),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).

Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), G. N. Khmaladze, editor, 1970. 180 p.

Descriptors: *Hydrology, *Orography, *Rivers, River basins, Watersheds (Basins), Lakes, Forests, Avalanches, Mudflows, Sediments, Meteorology, Rainfall-runoff relationships, Flow, Groundwater, Water balance, Water properties, Heat, Annual, Seasonal, Forecasting.
Identifiers: *USSR, *Caucasus, *Caspian Sea, *Mountain hydrology, Lowlands, Snow avalanches, Phytoreclamation.

This collection contains 15 papers dealing with various aspects of mountain hydrology, including areal distribution and variability of average annual precipitation; calculation of mountain streamflow in an erodible channel; hydraulics of mudflows and avalanches; and effects of forest cover on water regime of mountain rivers. Other topics include: (1) effects of viscous and turbulent flow on channel conveyance; (2) sediment transport caused by wave movement; (3) relation between bottom-sediment and suspended-sediment discharges; (4) use of 'tagged' sands to study sediment transport; (5) forecasting of annual water inflow to Lake Sevan; (6) storage and flow of groundwater in lava formations; (7) evaluation ofavalanche hazards and avalanche control techniques; (8) statistical analysis of extremely large wind waves of rare occurrence; and (9) thermal regime of waters near the east coast of the Caspian Sea. (See W72-12435 thru W72-12441) (Josefson-USGS)
W72-12434

SEDIMENT TRANSPORT CAUSED BY WAVI MOVEMENT (TRANSPORT NANOSOV VOL NAMI),
Zakavkazskii Nauchno-Issledovatelski Gidrometeorologicheskii Institut, Tiflis (USSR).
V. I. Vinogradova, Ye. I. Mass, and N. I. Salukvadze.
In: Voprosy gidrologii gornykh rek; Zakavkazski Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 3 (43), p 17-28, 1970. 4 fig, 4 tab, 13 ref.

Descriptors:*Sediments, *Sediment transport *Movement, *Waves (Water), Currents (Water), Sands, Flumes, Roughness (Hydraulic), Channe flow, Velocity, Equations, Foreign research.
Identifiers: USSR, Riffles, *Georgian SSR.

Determination of sediment transport due to wav movement was based on a series of experiments i large and small flumes designed by the Georgia Scientific Research Institute of Hydraulic E gineering and Reclamation. Wave height in th large 50-m x 72-cm flume ranged from 0.095 m t 0.20 m, and wave height in the small 12-m x 31-c flume ranged from 0.08 m to 0.12 m. The slope the wave in the large flume was 0.06-0.02 and th in the small flume was 0.07-0.34. Roughness w obtained from riffles placed at the bottom of th flume. Results presented in tabular form incluc sand discharges and maximum bottom velocities varying depths and discharges in the flume. Rel tionships for determining transport of sediment l longshore currents and by flow in channels a reviewed. (See also W72-12434) (Josefson-USGS
W72-12435

RELATION BETWEEN BOTTOM-SEDIMEN AND SUSPENDED-SEDIMENT DISCHARGI (NEKOTORYYE SOOBRAZHENIYA O SOO NOSHENII MEZHDU RASKHODAMI VLEK MYKH I VZVESHENNYKH NANOSOV),
Zakavkazskii Nauchno-Issledovatelsl Gidrometeorologicheskii Institut, Tiflis (USSR).
G. N. Khmaladze.
In: Voprosy gidrologii gornykh rek; Zakavkazsk Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No (43), p 76-84, 1970. 3 fig, 1 tab, 7 ref.

Descriptors: *Sedimentation, *Sedime discharge, *Bottom sediments, *Suspended los Suspension, Discharge (Water), Rivers, Riv basins, Watersheds (Basins), Drainage ar Slopes, Variability.
Identifiers: USSR, *Caucasus, *Georgian SS *Terek River, *Suspended sediments.

To determine the ratio of bottom-sedim discharges (G) to suspended-sediment discharg (R), investigations were carried out in 1940 on t Terek River near Kazbegi in the Georgian SS The lowest G/R ratio was observed on July when water discharge was 91.8 cu m/sec a suspended-sediment discharge was 1,570 kg/s The highest G/R ratio was observed on May when water discharge was 51.0 cu m/sec a discharge of suspended sediments was 39.2 kg/s The G/R ratio varies widely for Caucasian rive ranging from 0.13 for the Kura River to 86.4 for Zhovekvara River. Large rivers generally h low G/R ratios and small rivers have high G ratios, reaching 100%. Variations in G/R val along the channel depend on hydraulic conditio river-basin characteristics, and volume of flow rivers. (See also W72-12434) (Josefson-USGS)
W72-12436

DISTRIBUTION AND VARIABILITY OF A NUAL PRECIPITATION ON THE KOLKHI LOWLAND (RASPREDELENIYE I

MENCHIVOST' GODOVYKH OSADKOV NA TERRITORII KOLKHIDSKOY NIZMENNOSTI),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
M. A. Mirianashvili.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 90-100, 1970. 4 fig, 2 tab, 9 ref.

Descriptors: *Precipitation (Atmospheric), *Distribution, *Variability, *Annual, Seasonal, Average, Winds, Wetting, Evaporation, Meteorology, Orography, Maps, Measurement, Precipitation gages.
Identifiers: USSR, *Georgian SSR, *Kolkhida lowland, *Lowlands, Tretyakov precipitation gages, Isohyetal lines.

Investigations of the formation, areal distribution, and variability of average annual and seasonal precipitation on the Kolkhida lowland in the Georgian SSR were based on data of 23 meteorological stations for the period 1936-68. Total precipitation in a year ranges from 1,600 mm in the eastern part of the lowland to 2,800 mm along the southern shore. Precipitation during the warm season is 50%-65% of the annual precipitation or 1,000-1,200 mm. Precipitation during the cold season varies between 700 mm and 1,300 mm, the average being 900-950 mm. Variations in precipitation amounts are small (0.14-0.30) and are indicative of a more or less even distribution of rainfall over the lowland. Correction factors for wind and wetting applied to total annual precipitation and precipitation during warm and cold seasons are tabulated for 19 stations in the area. (See also W72-12434) (Josefson-USGS)
W72-12437

EFFECTS OF FOREST COVER ON WATER REGIME OF SOME MOUNTAIN RIVERS IN THE SOUTH GEORGIAN UPLANDS (O VLIYANII LESA NA REZHIM NEKOTORYKH GORNYKH REK YUZHNO-GRUZINSKOGO NAGOR'YA),
Zakavkazskii Nauchno-Issledovatelskiy. Gidrometeorologicheskiy Institut, Tiflis (USSR).
L. V. Glinskaya.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 112-123, 1970. 6 fig, 4 tab, 15 ref.

Descriptors: *Orography, *Mountain forests, *Trees, *Rivers, River basins, Watersheds (Basins), Rocks, Soils, Slopes, Streamflow, Runoff, Surface runoff, Base flow, Groundwater, Snowmelt, Floods, Annual, Seasonal.
Identifiers: USSR, *Georgian SSR.

Effects of forest cover on water regime of rivers in the vicinity of the Trialetskiy ridge in the Georgian SSR were investigated for water-regulating properties of mountain forests. Average annual runoff from forested parts of the basin is more than from unforested parts. The contribution of groundwater to streamflow is greater for forested parts of the basin than for unforested parts. Effects of forest cover are not reflected in redistribution of runoff in time. However, the duration of spring floods in forested areas is longer and lasts 103-111 days as compared with 91-99 days in relatively unforested areas. (See also W72-12434) (Josefson-USGS)
W72-12438

A METHOD FOR FORECASTING ANNUAL INFLOW OF WATER TO LAKE SEVAN (METOD PROGNOZA GODOVOGO PRITOKA VOD V OZERO SEVAN),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
O. A. Azernikova.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 134-140, 1970. 2 fig, 2 tab, 5 ref.

Descriptors: *Methodology, *Forecasting, *Inflow, *Lakes, Lake basins, Rivers, Surface waters, Discharge (Water), Runoff, Antecedent precipitation, Rainfall-runoff relationships, Equations, Probability.
Identifiers: USSR, *Armenian SSR, *Lake Sevan.

A method is proposed for developing an 8-month and 12-month forecast of inflow of surface waters to Lake Sevan in the Armenian SSR, based on a 12-month and 16-month antecedent precipitation index. Accuracy of the forecast is within 2.64 cu m/sec. Depending on the equations used, the forecast probability is 93%-97%. (See also W72-12434) (Josefson-USGS)
W72-12439

EVALUATION OF AVALANCHE HAZARDS IN THE VICINITY OF MZHAVETSKALI AND AVALANCHE CONTROL TECHNIQUES (OTSENKA LAVINNOY OPASNOSTI V RAYONE MZHAVETSKALI I ZASHCHITA OT LAVIN),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
V. Sh. Tsomaya.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 146-154, 1970. 1 fig, 5 tab, 10 ref.

Descriptors: *Avalanches, *Snow cover, *Snowfall, Water equivalent, Precipitation (Atmospheric), Meteorology, Geomorphology, Reforestation, Forest management, Snow management, Equations, Evaluation.
Identifiers: USSR, *Georgian SSR, *Snow avalanches, *Avalanche hazards, Avalanche chutes, Avalanche velocities, Avalanche release, Phytoreclamation.

Avalanche hazards in the vicinity of Mzhavetskali in the Georgian SSR were investigated in the summer of 1968 in connection with proposed construction of the Rachinskiy mining-metallurgical combine at the lower end of the Dzhvaruke ravine. Snowfalls with water equivalent in excess of 100 mm are rare in the area. Extreme snowfalls were recorded between February 2 and February 14, 1932, and between January 28 and February 10, 1956, when total water equivalent was 180 mm and 190 mm, respectively. According to local residents, the only known snow avalanche in the area between 1928 and 1968 occurred on February 14, 1932, when snow cover increased by 265 cm to produce a record depth of 315 cm. Avalanche defense and control measures discussed include: (1) reforestation of slopes at the site of avalanches; (2) establishment of dense forest plantations in the zone of avalanche release; and (3) construction of control structures for terrain modification. (See also W72-12434) (Josefson-USGS)
W72-12440

THERMAL REGIME OF WATERS NEAR THE EAST COAST OF THE CASPIAN SEA (OSOBENNOSTI TERMIKI VOD U VOSTOCHNOGO POBEREZH'YA KASPIYSKOGO MORYA),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
V. M. Zhirnov.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 162-172, 1970. 4 fig, 5 tab.

Descriptors: *Water properties, *Water temperature, *Air temperature, Heat balance, Heat budget, Radiation, Winds, Meteorology, Orography, Shores, Coasts, Littoral, Shallow water, Depth, Seasonal, Variability.
Identifiers: USSR, *Caspian Sea, *Turkmen SSR, Heat exchange, Isopleths.

Investigations of the thermal regime of waters of the southeast Caspian near the period 1936-66 and on field data collected in 1967-68 by the Transcaucasian Scientific Research Hydrometeorological Institute and the Azaerbaydzhan Administration of the Hydrometeorological Service. The hydrologic regime of waters off the coast of the Turkmen SSR is determined by atmospheric processes over the Caspian Sea, amount of incoming solar radiation, orographic characteristics of coastal and surrounding areas, and by the proximity of desert regions in Soviet Central Asia. Annual water temperature increases in a southerly direction from 11.3 deg C at Bekdash to 17.5 deg C at Gasan-Kuli. Annual water temperature in the Bekdash-Kuuli Mayak region varies between 3.3 deg C and 23.8 deg C and that in the Cheleken--Gasan-Kuli region between 4.7 deg C and 28.2 deg C. Average annual temperature of water near the coast varies between 12.4 deg C and 16.0 deg C, which is 2.6 deg C higher than the average annual air temperature. The water temperature increases on an average of 1.5 deg C for each degree of latitude. (See also W72-12434) (Josefson-USGS)
W72-12441

WATER RESOURCES INVESTIGATIONS IN PUERTO RICO, AND VIRGIN ISLANDS, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12444

WATER RESOURCES INVESTIGATIONS IN MICHIGAN, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12445

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12446

WATER RESOURCES INVESTIGATIONS IN UTAH, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12447

WATER RESOURCES INVESTIGATIONS IN VIRGINIA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12448

STUDIES IN DENSITY STRATIFIED FLOWS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 08B.
W72-12449

MULTIDIRECTIONAL TURBULENCE PROBE DEVELOPMENT PHASE I - UNIDIRECTIONAL TURBULENCE SENSOR DEVELOPMENT.
Battelle Columbus Labs., Ohio.

Copy available from GPO Sup Doc EPA 16050 DOW 10/71, $0.65; microfiche from NTIS as PB-211 280, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, October 1971. 61 p, 17 fig. EPA Program 16050 DOW 10/71.

Descriptors: *Turbulence, *Turbulent flow, *Streamflow, *Instrumentation, Non-uniform flow, Eddies, Channel flow, Flow profiles, Monitoring, Data collections, Strain gages, Measurement.

Identifiers: *Turbulence sensors.

Development of a unidirectional-turbulence probe was undertaken to investigate the feasibility of a small-diameter strain-gaged diaphragm-type pressure transducer and a self-adjusting depth compensation air reservoir for use in the follow-on development of a small (1/2-inch diameter) multidirectional-turbulence probe. A unidirectional probe has been developed which is capable of monitoring water velocities over a range of 0.5 to 5 ft/sec in turbulence frequencies of 0 to over 100 Hertz and which will automatically operate in water up to 10-feet deep. Sealing inadequacies in both the air reservoir membrane and the pressure diaphragm permit moisture entry into the air volume covering the strain gages. This has given rise to balance drift and circuitry ground problems that have resulted in the placing of limitations on the water exposure and turbulence monitoring times for the unidirectional probe. These problems also suggested that the concepts cannot be immediately incorporated into a multidirectional probe design. (Eagle-Vanderbilt)
W72-12453

WATER RESOURCES INVESTIGATIONS IN WYOMING, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12698

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA--A COMPILATION OF PEAK DATA, OCTOBER 1958 TO SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif.
A. O. Waananen.
Geological Survey Data Report, April 11, 1972. 140 p, 33 fig, 1 tab.

Descriptors: *Floods, *Small watersheds, *Streamflow, *Peak discharge, *California, Hydrologic data, Basic data collections, Gaging stations, Flow rates, Rainfall, Watershed management, Planning, Water resources development.

The magnitude and frequency of floods from drainage areas generally of less than 10 square miles was begun in California July 1, 1958. This is the 13th progress report (1971 water year) in an annual series designed to inform the cooperators and other interested parties of the status of the program. The reports consist mainly of a tabulation of the annual peak stage and discharge, by water years, for each gaging station in the program. The water year is the 12-month period ending September 30 of the specified year. The discharge hydrograph and recorded graph of accumulated rainfall for significant peak discharges during the current year are included for stations that are equipped with water-stage recorders. Monthly and annual rainfall totals are given for the recording stations. Program activities during the current year and program plans for the following year are summarized. The 1971 water year had moderate floods in small basins in south-coastal California in November and December 1970 and in northern and north-coastal regions of southern California in August 1971. (Woodard-USGS)
W72-12703

CASE STUDY OF DURATION-LIMITED WAVE SPECTRA OBSERVED AT AN OPEN OCEAN TOWER,
Naval Oceanographic Office, Washington, D.C.
P. S. DeLeonibus, and L. S. Simpson.
Journal of Geophysical Research, Vol 77, No 24, p 4555-4569, August 20, 1972. 15 fig, 30 ref.

Descriptors: *Waves (Water), *Frequency analysis, *Fourier analysis, *Air-water interfaces, Ocean waves, Gravity waves, Statistics, Correlation analysis, Winds.
Identifiers: *Wind-sea interactions.

A sequence of double-peaked open-ocean wave spectra was observed and simultaneous eddy correlation estimates were made of momentum flux and atmospheric stability over a 15-hour interval at Argus Island tower (near Bermuda) on March 22 and 23, 1967. The wave spectra were associated with a generating sea and advecting swell in the fetch of the warm sector of an advancing cyclone. The equilibrium range constant for these wave spectra was estimated to be 0.0078. The Miles-Phillips exponential growth parameter was in reasonably good agreement with other field investigations and observations support predicted amplification factors over the range C/U 20 to 32 where C is wave phase speed and U is the friction velocity. Two observations of both linear and exponential growth parameters associated with spectral frequencies of 0.13 and 0.14 Hz were available to compare predicted and observed wave growth, with good results after correction for residual wave background. Observed temporal overshoot-undershoot of a particular wave component is interpreted in terms of an energy balance between wind input, wave-wave interactions, and wave breaking as a wave component evolves to its equilibrium condition. Peaks in the horizontal and vertical wind-velocity spectra and the cospectra and quadrature spectra associated with spectral peaks are clearly evident when ocean swell propagates through the observation area. (Knapp-USGS)
W72-12866

STREAMFLOW VARIATION AND DISTRIBUTION IN THE BIG CYPRESS WATERSHED DURING WET AND DRY PERIODS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W72-12869

EXPERIMENTAL STUDIES OF THE REFRACTION OF UNIFORM WAVE TRAINS AND TRANSIENT WAVE GROUPS NEAR A STRAIGHT CAUSTIC,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
Y. Y. Chao, and W. J. Pierson.
Journal of Geophysical Research, Vol 77, No 24, p 4545-4554, August 20, 1972. 6 fig, 16 ref.

Descriptors: *Waves (Water), *Hydraulic models, *Gravity waves, *Refraction (Water waves), Frequency analysis, Fourier analysis, Wavelengths.
Identifiers: *Caustics (Water waves).

An experimental study of gravity wave behavior near a straight caustic was carried out in a wave tank that was 4.26 meters square and 30.48 centimeters deep. A uniform wave train was generated in shallow water of constant depth and propagated toward a portion of the tank where the depth increased linearly to a value equivalent to deep water. The straight line at which the depth started to increase was 50 deg to the wave crests at the generation source. The waves propagated up to this line, then refracted, totally reflected, and turned back toward the shallow water. The experimental model not only successfully produces a caustic but also verifies the theoretical results near the caustic derived within the framework of a linear theory. The same bottom model was used to examine the refraction of transient wave groups. The transients were recorded at several places in the tank in such a way as to compare two alternative hypotheses: one that the waves refracted according to refraction equations involving their spectral phase speeds, and the other that group velocities were involved. The wave groups were refracted according to the phase speeds of the spectral components. (Knapp-USGS)
W72-12871

A NEW MATHEMATICAL MODEL FOR THE VELOCITY DISTRIBUTION IN TURBULENT SHEAR FLOW,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Willis.
Journal of Hydraulic Research, Vol 10, No 2, p 205-225, 1972. 6 fig, 2 tab, 10 ref.

Descriptors: *Mathematical models, *Turbulent flow, *Velocity, *Diffusion, Uniform flow, Flow resistance, Shear drag, Non-uniform flow, Suspended load, Unsteady flow, Steady flow, Pipe flow, Open channel flow, Vicosity.
Identifiers: *Turbulent diffusion.

A mathematical model for the velocity distribution in turbulent shear flow was developed using an error function approximation to the distribution of the eddy viscosity or the turbulent momentum diffusion coefficient. The model agrees with observed velocity distributions from the top of the boundary layer to within the limits of velocity measurements near the solid flow boundary. The integral of the velocity distribution equation gives relative mean velocities or resistance relationships that are consistent with classical pipe flow data and that also permit the velocity distribution to be expressed in terms of boundary shear and boundary roughness values. One of the main uncertainties concerning other models which use a parameter equivalent to k (the Von Karman constant) is the variability that is observed in the k values for different flow conditions. The data presented for clear water flow suggest k values of about 0.28 for boundary layer flow, 0.33 for channel flow, and 0.37 for pipe flow. Secondary flows and the presence of suspended sediment may alter the apparent turbulent diffusion processes and give velocity distributions that suggest either different k values or different shear velocity values. (Knapp-USGS)
W72-12872

WATER RESOURCES INVESTIGATIONS IN WISCONSIN, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12874

WATER RESOURCES INVESTIGATION IN VERMONT, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12875

FLOODS IN MISSISSIPPI, OCTOBER 1967 THROUGH SEPTEMBER 1969,
Geological Survey, Jackson, Miss.
B. E. Wasson.
Mississippi Board of Water Commissioners Bulletin 72-1, April 1972. 40 p, 14 fig, 4 tab, 5 ref.

Descriptors: *Floods, *Rainfall-runoff relationships, *Streamflow, *Flood damage, *Mississippi, Tidal waters, Hurricanes, Flood stages, Flood peak, Flood profiles, Storms, Stream gages, Hydrologic data, Data collections, Flow duration, Discharge measurement.

Between October 1967 and September 1969, there were 10 noteworthy periods of flooding in Mississippi. The most notable of these was on August 17-18, 1969, when Hurricane Camille produced all-time record tidal floods along the Mississippi coast and killed 137 people and caused more than 510 million dollars in damage. Greater-than-50-year floods occurred on small streams in Wilkinson County as the result of 12 inches of rain on July 19 and 8 inches on July 23, 1969. Comparatively low floods occurred on Tombigbee River at Columbus on July 8-9, 1968, although the 24-hour total rainfall of 16 inches there was the greatest ever recorded in Mississippi. Split storm periods and

the rapid dissipation of the flood flows of small streams draining into the Tombigbee River help to explain the minor flooding resulting from the intense rainfall. (Woodard-USGS)
W72-12876

SPEED CALIBRATION OF THE PLESSEY MODEL M021 SELF-RECORDING CURRENT METER,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
H. S. Weiler, and N. De Zeeuw.
Canada Department of the Environment Inland Waters Branch Technical Bulletin No 58, 1972. 14 p, 6 fig, 3 tab, 4 ref.

Descriptors: *Current meters, *Stream gages, *Calibrations, *Low flow, *Canada, Methodology, Analytical techniques, Discharge measurement, Curves, Remote sensing.
Identifiers: *Current meters (Plessey Model M021).

The Canada Center for Inland Waters has been using the Plessey Model M021 self-recording current meter since 1967. Because of the low speeds generally measured with this meter, a set of speed calibrations was made in the range of about 0 to 100 cm/sec. The current meters were calibrated at the 'Current Meter Rating and Experimental Station' at Calgary, Alberta. This station, established in 1911, is used by the Water Survey of Canada to rate current meters employed in stream measuring programs throughout Canada. Most care was expended in carrying out calibrations in the range 3 - 15 cm/sec, since this was the range where the majority of measured values occurred. The calibrations were consistent in giving a straight line (first order) calibration curve, with a standard deviation of 0.3 cm/sec. Higher order calibration curves did not improve the fit; a lesser variance was achieved by splitting the calibration range of 0 - 70 cm/sec into two segments: 0 - 15, and 15 - 70 cm/sec. The method and equipment used, and the results obtained are described. (Woodard-USGS)
W72-12879

STRUCTURE AND PROCESS IN A BRAIDED RIVER,
Ottawa Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-12882

2F. Groundwater

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE, PHASE II,
Oklahoma Univ. Research Inst., Norman.
For primary bibliographic entry see Field 04B.
W72-12389

GROUNDWATER PRESSURE WAVE IN CONFINED POROUS MEDIA,
Idaho Univ., Moscow. Water Resources Research Inst.
G. L. Bloomsburg.
Available from the National Technical Information Service as PB-211 279, $3.00 in paper copy, $0.95 in microfiche. Idaho University Water Resources Research Institute Project Report, July 1971. 5 p, 19 ref. OWRR A-031-IDA (1).

Descriptors: *Groundwater movement, *Hydrogeology, *Idaho, *Confined water, *Water level fluctuations, Artesian aquifers, Water table.
Identifiers: *Snake River Plain, *Pressure waves.

Literature concerning pressure waves in porous media is reviewed, and an example in the Snake River Plain is discussed. Two types of literature were required, one dealing with the groundwater hydrology of the Snake River Plain and the other with the theoretical aspects of pressure wave movement in aquifers. The first report of a pressure wave phenomenon in the Snake River Plain appeared in 1965. The phenomenon was brought about by extremely high flows in the Big Lost River during the summer of 1965. By December, 1965, the water table had risen more than 2 ft over a 400 sq mi area, and over part of this area had risen as much as 6 ft. The fact that the water table rose was not unexpected, but the rate at which it rose in areas considerably removed from the recharge area was unexpected. There is not enough information as yet to explain the phenomenon, and several statements have been made emphasizing the need for additional research. (Knapp-USGS)
W72-12390

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN MARSHALL COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 04B.
W72-12412

GROUNDWATER LEVELS IN NEBRASKA--1971,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 04B.
W72-12433

FORMATION AND DISTRIBUTION OF NATURAL FRESH GROUNDWATER RESOURCES ON THE ASIAN MAINLAND (O FORMIROVANII I RASPREDELENII YESTESTVENNYKH RESURSOV PRESNYKH PODZEMNYKH VOD AZIATSKOGO MATERIKA),
N. A. Marinov, V. Z. Rubeykin, and R. I. Tkachenko.
Byulleten' Moskovskogo Obshchestva Ispytateley Prirody, Otdel Geologicheskiy, Vol 47, No 1, p 108-120, January-February 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Asia, *Hydrogeology, *Groundwater, *Groundwater resources, *Groundwater basins, Groundwater availability, Groundwater movement, Subsurface runoff, Aquifers, Artesian aquifers, Rocks, Springs, Precipitation (Atmospheric), Water chemistry, Structural geology, Geologic mapping, Maps, Arctic Ocean, Indian Ocean, Pacific Ocean.
Identifiers: *USSR, *Black Sea, *Mediterranean Sea, *Artesian basins, Tectonics, Taliks, Mineralization.

The Asian continent is characterized by extremely diverse physiographic conditions and by a very complex geologic-tectonic structure, resulting in uneven distribution of groundwaters and in marked differences in groundwater flow. On the basis of groundwater flow, 5 hydrogeological provinces are distinguished: (1) the Arctic Ocean drainage, covering about one-fourth of the Asian continent and consisting of 5 large hydrogeological regions, including 28 artesian basins; (2) the Black and Mediterranean Sea drainage, covering less than 2% of the continent and comprising 4 hydrogeological regions, including 8 artesian basins; (3) the drainage basin of the Asian heartland, covering about 25% of the land mass and consisting of 9 large hydrogeological regions and 46 artesian basins; (4) the Indian Ocean drainage, covering about 20% of the continent and representing 11 hydrogeological regions, including 12 artesian basins; and (5) the Pacific Ocean drainage, covering about 25% of the continent and divided into 18 hydrogeological regions comprising 103 artesian basins. A sketch map showing the hydrogeologic zoning of the Asian mainland is accompanied by a map of groundwater availability. (Josefson-USGS)
W72-12443

WATER RESOURCES INVESTIGATIONS IN PUERTO RICO, AND VIRGIN ISLANDS, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12444

WATER RESOURCES INVESTIGATIONS IN MICHIGAN, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12445

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12446

WATER RESOURCES INVESTIGATIONS IN UTAH, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12447

WATER RESOURCES INVESTIGATIONS IN VIRGINIA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12448

WATER RESOURCES INVESTIGATIONS IN WYOMING, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12698

APPLICATION OF ARTIFICIAL RECHARGE TECHNOLOGY FOR MANAGING THE WATER RESOURCES - ANCHORAGE, ALASKA,
Alaska Univ., College. Inst of Water Resources.
For primary bibliographic entry see Field 04B.
W72-12707

GROUNDWATER IN THE SANTA CRUZ VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 04B.
W72-12850

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1971.
Geological Survey, San Antonio, Tex.
For primary bibliographic entry see Field 04B.
W72-12863

ESTIMATE OF SUBSIDENCE IN VENICE USING A ONE-DIMENSIONAL MODEL OF THE SUBSOIL,
IBM World Trade Corp., Venice (Italy). Scientific Center.
G. Gambolati.
IBM Journal of Research and Development, Vol 16, No 2, p 130-137, March 1972. 7 fig, 6 tab, 19 ref.

Descriptors: *Land subsidence, *Withdrawal, *Groundwater, *Mathematical models, Aquifer characteristics, Water table, Hydrogeology.
Identifiers: *Venice (Italy).

A one-dimensional model, based on the theory of vertical consolidation, is applied to the calculation of land subsidence in the Venetian Lagoon, which is caused by extraction of water from wells. Some assumptions are made in order to compensate for the scarcity of data. These assumptions are made

with regard to both the geophysical characteristics of the subsoil and the decline in piezometric level in the various strata. A direct correlation is shown between water extraction and surface subsidence. (Knapp-USGS)
W72-12865

WATER RESOURCES INVESTIGATIONS IN WISCONSIN, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12874

WATER RESOURCES INVESTIGATION IN VERMONT, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12875

GROUND WATER IN THE TORTUGUERO AREA, PUERTO RICO AS RELATED TO PROPOSED HARBOR CONSTRUCTION,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-12883

GROUND WATER ALONG RIO BUCANO AT PONCE, PUERTO RICO AND THE EFFECTS OF A PROPOSED FLOODWAY ON GROUND--WATER QUALITY,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-12884

CONCENTRATION GRADIENTS IN AQUIFERS, PHASE II,
Tulsa Univ., Okla.
M. K. Kemp.
Available from the National Technical Information Service as PB-211 542, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, June 1972, 29 p, 7 fig, 11 tab, 26 ref. OWRR A-037-OKLA (1).

Descriptors: *Aquifers, *Thermal gradient, Ion exchange, Brine, Membrane processes, Electrolytes, *Bentonite, Heat transfer, *Ion transport.
Identifiers: *Thermal pumping, Electrical potential, Potential gradient.

The objectives of this project were to measure the electrical potential across sodium bentonite membranes due to a thermal gradient using sodium chloride solutions of various concentrations and combine these data with equations derived from the thermodynamics of irreversible processes to predict the rate of electrolyte transport. The electrical potential measurements have shown that for a 1/4 inch Wyoming Bentonite membrane and sodium chloride solutions, the potential gradient, dE/dT, varies in a log-log fashion with concentration. Data are presented that can be used to estimate heats of transport, for the sodium ion assuming negligible water and chloride ion transport. The data collected thus far are not sufficient to indicate much about the transport mechanism in the membrane. Thus, the original objective of delineating the role of thermal pumping of electrolytes in the generation of observed concentration gradients in aquifers has not been attained. (See also W72-02055)
W72-12952

2G. Water in Soils

DIRECT METHODS OF SOIL MOISTURE ESTIMATION FOR WATER BALANCE PURPOSES,
M. Kutilek.
World Meteorological Organization Reports on WMO/IHD Projects, Report No 14, 1971. 58 p, 15 fig, 1 tab, 84 ref.

Descriptors: *Soil moisture, *Mapping, *Surveys, *Remote sensing, Aerial photography, Satellites (Artificial), Soil moisture meters, Vegetation effects, Infiltration, Evapotranspiration, Water balance, Hydrologic budget, International Hydrological Decade.

A method is proposed for direct measurement and estimation of soil moisture for large areas. The basis of the method is the point measurement of soil moisture at given stations. The measured values are extrapolated, and are correlated with the results of an areal determination of surface soil moisture. The extrapolation is based on maps of ecological classification of soil moisture and of hydrological types of soil water regime, on maps of texture, and on other maps from which the different types of soil moisture regime can be deduced. The areal study of surface soil moisture and the determination of the main hydrological factors causing the actual moisture of the soil use aerial photographs obtained from frequent aircraft flights or from satellites. By mutual correlation of point measurements of moisture, extrapolated values, and soil surface moisture determined by areal methods, the moisture profiles and maps of soil water storage may be determined. (Knapp-USGS)
W72-12417

INFILTRATION ANALYSIS II-SPRINKLING-PLOT ANALYSIS,
Ministry of Works, Wellington (New Zealand).
C. Toebes, and G. D. Mallinson.
New Zealand Ministry of Works Handbook of Hydological Procedures, Procedure No 22, (1971). 8 p, 7 fig, 9 ref, append.

Descriptors: *Soil water movement, *Infiltration, *Mathematical studies, Analytical techniques, Hydrologic data, Statistical methods, Rainfall, Soil properties, Hydrologic properties, Permeability, Depression storage, Runoff.

In determining soil infiltration rates, the sprinkling-plot analysis can be used only when the rate of rainfall is uniform throughout the sotrm. The principle of the sprinkling-plot analysis is that subtraction of the mass-runoff curve from the mass-rainfall curve results in a curve which represents surface detention, depression storage, and infiltration. A relationship is developed between the discharge after the end of rainfall (when the runoff is wholly from surface detention) and the surface detention, and this relationship is used for the calculation of surface detention during the entire storm. Subsequent correction for the surface detention and an estimated correction for the depression storage produces the infiltration curve. (Woodard-USGS)
W72-12431

MICROFLORA OF SOIL AS VIEWED BY TRANSMISSION ELECTRON MICROSCOPY,
Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W72-12493

CAPACITY OF DESERT ALGAL CRUSTS TO FIX ATMOSPHERIC NITROGEN,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
For primary bibliographic entry see Field 05B.
W72-12505

PREDICTION OF IRRIGATION ADVANCE FUNCTION BY DIMENSIONAL ANALYSIS,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W72-12518

PREDICTIONS OF AGRICULTURAL IRRIGATION FOR INDIANA AND IRRIGATION POTENTIALS OF SELECTED INDIANA SOIL SERIES,
Indiana State Dept. of Natural Resources, Indianapolis.
For primary bibliographic entry see Field 03F.
W72-12524

INFILTRATION RATE AND SEDIMENT PRODUCTION TRENDS ON A PLOWED BIG SAGEBRUSH SITE,
Utah State Univ., Logan. Dept. of Range Science.
G. F. Gifford.
Journal of Range Management, Vol 25, No 1, p 53-55, January 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Sagebrush, *Infiltration rates, *Sediment load, *Runoff, Vegetation effects, Land use, Hydrologic properties, Regression analysis, Arid lands, Xerophytes, Idaho.

Vast acreages of big sagebrush (Artemisia tridentata) have been sprayed, burned, plowed, railed, ripped or contour furrowed in the last 20 years. Surprisingly little information is available regarding the hydrologic consequences of this vegetation manipulation. This study was designed to provide additional information regarding the influence of plowing sagebrush on surface runoff and sediment production at a study site in southern Idaho. The ability to predict infiltration rates using cover characteristics alone varies with time both within a given storm event and on a seasonal basis. The trend was toward lowered infiltration rates following plowing and seeding of a big sagebrush site. Sediment production rates increased following plowing, but yields were variable. Considering the variation, the ability to predict infiltration rates was not particularly affected by the plowing treatment. (Casey-Arizona)
W72-12526

THE USE OF DETAILED SOILS INFORMATION FOR DELINEATING AND REGULATING FLOOD PLAINS: LEGAL AND ADMINISTRATIVE CONSIDERATIONS,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 06F.
W72-12654

DEVELOPMENT OF NEW TECHNIQUES FOR DELINEATION OF FLOOD PLAIN HAZARD ZONES - PART I: BY MEANS OF DETAILED SOIL SURVEYS - PART II: BY MEANS OF AIR--PHOTO INTERPRETATION,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 06F.
W72-12655

SULFATE SALINIZATION OF SOILS IN THE AK-DAR'YA RAYON OF THE SAMARKAND OBLAST (O SUL-FATNOM ZASOLENII POCHV V AKDAR'INSKOM RAYONE SAMARKANDSKOY OBLASTI),
Selskokhozyaistvennyi Institut, Samarkand (USSR).
For primary bibliographic entry see Field 03C.
W72-12690

CONVECTIVE SALT ACCUMULATION IN THE CAPILLARY FRINGE PRODUCED BY SOIL--WATER EVAPORATION (KONVEKTIVNOYE SOLENAKOPLENIYE V KAPILLYARNOY KAYME, VYZVANNOYE ISPARENIYEM POCHVENNYKH VOD),
Institut Gidrodinamiki, Novosibirsk (USSR).
For primary bibliographic entry see Field 02D.

W72-12691

SOME UNRESOLVED PROBLEMS IN SOIL SODIUM-CARBONATE SALINIZATION (O NEKOTORYKH NEYASNYKH VOPROSAKH SODOVOGO ZASOLENIYA POCHV),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 03C.
W72-12692

RELATION OF THERMOPHYSICAL SOIL PROPERTIES TO MOISTURE TENSION AND WATER-FILM THICKNESS (ZAVISIMOST' TEPLOFIZICHESKIKH SVOYSTV POCHV OT DAVLENIYA VLAGI I TOLSHCHINY VODNOY PLENKI),
Agrofizicheskii Nauchno-Issledovatelskii Insitut, Leningrad (USSR).
A. M. Globus, and A. V. Aref'yev.
Pochvovedeniye, No 11, p 100-104, November 1971. 4 fig, 1 tab, 10 ref.

Descriptors: *Soil physics, *Physical properties, Soil physical properties, *Thermal properties, Moisture tension, Moisture content, Soil texture, Soil density, Bulk density, Thermal conductivity, Thermal capacity, Diffusivity, Podzols, Equations.
Identifiers: *USSR, *Leningrad Oblast, *Water films, Moisture potentials, Sod-Podzolic soils.

Relationships of thermal conductivity, diffusivity, and heat capacity of medium loam, sandy loam, and sandy Sod-Podzolic soils in the Leningrad Oblast to moisture potential and reduced water-film thickness at different soil bulk densities are analyzed and graphed. Film thickness and bulk density account for the changes in thermal properties of the soils with changing moisture content and density. For a given bulk density, the relationship of thermal conductivity to film thickness can be approximated by a single curve for all 3 soils. For a given film thickness, the relationship of thermal conductivity and diffusivity to bulk density is nearly linear. A simplified relation between reduced thermal conductivity and film thickness, applicable to all soils studied, is obtained. (Josefson-USGS)
W72-12693

HEIGHT OF THE CAPILLARY RISE OF WATER IN PEAT SOILS (O VYSOTE KAPILLYARNOGO PODNYATIYA VLAGI V TORFYANYKH POCHVAKH),
Armenskaya Nauchno-Issledovatelskaya Stantsiya, Sarny (USSR).
A. S. Gordiychuk.
Pochvovedeniye, No 11, p 93-99, November 1971. 3 fig, 1 tab, 13 ref.

Descriptors: *Soil physics, *Capillary action, *Capillary water, *Capillary fringe, *Peat, Bogs, Soil profiles, Soil physical properties, Soil compaction, Porosity, Moisture content, Groundwater, Water table, Height, Evaporation, Agriculture, Adoption of practices.
Identifiers: *USSR, *Ukraine, *Poles'ye, *Capillary rise, *Soil monoliths, Lowmoor bogs.

The capillary rise of water in cultivated Peat soils of the 'Chemernoye' lowmoor bog in the Western Poles'ye of the Ukraine was investigated in laboratory and field experiments. Height of the capillary rise of water was determined in the laboratory in soil monoliths 50 cm x 50 cm in area and 50, 100, and 150 cm in depth. Maximum capillary rise of water in the 150-cm monolith was 120-122 cm; in the 100-cm monolith, 70-72 cm; and in the 50-cm monolith, 30-32 cm. Height of the capillary rise of water in the field was 87-110 cm when the groundwater depth was 120-160 cm. Compaction of Peat soil improves th e capillary properties of the lowed layer. Maximum height of the capillary rise of water in plowed and conventionally rolled plots was 96 cm and in plowed and intensively rolled plots and disked plots, 115-118 cm. To determine the drainage rate for Peat soils, the root system must reach the upper boundary of the capillary fringe. (Josefson-USGS)
W72-12694

NITROGE, PHOSPHORUS, AND POTASSIUM CONTENT IN ATMOSPHERIC PRECIPITATION IN BELORUSSIA (POSTUPLENIYE AZOTA, FOSFORA I KALIYA S ATMOSFERNYMI OSADKAMI V BELORUSSII),
Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR).
For primary bibliographic entry see Field 02B.
W72-12696

DEGRADATION OF ORGANOCHLORINE INSECTICIDES IN FLOODED SOILS IN THE PHILLIPPINES,
International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 05B.
W72-12808

SOURCES OF SEDIMENT IN A MOUNTAIN RIVER BASIN,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W72-12817

STABILIZATION OF NEWLY FORMED SOIL AGGREGATES,
Minnesota Univ., St. Paul. Dept. of Soil Science.
L. M. Arya, and G. R. Blake.
Agronomy Journal, Vol. 64, p. 177-180, March-April 1972. 4 fig., 2 tab., 8 ref. OWRR B-015-Minn (4).

Descriptors: *Soil aggregates, *Moisture content, *Stability, Soils, Cultivation, Plowing, Rain, Soil structure.
Identifiers: *Thixotropic aging, *Aggregate formation and stabilization.

The stabilization of newly formed soil aggregates was observed. Stability of 3- to 5-mm diameter aggregates collected immediately after plow-shearing on four soil types increased with time after plowing when water content was held constant. The rate of increase was high during initial aging times and decreased as aging progressed. Increases of about 0.17 for sandy soils and about 0.24 for finer-textured soils were observed in 72 hours of aging. For all soils, stability increase after about 10 to 12 hours was small. Earthworm casts were simulated by extruding kneaded, moist soil through a sieve with 2-mm round holes. Extrusions aged at four water contents showed considerable increases in relative stability in the 24-hour period following formation. Stabilities determined shortly after extrusion varied with water content of the extrusions. The largest change in stability was from 0.68 to 0.98 at a water content of 0.36 g/g. Aggregates were also prepared by placing water drops on dry soil powder and collecting the individual coalesced portions. These aggregates were aged at two water contents. Initially, stabilities were near 0 but attained values ranging from 0.14 to 0.31 in about 120 hours. Stability differences due to water content were inconclusive. (Walton-Minnesota)
W72-12819

SPATIAL VARIABILITY OF UNSATURATED HYDRAULIC CONDUCTIVITY,
Arizona Univ., Tucson.
J. G. Stockton, and A. W. Warrick.
Soil Sci Soc Am Proc. Vol 35, No 5, p 847-848. 1971. Illus.

Identifiers: *Soil physical properties, *Hydraulic conductivity, Moisture, Pressure, Soils, Spatial distribution, Variability.

Spatial variability of unsaturated hydraulic conductivity was studied for 40 ha of Pima clay loam. Calculations of hydraulic conductivity were based on the moisture release data using a modified Millington-Quirk equation. One standard deviation to either side of the average moisture release curve resulted in a 20-30% variation in the unsaturated hydraulic conductivity. This offers a relatively quick and easy method for estimating variability of unsaturated hydraulic conductivity variation from pressure head vs. moisture relations. Input needed for application: moisture release relations and their variances.--Copyright 1972, Biological Abstracts, Inc.
W72-12820

PROBLEMS AND TRENDS IN DRAINAGE RESEARCH, MIXED BOUNDARY CONDITIONS,
Iowa State Univ. of Science and Technology, Ames.
For primary bibliographic entry see Field 04A.
W72-12823

POLYSACCHARIDES IN MOLASSES MEAL AS AN AMELIORANT FOR SALINE-SODIC SOILS COMPARED TO OTHER RECLAMATION AGENTS,
Stellenbosch Univ. (South Africa). Dept. of Soil Science.
H. W. Weber, and P. C. Van Rooyen.
Geoderma, Vol. 6, No. 4, p. 233-253, December 1971. 17 tab, 18 ref.

Descriptors: *Soil amendments, *Soil aggregates, *Arid lands, *Alkaline soils, *Soil moisture, Saline soils, Irrigation systems, Sodium, Potassium, Hydrogen ion concentration, Soil chemical properties, Soil physical properties, Soil management.
Identifiers: *South Africa, *Molasses meals, *Sodium adsorption ratio, *Polysaccharides.

In South Africa, as well as in other arid and semi-arid areas, large acreages of structurally severely deteriorated brack (sodic) soils occur which have been abandoned. This situation usually has come about as a result of over-irrigation or of irrigation with saline waters. Such soils are often reclaimed by the use of soil amendments such as gypsum, sulfur, potassium sulfate or manure. It is a well-established fact that polysaccharides and polyuronides in soils promote the formation and stabilization of soil aggregates. Using molasses meal, a study was undertaken to evaluate the effect of polysaccharides on the physical properties of sodic soils compared to the commonly used brack-soil amendments. Sandy loam saline-sodic soils were used, and the experiment was conducted with a minimum of irrigation under the rigidly arid conditions of the southern Cape Province. All measured factors were subjected to analyses of variance. Results proved both instant and long term effectiveness of molasses meal and its superiority to the other ameliorants. Soil physical properties were drastically improved while most critical chemical properties were unchanged. It was tentatively concluded that the polysaccharide aggregating powers were greater than the Na ion dispersing forces in the soil. (Casey-Arizona)
W72-12825

THE DETERMINATION OF HYDRAULIC CONDUCTIVITY AND DIFFUSIVITY OF UNSATURATED SOILS,
Agricultural Research Service, Fort Collins, Colo.
A. Klute.
Soil Science, Vol. 113, No. 4, p. 264-276, April 1972. 2 tab, 63 ref.

Descriptors: *Soil physics, *Soil water movement, *Unsaturated flow, *Hydraulic conductivity, *Diffusivity, Soil types, Infiltration, Moisture tension, Profiles, Estimating equations, Flow measurement, Flow characteristics, Flow profiles, Variability.
Identifiers: *Moisture retention, *Soil water diffusivity.

In order to quantitatively apply the theory of unsaturated flow to field or laboratory flow systems, knowledge is required of the moisture and hydraulic flow characteristics of the soils involved. The methods available for measurements of these parameters are reviewed. Steady-state methods are handicapped by the relatively long times needed to establish steady flow, the difficulties of obtaining conductivity-water-content functions, and the fact that they are primarily laboratory methods. Unsteady-state methods may be grouped into outflow-inflow methods and instantaneous profile methods, all of which are characterized by the time dependence of some aspect of flow system behavior to obtain conductivity or soil-water diffusivity. Calculation of conductivity from water retention data is also discussed. If one wishes to verify the validity of flow concepts as applied to a particular flow system, then one needs more precise measurements of a relatively small number of samples. For prediction of soil-water behavior in field situations, the problem of soil variability dictates the need for extensive methods for characterizing the field soil. Meaningful average conductivity functions and probability statements as to the deviations from the average conductivity function are required. (Casey-Arizona)
W72-12827

THE IMPACT OF L.A. RICHARDS UPON THE FIELD OF SOIL WATER PHYSICS,
Wisconsin Univ., Madison. Dept. of Soil Science.
W. H. Gardner.
Soil Science, Vol 113, No 4, p 232-237, April 1972. 49 ref.

Descriptors: *Soil physics, *Soil moisture, *Soil properties, *History, Unsaturated flow, Darcys Law, Saline soils.
Identifiers: *Soil water potential.

L. A. Richards was and is one of the most influential practitioners in the field of soil physics, and many of his accomplishments are briefly recounted. In 1928, he proposed and illustrated a tension plate apparatus for the determination of the capillary potential of soil samples. He also urged extension of Darcy's Law to unsaturated flow problems. He worked to develop methods of measuring both the capillary and total potentials. He was influential in the development and spread of energy potential concepts of soil water and its measurement by the phychrometer. His debate with Veihmeyer on soil water availability illuminated many important concepts. He edited the soil salinity handbook of the U.S. Salinity Laboratory and developed the saturation extract method of measuring soil salinity. (Casey-Arizona)
W72-12829

PHYSICAL AND PHYSICO-CHEMICAL CHANGES IN THE PROFILE OF A SODIC SOIL TREATED WITH GYPSUM,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Rivernina Lab.
M. L. Sharma.
Australian Journal of Soil Research, Vol 9, No 2, p 73-82, December 1971. 5 fig, 2 tab, 18 ref.

Descriptors: *Alkaline soils, *Salinity, *Hydrogen ion concentration, *Reclamation, Water storage, Conductivity, Hydraulic conductivity, Soil structure, Soil properties, Soil water movement, Soil physical properties.

No quantitative information regarding long-term changes in physical or physico-chemical properties is available for gypsum treated sodic soils which have been maintained under irrigated pasture. Soil properties of a brown sodic soil, measured 40 months after a gypsum treatment are reported and discussed and compared with the results of some measurements made 7 months after treatment. Gypsum effects extended down to 30 cm compared to 15-20 cm after 7 months. Leaching effects would be seen as salt movement while plant root respiration would release carbon dioxide into the soil which would hydrolyze, lowering pH. Electrical conductivity (EC) changes were found at 40 cm depths while pH decreased in the 15-30 cm layer. pH was significantly reduced in the surface layer of control plots, but salinity, or EC, was increased. Field measurements indicated increased water penetration and storage as a result of gypsum treatments and this was confirmed by lab studies which showed increased hydraulic conductivity as a result of improved soil structure. (Casey-Arizona)
W72-12833

APPLICATION OF FLOW THEORY TO FIELD SITUATIONS,
California Univ., Davis.
D. R. Nielsen, J. W. Biggar, and J. C. Corey.
Soil Science, Vol 113, No 4, p 254-263, April 1972. 7 fig, 39 ref.

Descriptors: *Soil water movement, *Soil physics, *Diffusivity, *Darcys law, *Hydraulic conductivity, Saline soils, Unsaturated flow, Drainage, Hysteresis, Soil moisture, Mathematical models, Tensiometers, Moisture content.
Identifiers: *Soil water retention, *Soil water potential, *Matric potential.

The contributions of L. A. Richards, many of which are reviewed, make it possible to measure and predict soil water movement. Less than 5% of all articles written in soil, water and crop research journals contained analytic measurement or prediction of soil water retention. The development of tensiometers made possible measurements of hydraulic conductivity as a function of water content or matric potential. Because of the heterogeneous nature of field soils in the vertical direction owing to genetic horizons or poorly defined layers stemming from alluvium, prediction of soil water movement is difficult, and best accomplished under field conditions, using analytical or numerical solutions of Darcy-type equations, or obtained with either laboratory- or field-measured values of the hydraulic conductivity. The study of soil water movement with such methods may also be of much use in studying soil salinization problems, particularly soluble salt transfer in unsaturated soils. (Casey-Arizona)
W72-12834

DECOMPOSITION AND BINDING ACTION OF POLYSACCHARIDES IN SOIL,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
J. P. Martin.
Soil Biology and Biochemistry, Vol 3, No 1, p 33-41, February 1971. 1 fig, 1 tab, 65 ref.

Descriptors: *Soil physical properties, *Soil aggregates, *Soil chemical properties, Soil microbiology, Humus, Soil structure, Soil treatment, Cations, Clay minerals.
Identifiers: *Soil polysaccharides.

Soil humus contains polysaccharides which quantitatively are the second most important components of the soil organic fraction. The polysaccharides appear to be active in soil aggregate formation or binding of soil particles and are probably important in chelation and exchange reactions related to active constituents such as uronic acids. The available evidence indicates that most plant or microbial polysaccharides are largely decomposed in soils within a few weeks to a few months. A few are more resistant, lasting much longer, and are possibly of relatively greater importance than those more readily utilized. Many polysaccharides are adsorbed by clay minerals while others which contain uronic acid groups may form salts or complexes with metal cations. Such chemical combinations may increase their resistivity to breakdown. Although much has been learned about different structural units and their origins and relations with other soil constituents, much is yet to be done, particularly recovery of relatively unaltered preparations. The probable mechanisms of the polysaccharide binding action are reviewed. (Casey-Arizona)
W72-12836

CONCEPTS OF SOIL WATER PHENOMENA,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. C. Childs.
Soil Science, Vol 113, No 4, p 246-253, April 1972. 2 fig, 29 ref.

Descriptors: *Soil water movement, *Pore water, *Soil physics, *Mathematical models, *Hydraulic conductivity, Darcy's Law, Membrane processes, Conduction, Diffusivity, Infiltration, Capillary water, Laplaces equation.
Identifiers: *Soil water diffusivity, *Domain diagrams.

Soil water has been divided into 3 classes: hygroscopic, gravitational and capillary. Such concepts suffer from imprecise definitions which preclude precise measurement. Such criticisms also apply to the concepts of field capacity and permanent wilting percentage. The measurement of soil water properties reduces to the twin problems of measuring pore water suction and plotting the relationship between this and the pore water content, first, and secondly, interpreting the curves that result. Elucidation of the static equilibrium requires definitions of pore water pressure which can be measured by permeable or semi-permeable membrane studies. Geometrical interpretations of the pore space can only be qualitative, so domain concepts must be used. A simple domain diagram of drying and wetting suction, is presented and interpreted. While soil water movement can be described by Darcy's Law, which is a part of general conduction theory, it is cautioned that features of gravity, pore water content and hysteresis distinguish soil water flow from other branches of conduction theory. Bearing in mind these features Darcy's Law is developed for a variety of situations. (Casey-Arizona)
W72-12837

FUTURE PROBLEMS OF SOIL WATER RESEARCH,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
J. R. Philip.
Soil Science, Vol 113, No 4, p 294-300, April 1972. 59 ref.

Descriptors: *Soil water, *Soil water movement, *Soil physics, *Research priorities.

After a brief review of L.A. Richard's scientific research, 5 fields are identified in which it is felt that significant progress is possible in the next decade: the stability of soil water flows, the dispersion of solutes by convection and molecular diffusion in porous media, solute-induced flow and transport, water movement in saturated and unsaturated swelling soils, and electric double layers on soil colloids. The future of soil water research is confronted with several general problems and 3 of these are described. The problem of diminishing returns or when to stop pursuing a given research avenue is too often not considered, despite the combination of increas

ingly difficult research data leading to increasingly irrelevant or unusable results. The problem of transferring the scale of soil water research from the small local process to the large-scale river basin or ecosystem must eventually be faced. Finally, the social problem of decreased social support for science and the closing of the entry of the young into research is especially serious. (Casey-Arizona)
W72-12838

WATER RETENTION IN SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics; and Agricultural Univ., Wageningen (Netherlands). Lab. of Soils and Fertilizers.
P. H. Groenevelt, and G. H. Bolt.
Soil Science, Vol 113, No 4, p 238-245, April 1972. 3 fig, 21 ref.

Descriptors: *Soil physics, *Soil water movement, *Tensiometers, *Saturated flow, *Chemical potential, Soil water, Mathematical analysis, Hysteresis, Thermodynamic behavior, Moisture content, Moisture tension.
Identifiers: *Soil water potential, *Matric potential, *Soil water retention.

The concept of the capillary potential of soil water and its generalization in terms of matric potential have provided a rigorous thermodynamic basis for soil water retention. Soil water potential may be expressed in terms of its component water potentials: matric, solute, temperature, external (gas) pressure and truly external force fields (such as gravity). The operation of the tensiometer is then explained in terms of its water retention properties. Even when hysteresis is left out, the situation is much more complicated in swelling soils. Because of changes in geometry, it seems advantageous to express the moisture content in terms of a moisture rate of cu cm of water per cu cm of solid. Thus, the system can then be characterized by 2 independent parameters and 2 dependent parameters. Equations are developed leading to families of curves of the void ratio and the moisture ratio as functions of the load pressure. (Casey-Arizona)
W72-12839

THE ROLE OF MICROORGANISMS IN THE STABILIZATION OF SOIL AGGREGATES,
Wisconsin Univ., Madison. Dept. of Bacteriology; and Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W72-12857

INTENSITY OF SOIL DEFLATION,
A. M. Krivenkov.
Probl Osvoeniya Pustyn, 3, 65-72, English summary.

Descriptors: *Soil, *Erosion, *Soil stability, Soils, Water table, Vegetation, Wind velocity, Moisture content.

Resistance of soils to deflation (erosion) was quantitatively estimated on semi-permanent sample plots. The deflation rate was dependent on the substrate, wind velocity, water table, moisture content, density, nature of vegetation, and other natural factors. The annual rate varied from 0.1 cm on periodically moistened solonchaks to 7.1 cm on loose sandy deposits.--Copyright 1972, Biological Abstracts, Inc.
W72-12890

HYSTERESIS IN CALCULATIONS OF SOIL MOISTURE REDISTRIBUTION,
N. V. Nerpin, G. S. Reznik, and G. I. Yuzefovich.
Sb Tr Po Agron Fiz. 23. p 4-17. 1969.

Identifiers: Calculations, Distribution, *Hysteresis, *Soil moisture, Moisture profile.

The movement of moisture in soil allowing for hysteresis, described by the nonlinear diffusion equation, is discussed. The different processes are indicated by the position of the inflection point in the moisture profile at every moment of time. The resultant numerical solution shows that in the absence of evaporation and for given diffusion coefficients, the redistribution of moisture in soil is more rapid when hysteresis is considered--Copyright 1972, Biological Abstracts, Inc.
W72-12891

SOIL CHARACTERISTICS AND SUBSURFACE SEWAGE DISPOSAL,
Department of Agriculture, Guelph (Ontario).
For primary bibliographic entry see Field 05B.
W72-12913

MIGRATION OF SUBSTANCES IN BROWN FOREST SOILS,
L. Reintam, I. Rooma, and E. Arvisto.
Sb Nauchn Tr Est S-Kh Akad. 65. p 163-187. 1970. English summary.
Identifiers: *Forest soils, Formation, Humus, Lysimeters, *Migration, Seasonal, Soils, Substances.

The migration of substances was studied by insertion into the soil of Al2O3 (chromatographic grade), KU-2 cation-exchange resin and microlysimeters. Accumulation processes predominate in brown forest soils, the bulk of Fe and Fe-organic complexes being fixed in the soil. A considerable part of the total migrating Fe consists of the free forms extracted with 1 N H2SO4, while free Fe extracted by 0.1 N H2SO4 is completely absent in certain periods. Free Fe migrates in summer. The importance of Fe-organic complexes increases in winter. The amount of substances retained by sorbents is always larger than in lysimetric waters. Substances are evidently transported by capillary waters. Mobile organic matter formed in the forest floor becomes fixed in underlying horizons. The formation of mobile humus is less in the 6 cold mo. of the year, and its fixation is weaker. The entire soil profile is appreciably decalcified.--Copyright 1972, Biological Abstracts, Inc.
W72-12914

WATER, THERMAL AND AIR REGIME OF BROWN SOILS,
K. Roostalu, Y. Enni, and R. Okk.
Sb Nauchn Tr Est S-Kh Akad. 65. p 144-162. 1970. English summary.
Identifiers: *Soil properties, Air, *Brown soils, Oak D, Soils, Spruce G, Soil moisture, Temperature.

The leached and typical brown soils are well provided with a comparatively abundant water supply, the moisture content of horizon Bt dropping below wilting point only during drought. The relative moisture content of typical brown soils very rarely falls below 50-60%, with greater water consumption at the beginning of the growing season in spruce stands and in the second half of summer in oak stands. The amount of available moisture under oak is 25 mm less than under spruce, from July on. Appreciable warming of typical brown soils begins nearly 2-3.5 wk earlier than in leached brown soils. The active temperature period at depth 25 cm is 1-2 wk longer under oak than under spruce on typical brown soil and nearly 1 mo. longer on leached brown soil. The CO2 content in the air of typical brown soils under oak reaches 1.35%, and seldom exceeds 0.5% in leached brown soil. Maximum CO2 liberation by brown soils occurs during the growing season.--Copyright 1972, Biological Abstracts, Inc.
W72-12916

DDT-DEHYDROCHLORINASE FOR IDENTIFICATION OF DDT IN SOIL,
Alberta Univ., Edmonton. Dept. of Entomology.
For primary bibliographic entry see Field 05A.
W72-12934

EFFECT OF STEEPNESS AND LENGTH OF SLOPE ON SOIL LOSS,
College of Agriculture, Gwalior (India).
H. B. Battawar, and Y. P. Rao.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 4, No 1/2, p 46-51. 1970 (1971). Illus.
Identifiers: *Erosion, Length, Loss, *Slope, Soils Steepness.

Runoff was studied on plots of 2% slope with 60-m length, 3.5% with 45-m length and 5% slope with 30-m length with paddy crop. With the increase in the degree of slope even when the length was reduced, soil loss increased rapidly.--Copyright 1972, Biological Abstracts, Inc.
W72-12936

CANNERY WASTE DISPOSAL ON LAND,
Guelph Univ. (Ontario). Dept. of Soil Science.
For primary bibliographic entry see Field 05D.
W72-12969

CHARACTERISTICS OF THE WATER REGIME IN WEAKLY PODZOLIC SANDY SOILS OVERLYING THICK SANDS IN THE SOUTHWESTERN ZONE OF THE EUROPEAN PART OF THE USSR,
A. A. Kolosova.
Tr Novozybkovsk S-Kh Opytn Stn Vses Nauchno-Issled Inst Udobr Agropochvoved. 3. p 313-339. 1969.
Identifiers: *Precipitation (Atmospheric), Moisture deficit, *Podzols soils, *Sands, Soils, USSR.

Summer precipitation plays an insignificant and transient part in the wetting of these sandy soils. In spite of autumn precipitation, the soils often form a dry layer at depths of 50-70 or 90-100 cm, which persists till spring. The water balance remains precarious with a permanent moisture deficit throughout the growing season, irrespective of the amount of summer precipitation.--Copyright 1972, Biological Abstracts, Inc.
W72-12975

CONTRIBUTION TO THE STUDY OF THE INFLUENCE OF SOIL ON VEGETATION IN FOREST-SAVANNA CONTACT OF WESTERN AND GENERAL IVORY COAST,
M. Digerdil Latham.
Adansonia. Vol 10, No 4, p 553-576. 1970. Illus. Maps.
Identifiers: Climate, Contact, *Soil fertility, Forests, *Ivory Coast, *Soil moisture, *Forest Savanna, Soil, Vegetation.

The transition between semi-deciduous forest and savanna in central Ivory Coast may be due to climatic causes, distinction is not sharp. Comparison of the quantitative relief of vegetation and characteristics of soil show: a significant relation between well managed water reserve and types of vegetation, saturation of the soil in the formation of certain herbaceous savannas, and a probable relationship between chemical fertility of soils and vegetation.--Copyright 1972, Biological Abstracts, Inc.
W72-13023

2H. Lakes

EFFECT OF SPECTRAL COMPOSITION ON PHOTOSYNTHESIS IN TURBID RESERVOIRS--PHOTOSYNTHETIC PRODUCTION IN A

TURBID RESERVOIR II. DETAILS OF AN INCUBATION MODEL AND COMMENTS ON THE EFFECT OF LIGHT QUALITY ON PHOTOSYNTHESIS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 05C.
W72-12393

LAKES OF WEST VIRGINIA,
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 06D.
W72-12397

PEACE VALLEY AQUATIC RECREATION AREA, RECREATION DEVELOPMENT PLAN,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 06B.
W72-12429

A METHOD FOR FORECASTING ANNUAL INFLOW OF WATER TO LAKE SEVAN (METOD PROGNOZA GODOVOGO PRITOKA VOD V OZERO SEVAN),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12439

THERMAL REGIME OF WATERS NEAR THE EAST COAST OF THE CASPIAN SEA (OSOBENNOSTI TERMIKI VOD U VOSTOCHNOGO POBEREZH'YA KASPIYSKOGO MORYA),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12441

SURFACE DISCHARGE OF HEATED WATER,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W72-12452

COMPARISON OF THERMAL DATA FROM AIRBORNE AND VESSEL SURVEYS OF LAKE ERIE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 05A.
W72-12455

A PROGRAM TO ASSESS THE THERMAL DISCHARGE FROM A PLANNED NUCLEAR POWER PLANT ON CAYUGA LAKE,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 05B.
W72-12456

SIMULATED THERMAL EFFLUENT INTO LAKE ONTARIO,
Toronto Div. of Sanitary Engineering (Ontario). Water Quality Surveys Branch.
For primary bibliographic entry see Field 05B.
W72-12457

FRESH WATER AND ESTAURINE SPECIFIC GRAVITY DIAGRAMS,
State Univ. Coll., Fredonia, N.Y.
For primary bibliographic entry see Field 05A.
W72-12458

SATELLITE MEASUREMENT OF LAKE-SURFACE TEMPERATURES,
Allied Research Associates, Inc., Concord, Mass.
J. R. Greaves.
In: Proceedings 12th Conference on Great Lakes Research, University of Michigan, Ann Arbor, Michigan, May 5-7, 1969, p 558-563. 12 ref.

Descriptors: *Remote sensing, *Water temperature, *Satellites (Artificial), *Thermal pollution, Cloud cover, *Lakes, Infrared radiation.
Identifiers: Absorbing gases, Spatial resolution.

Monitoring of thermal pollution, providing data for circulation models and for fish prediction services, and meteorological applications are a few important uses of lake-surface temperature measurements. An IR satellite system is inherently cloud cover limited. Because of the presence of absorbing gases in the atmosphere between the lake surface and the spacecraft, IR sensors measure a temperature which is less than the true temperature of the surface. If the vertical distribution of these absorbing gases is known, the temperature correction can be determined. Wherever a cloud falls within the field of view of the satellite radiometer, the recorded temperature will be intermediate between that of the lake surface and that of the cloud top. Ways which have been devised to circumvent this problem include the establishment of a temperature threshold, composite mapping, and more complicated multispectral techniques. A brief description of the equipment aboard the TIROS and NIMBUS meteorological satellites is given. Future satellites should provide improvements in spatial resolution to make the study of smaller bodies of water possible and atmospheric sounding techniques and multispectral sensing to overcome the problems of absorbing gases and cloud contamination. (Upadhyaya-Vanderbilt)
W72-12460

BIOLOGIC CHARACTERISTICS OF THE CASPIAN STURGEONS (FAMILY ACIPENSERIDAE) AND THEIR USE IN THE REPRODUCTIVE REPLETION OF STOCK,
Tsentralnyi Nauchno-Issledovatelskii Institut Osetrovogo Khozyaistva, Baku (USSR). Azerbaidzhanskoe Otdelenie.
M. I. Legeza.
Vopr Ikhtiol. Vol 11, No 3:, p 447-456, 1971. Illus.
Identifiers: *Fish management, Fish reproduction, Fish stocking, Acipenser nudiventris, Acipenseridae, Biology, Caspian basin, Repletion, Reproduction, *Sturgeons.

Studies on the nutritional factors, spawning habits, and growth rates of various members of the sturgeons in the Caspian basin led to the following recommendations for reproductive repletion of sturgeon stocks. Controlled reproduction should be conducted to assure that about 60% of the sturgeons family population consisted of sturgeons, approximately 20% of starred sturgeon, about 15% of beluga, and around 5% of Acipenser nudiventris. In order to transform the Caspian basin into a sturgeon reservoir, the fish industry should select means that will allow the highest population of sturgeon and low levels of beluga.—Copyright 1972, Biological Abstracts, Inc.
W72-12537

AN OBSERVATION OF MASS MORTALITY OF NILE PERCH (LATES SP.) ON LAKE ALBERT, UGANDA,
I. S. C. Parker.
East Afr Agric For J. Vol 36, No 4:, p 419-421. 1971.
Identifiers: *Fishkill, *Earthquakes, Lake Albert, *Lates p, Mortality, *Perches, Uganda.

An observation of mass mortality of Lates in Lake Albert is described. That this had been a relatively frequent phenomenon (Worthington, 1929; Greenwood, 1958) is noted. The circumstances surrounding the instance recorded do not support previous ideas put forward to explain it. The observation that Lake Albert lies in an area of considerable seismic activity, together with the occurrence of an earth tremor immediately prior to the mortality recorded, suggest a relationship between the 2 phenomena. The hypothesis is therefore presented that seismic activity is the most likely cause for the frequent mass mortalities of Lates in Lake Albert.—Copyright 1972, Biological Abstracts, Inc.
W72-12538

INTERRELATIONS AMONG PLANKTON, ATTACHED ALGAE, AND THE PHOSPHORUS CYCLE IN ARTIFICIAL OPEN SYSTEMS,
Ithaca Coll., N.Y. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-12543

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W72-12548

SYNOPTIC STUDY OF ACCELERATED EUTROPHICATION IN LAKE TAHOE--AN ALPINE LAKE,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W72-12549

THE SOUTH BASIN OF LAKE WINNIPEG - AN ASSESSMENT OF POLLUTION,
Department of Mines and Natural Resources, Winnipeg (Manitoba). Fisheries Branch.
For primary bibliographic entry see Field 05C.
W72-12550

EUTROPHICATION IN SOME LAKES AND COASTAL AREAS IN FINLAND, WITH SPECIAL REFERENCE TO POLYHUMIC LAKES,
Helsinki Univ. (Finland). Dept. of Limnology.
For primary bibliographic entry see Field 05C.
W72-12551

THE RECOVERY PROCESS OF A LAKE WHICH RECEIVED WASTEWATER FROM AN ORE DRESSING PLANT,
Swedish Water and Air Pollution Research Lab. Stockholm.
For primary bibliographic entry see Field 05C.
W72-12552

PHOSPHORUS BINDING MECHANISMS DURING SELF-PURIFICATION OF POLLUTED LAKES,
Swedish Water and Air Pollution Research Lab. Stockholm.
For primary bibliographic entry see Field 05C.
W72-12557

GONADAL RESORPTION IN CERTAIN SEMI-MIGRATORY FISHES OF ARAKUM RESERVOIRS (DAGESTAN ASSR) DUE TO REGULATION OF WATER FLOW,
M. M. Shikhshabekov.
Vopr Ikhtiol. Vol. 11, No. 3, p 526-530. 1971. Illus. Map.
Identifiers: *Fish reproduction, *Fish migration, Arakum, Carp, Dagestan ASSR, Fishes, Flow, *Gonads, Regulation, Reservoirs, *Resorption, Shiners, USSR.

Long-term investigations were undertaken to determine the effects of controlled water flows in the Arakum reservoirs in Dagestan on the sexual cycle of vobla, golden shiner, and carp from 196 to 1969. Histologic investigations on the sex of gans of 2-5 yr old vobla, 3-6 yr old carp, and 3-8 y old golden shiner showed that full development of the gonads and completion of the sex cycle

strongly dependent on environmental conditions. The fish must be able to reach the spawning grounds prior to exposure to spawning temperature. Regulation of water flow with locks prevents migration of these semimigratory fishes and leads to massive resorption of the gonads and subsequent decrease in the fish population.--Copyright 1972, Biological Abstracts, Inc.
W72-12577

SOME DATA ON THE AGE AND GROWTH OF STIZOSTEDION LUCIOPERCA L. AND ESOX LUCIUS L. FOUND IN THE LAKE LION,
Vysoka Skola Polnohospodarska, Nitra (Czechoslovakia). Katedra Drobnych Hospodarska Zvierat.
J. Sedlar.
Biologia (Bratisl). Vol 26, No 8: p 627-634, 1971. Illus. (English summary).
Identifiers: *Fish physiology, Age, Czechoslovakia, *Esox lucius, *Growth, Lakes, *Lion, Lake (Czech), *Stizostedion lucioperca.

An estimation is given of the ages and growth of S. lucioperca L. (122 specimens of ages 1-9 yr and of body lengths 147-755 mm) and of E. lucius L. (90 specimens of ages 1 to 6 yr and of body lengths 175-780 mm). Various indices, both absolute (increments to lengths and weights of bodies in mm and g, respectively) and relative (increase in lengths in single years expressed as % of the length in the first growing period, and increase in length in single years compared to the average growth of the whole population) are evaluated. Fishhooks were used to obtain the material of both species, so that only a fragment of the population was involved.--Copyright 1972, Biological Abstracts, Inc.
W72-12624

RATE OF POPULATION OF LAKES WITH PERCH (PERCA FLUVIATILIS L.),
Siberian Research Inst. of Pisiculture, Tyumen (USSR).
I. S. Mukhachev.
Vopr Ikhtiol. Vol 11, No 3, p 522-524. 1971.
Identifiers: Fish establishment, Fish populations, Fish stocking, Lakes, *Perca fluviatilis, *Perches, Rates.

The periodically fish-killing Transural lakes provide natural laboratories for investigations on the dynamics of limnophilic fish populations and their interrelationships. It has been observed that when high water returns and lakes are artificially replenished with perch, the fish increase in weight 4-5 fold after 1 summer. It has been established that introduction of P. fluviatilis rapidly turns such lakes into perch reservoirs. A case in point is Lake Smolino in which a few hundred specimen were introduced by the local fishermen in 1958-1959. By 1964 perch accounted for 50% of all the catch, and by 1968 the vast majority of the fish caught were perch. Such findings have also been observed with other lakes in the Transural region and point to the need for ichthyological consultations before restocking lakes with fish.--Copyright 1972, Biological Abstracts, Inc.
W72-12635

THE SEDIMENT-INHABITING TESTATE AMOEBAE (RHIZOPODA, TESTACEA) FROM THE FINSTERTALER SEEN (TYROL/AUSTRIA), (SEDIMENTBEWOHNENDE SCHALENAMOBEN RHIZOPODA, TESTACEA) DER FINSTERTALER SEEN (TIROL)),
Biological Station, Lunz am See (Austria).
For primary bibliographic entry see Field 05A.
W72-12653

GEOCHEMISTRY OF HOLOCENE BEDS OF LAKE MUTNOYE (GEOKHIMIYA GOLOTSENOVYKH OTLOZHENIY OZ. MUTNOGO),
Akademiya Nauk SSSR, Moscow, Institut Geokhimii i Analiticheskoi Khimii.
I. F. Gribovskaya, A. S. Kremen', and Ye S. Malyasova.
Geokhimiya, No 8, p 992-1003, August 1971. 2 fig, 4 tab, 19 ref.

Descriptors: *Geochemistry, *Lakes, *Lake beds, *Lake stages, *Recent epoch, Geologic time, Radioactive dating, Dendrochronology, Palynology, Pollen, Spores, Sediments, Sedimentation, Salinity, Salts, Carbonates, Trace elements, Metals, Organic matter, Correlation analysis.
Identifiers: *USSR, *Smolensk Oblast, *Biogeochemistry, Silicon, Barium, Vanadium, Sapropel.

Investigations of principal stages in the biogeochemical evolution of Lake Mutnoye in the Smolensk Oblast were based on chemical, spectral, and spore-pollen analyses. The lake area is 13.5 ha and the maximum depth is 3 m near the center. The salt content is 200-250 mg/liter, represented mainly by HCO3, Ca, and Mg. Sedimentation in the lake has been continuous since the Allerod period, the average annual rate at the center being 0.7 mm. The lake has many features in common with Lake Bebrukas in southern Lithuania, but differs from many lakes in Belorussia, Poland, and the Baltic Sea area. Carbonate accumulation in Lake Mutnoye began in the Late Drias period and in the other lakes, in the Preboreal period. In the Boreal period, Ca content decreased sharply in Lake Mutnoye sediments but reached a maximum in the other lakes. The concentration of Si, Ca, Fe, Mn, Cu, Sr, and Pb in Lake Mutnoye sediments varied widely from one period to another, particularly in the case of trace elements. Migration of Fe and Mn was related to the stage of development of the weathering crust. In the Allerod and Late Drias periods, Mn migrated early from the weathering crust in the alkaline stage of the eluvial process, while Fe migrated later during the acid stage of the eluvial process in the Atlantic period. Vegetation in the lake basin greatly affects migration of chemical elements, particularly Cu and Pb. These elements correlate with the organic matter in lake sediments, while Mn, Cr, Mo, Sr, and Ba correlate with the inorganic fraction. A correlation is established between Sr and Ba and between Ba and Mn. (Josefson-USGS)
W72-12688

THE GRADUAL DESTRUCTION OF SWEDEN'S LAKES,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 05C.
W72-12729

FRESHWATER OSTRACODS (CRUSTACEA) FROM LAKE NIPIGON, ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
P. M. Nuttall, and C. H. Fernando.
Can Field Natur. Vol 85, No 2, p 184-186. 1971. Map.
Identifiers: Canada, *Crustaceans, Fresh water, *Lake Nipigon (Canada), Ontario, Ostracods, Water temperature.

Twelve species of Ostracoda were identified from collections made in Lake Nipigon. This adds 8 new records of Ostracoda for this lake. Morphological variation hitherto unrecorded was found in 2 spp. Some species considered as shallow water forms from previous work were recorded from deep water. The distribution of species in the lake appears to be influenced by the temperature of the water. The following 12 spp. were identified: Candona candida (Muller, 1776); C. crogmaniana Turner, 1894; C. elliptica Furtos, 1933; C. eriensis Furtos, 1933; C. ohioensis Furtos, 1933; Candona cf. C. acutula Delorme, 1967; Candona cf. C. scupulosa Furtos, 1933; Cyclocypris laevis (Muller, 1766); C. serena (Koch, 1838); C. lacustris (Sars, 1863); Ilyocypris bradyi (Sars, 1890); Limnocythere friabilis Benson and MacDonald, 1963.--Copyright 1972, Biological Abstracts, Inc.
W72-12733

A MODEL FOR THE INTERACTION BETWEEN THE FISH INDUSTRY AND THE ECOLOGIC SYSTEM OF A RESERVOIR,
Akademiya Nauk SSR, Moscow. Inst. of Evolutionary Physiology.
V. V. Menshutkin.
Vopr Ikhtiol. Vol 11, No 2, p 195-202. 1971.
Identifiers: *Fish populations, *Aquatic environment, Computers, Ecology, Fish, Interaction, Kamchatka, Model studies, Reservoirs, USSR.

Up to the present time the various models designed to correlate fish populations in various reservoirs with the different biotic and abiotic characteristics of the reservoirs have been essentially qualitative. In the present study an attempt was made to place such an approach on a quantitative basis taking into consideration not one but several factors affecting fish populations. This approach is significantly different from those previously attempted in that emphasis was placed on cause and effect relationships rather than correlational dependencies. Application of such a theoretical approach to Lake Dal'noe (Kamchatka region) gave promising results in that it seems possible to consider the entire ecological system of a reservoir involved in the fish yield as 1 system whose variables lend themselves to computer analyses.--Copyright 1972, Biological Abstracts, Inc.
W72-12737

PHYTOPLANKTON OF TWO DANISH LAKES, WITH SPECIAL REFERENCE TO SEASONAL CYCLES OF THE NANNOPLANKTON,
Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology.
For primary bibliographic entry see Field 05C.
W72-12738

THE EFFECTS OF REGULATED VOLGA FLOW ON THE REPRODUCTION OF ASP, BLUE BREAM, WHITE BREAM, AND BLEAK IN THE SVIYAZH BAY OF THE KUIBYSHEV RESERVOIR,
Kazan State Univ. (USSR).
V. A. Kuznetsov.
Vopr Ikhtiol. Vol 11, No 2, p 232-239. 1971. Illus.
Identifiers: *Fish reproduction, Abramis ballerus, Adaptation, Alburnus alburnus, *Asp, Aspius aspius, *Bleak, Blicca bjoerkna, *Bream, *Flow, *Kuibyshev Reservoir, Plants, *Regulated flow, Reservoirs, Sviyazh Bay, USSR, Volga River.

Construction of the Kuibyshev Reservoir led to significant changes in the hydrology of the middle Volga. In order to determine the effects of the reservoir on fish, the reproduction of several species was studied during a 7 yr period (1963-1969) at the Sviyazh Bay of the reservoir. The species investigated were: ask (Aspius aspius), blue bream (Abramis ballerus), white bream (Blicca bjoerkna), and bleak (Alburnus alburnus). Best adaptability in terms of reproduction was shown by the asp and the bleak who started to deposit their eggs on rocky regions, plants, and submerged roots. In addition, the bleak also began to utilize deep spawning grounds. Thus, the asp and the bleak retained their population at relatively high levels. The blue bream also adapted fairly well to the new conditions and started to deposit eggs in riverbank regions that were rich in plant life and well protected from winds. However, in periods of low water the eggs died massively and, consequently, numerically the blue bream dropped sharply in

such years. White bream began to deposit eggs close to the banks when the waters began to rise (end of May to beginning of June) and, thereby, showed greater adaptability than the blue bream.--Copyright 1972, Biological Abstracts, Inc.
W72-12747

DISTRIBUTION PATTERNS OF FIVE SELECTED GASTROPODS SPECIES FROM MCCARGO LAKE,
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 05C.
W72-12786

MIGRATIONS OF ADULT AND JUVENILE WALLEYES (STIZOSTEDION VITREUM VITREUM) IN SOUTHERN LAKE HURON, LAKE ST. CLAIR, LAKE ERIE, AND CONNECTING WATERS,
Wayne State Univ., Detroit, Mich. Dept. of Biology.
R. G. Ferguson, and A. J. Derksen.
J Fish Res Bd Can. Vol 28, No 8, p 1133-1142. 1971. Illus. Map.
Identifiers: *Fish migration, *Great Lakes, Canada, Lake Erie, Lake Huron, Lakes, Lake St-Clair, Stizostedion vitreum vitreum, *Walleye, Thames River, St. Clair River.

Recoveries of S. vitreum vitreum tagged as adults and juveniles at various sites in waters from southern Lake Huron to eastern Lake Erie provided information on the migrations of the Thames River stock and the mixing of these fish with other stocks in the study area. Walleyes spawning in the Thames River in March and April quickly migrated into the St. Clair River and southern Lake Huron, where they mingled with other stocks, including some from Lake Erie. The return migration to the Thames River occurred between Nov. and March. Juvenile walleyes tagged in Lake St. Clair, moved downriver to Lake Erie. Young-of-the-year fish tagged in western Lake Erie, many presumably of Lake St. Clair origin, provided evidence of a reverse migration, since they tended to move back into Lake St. Clair and Lake Huron as they matured. Adult walleyes tagged along the Canadian shore of Lake Erie migrated eastward during the summer, but were recovered in or near the western basin during the spawning season. Thus, western Lake Erie appeared as a juvenile milling or mixing area during the summer, whereas southern Lake Huron and the north shore of central and eastern Lake Erie were adult areas.--Copyright 1972, Biological Abstracts, Inc.
W72-12929

EUTROPHICATION OF SURFACE WATERS--LAKE TAHOE.
Lake Tahoe Area Council, South Lake Tahoe, Calif.
For primary bibliographic entry see Field 05C.
W72-12955

ROLE OF BACTERIA IN THE NITROGEN CYCLE IN LAKES,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 05C.
W72-12956

EUTROPHICATION OF SURFACE WATERS--LAKE TAHOE INDIAN CREEK RESERVOIR.
Lake Tahoe Area Council, South Lake Tahoe, Calif.
For primary bibliographic entry see Field 05C.
W72-12957

PROJECT HYPO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Fairview Park, Ohio. Ohio District Basin Office.
For primary bibliographic entry see Field 05C.
W72-12990

OBSERVATIONS ON THE NUTRIENT COMPOSITION OF A FRESHWATER LAKE ECOSYSTEM,
North Dakota Univ., Grand Forks. Dept. of Biology; State Univ. Coll., Plattsburgh, N.Y. Dept. of Biological Sciences; and Arizona State Coll., Flagstaff. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-13002

DISTRIBUTION OF REDUCED INORGANIC COMPOUNDS AND THEIR OXIDATION IN LAKES,
Ehime Univ., Matsuyama (Japan).
For primary bibliographic entry see Field 05C.
W72-13012

STUDY OF PRIMARY PRODUCTION IN A FOREST POOL,
Institut Royal des Sciences Naturelles de Belgique, Brussels.
S. Yuen-Yong.
Bull Inst R Sci Nat Belg. Vol 47, No 21, p 1-9. 1971. Illus. Map.
Identifiers: Belgium, Forest, *Photosynthesis, *Phytoplankton, Pool, *Primary production, Seasonal.

Studies in a Belgian pool were carried out from the beginning of March 1968 to the end of May 1969. Samples of surface water were taken weekly. Tables of data are given. Production showed a maximum in summer and a less elevated maximum in winter. Minima were observed in spring and autumn. Two methods of measurement were used, which gave approximately the same results. By 'primary production' is meant the quantity of organic matter produced by the phytoplankton by the process of photosynthesis.--Copyright 1972, Biological Abstracts, Inc.
W72-13021

THE FLUORINE CONTENT AND FOOD VALUE OF KENYA LAKE FISH,
University Coll., Nairobi (Kenya).
H. Bergh, and J. Haug.
East Afr Agric For J. 36 (4): 392-400. Illus. 1971.
Identifiers: *Fish products, *Flourine contents, Hazard, Health, *Kenya Lake, Perch, Pig, Protein.

Studies were conducted to determine whether or not the F content of fish and fish products from lakes Rudolf, Baringo, Naivasha and Victoria was such as to constitute a hazard to consumers. Seafish from Mombasa were also included in the study. A small feeding trial was conducted to compare the effects of feeding fish meal and a mixture of meat and blood meal to pigs. Analyses of lake waters showed Lake Rudolf to have the highest F content (10.2 ppm), followed by Baringo (6.0 ppm), with Naivasha, Victoria and coastal waters having very low amounts (2.0, 0.7 and 0.11-0.10, respectively). The level of F in fish flesh was low and that of bones, though higher still, very modest. There was evidence from Nile perch of an increase in F content with increase in size (weight) of fish. The F in fish and fish products from Kenya lakes and coastal waters do not constitute a health hazard to consumers and these products are a useful source of protein for human and animals alike.--Copyright 1972, Biological Abstracts, Inc.
W72-13038

2I. Water in Plants

WATER USE EFFICIENCY IN PLANT GROWTH AND AMBIENT CARBON DIOXIDE LEVEL,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 03B.
W72-12391

ENERGY EXCHANGES BETWEEN A PASTURE AND THE ATMOSPHERE UNDER STEADY AND NON-STEADY-STATE CONDITIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
C. W. Rose, J. E. Begg, G. F. Byrne, J. H. Goncz, and B. W. R. Torssell.
Agricultural Meteorology, Vol 9, No 5/6, p 385-403, March 1972. 5 fig, 2 tab, 15 ref.

Descriptors: *Energy transfer, *Micrometeorology, *Lysimeters, *Convection, *Semiarid climates, *Solar radiation, Latent heat, Clouds, Vegetation effects, Estimating equations, Pastures, Grasses, Agroclimatology.

Because of the fundamental limitation of assuming energy, momentum and gas exchange processes to be steady-state and one dimensional in character the application of micrometeorological theory to the description of energy and mass exchange between vegetation and the atmosphere has been restricted to cloud-free periods. This paper attempts to test the validity of applying existing steady-state (SS) micrometeorological theory to analyze measurements under patently non-steady state (NSS) conditions accompanying the highly variable radiation with intermittent cloud. NSS conditions are characterized by fluctuations in air temperature gradients and vapor pressure gradients and the errors introduced by such conditions cannot be evaluated on theoretical ground alone. Energy exchange determinations were carried out with a pasture of Townsville stylo (Stylosanthes humilis) at Katherine, Northern Territory, Australia, in a region of dry monsoonal climate. Both latent and sensible heat fluxes were measured at 2 sites and independently obtained by both fluxatron and weighing lysimeter. The latent and sensible heat fluxes were derived from the micrometeorological profiles and integrated over time and compared. There was a modest variation in fluxes between sites which may have been due to inhomogeneities within the experimental area. Also, compared to the lysimeter measurement micrometeorological techniques underestimate heat flux up to 18% over a day. Further clarification of this is needed. (Casey-Arizona)
W72-12528

TEMPERATURE AND MOISTURE STRESS AFFECT GERMINATION OF GUTIERREZIA SAROTHRAE,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W72-12533

BIOTIC AND HYDROLOGIC VARIABLES IN PRAIRIE POTHOLES IN NORTH DAKOTA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04A.
W72-12535

LEHMANN LOVEGRASS ON THE SANTA RITA EXPERIMENTAL RANGE, 1937-1968,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04A.
W72-12539

;OME WATER MOVEMENT PATTERNS OVER ,ND THROUGH PINYON-JUNIPER LITTER,
Jtah State Univ., Logan. Dept. of Range Science.
?or primary bibliographic entry see Field 04A.
W72-12540

;EXUAL DIMORPHISM AND AGE- AND RE-;ION-RELATED VARIATIONS IN THE TUR-CESTAN BARBEL (BARBUS CAPITO :ONOCEPHALUS, KESSLER) IN THE BASINS)F KASHKADARYA RIVER),
Gosudarstvennyi Pedagogicheskii Institut, Buk-ara (USSR).
L. G. Usmanova.
/opr Ikhtiol. Vol 11, No 2, p 203-216. 1971.
dentifiers: *Fish physiology, *Aquatic environ-ıent, Age, Barbus capito conocephalus, Basins, Sexual dimorphism, Ecology, Kashkadarya ;iver, Fish populations, Rivers, USSR, Varia-ons, *Turkestan Barbel.

)ne of the most important commercial fishes in Jzbekistan is B. capito conocephalus. However, ıe morphology and ecology of this species has een studied inadequately and, in addition, what ata are available has been derived from fish aught in reservoirs. Consequently these studies ere devoted to sexual dimorphism and age- and egion-related variations in barbel in the basins of ıe river Kashkadarya, since it is known that many arbel populations never enter the reservoirs but pend their entire life span in the river. On the asis of 500 specimens that were examined, it was)und that sexual dimorphism is clearly present, nd it is possible to distinguish between males and emales on the basis of 13 statistically significant ıdices. Age- and territory-related variations were learly evident in a number of morphologic fea-ures in the barbels from Kashkadarya, Tankhaz-arya, and Shurabsa rivers and were obviously ue to the hydrologic environment and the availa-le nutrients.--Copyright 1972, Biological Ab-tracts, Inc.
/72-12720

FFECTS OF CLIMATE ON RATE OF BANANA EAF PRODUCTION,
ropical Fruit Research Station, Alstonville (Aus-alia).
. W. Turner.
rop Agric. Vol 48, No 3, p 283-287. 1971.
lentifiers: *Crop response, Banana M, *Climate, umidity, Leaves, Monthly, Production, Rates, egression, Speed, Techniques, Temperature, 'ind.

ata were analyzed using multiple regression chniques. Mean monthly temperature, wind ıeed and relative humidity are significantly corre-ted with rate of leaf production. These variables e closely interrelated and the individual effect of ich cannot be properly separated.--Copyright 172, Biological Abstracts, Inc.
'72-12722

NERGY EXCHANGE WITHIN THE CROP ANOPY OF TOWNSVILLE STYLO, TYLOSANTHES HUMILIS H.B.K.,
ommonwealth Scientific and Industrial Research rganization, Canberra (Australia). Div. of Land esearch and Regional Survey.
H. Goncz, and C. W. Rose.
gricultural Meteorology, Vol. 9, No. 5/6, p. 405-9, March 1972. 7 fig, 2 tab, 12 ref.

escriptors: *Micrometeorology, *Energy budget, Canopy, *Pastures, *Data processing, Model stu-es, On-site data collections, Vertical migration, emperature, Humidity, Vapor pressure.
entifiers: *Energy exchange, *Transport ocesses, *Layering.

eteorological measurements of crop canopy ıergy-exchange processes are extremely com-plicated, requiring continuous monitoring of a large number of variables over space and time. The exchange coefficient hypothesis of micrometeorology assumes that the flux of a quantity is proportional to the negative gradient of the concentration of the same quantity. This is valid if sampling is extensive enough to yield a profile which can be considered to be an average picture of canopy microclimate. For 22 days, an intensive micrometeorological study was conducted in a sown pasture of Townsville stylo with the objectives of evaluating the adequacy of 1-dimensional transport process models within the compact canopy, and of carrying out all analyses of rough field data entirely by machine. It appeared that the 1-dimensional model could not always explain the data particularly because of anomalies in the vapor pressure profiles which lasted for varying periods of time. These anomalies were characterized by the appearance of a layer in which specific vapor pressure was less than in the layers both above and below. This was explained by a 'tunneling effect' hypothesis concerning canopy ventilation. Traditional data analysis involves data interpolation to obtain continuous profiles and profile differentiation to calculate energy exchange. It is hoped that methods of continuous machine data processing will be developed to replace this method. (Casey-Arizona)
W72-12826

EDAPHIC ARIDITY AS A FACTOR IN ANGIOSPERM EVOLUTION,
California Univ., Davis. Depts. of Geology; and California Univ., Davis. Dept. of Botany.
For primary bibliographic entry see Field 03B.
W72-12828

DRINKING PATTERNS AND BEHAVIOR OF AUSTRALIAN DESERT BIRDS IN RELATION TO THEIR ECOLOGY AND ABUNDANCE,
Michigan Univ., Ann Arbor. Museum of Zoology; and Western Australia Univ., Nedlands. Dept. of Zoology.
C. D. Fisher, E. Lindgren, and W. R. Dawson.
Condor, Vol 74, No 2, p 111-136, Summer 1972. 11 fig, 7 tab, 45 ref.

Descriptors: *Ecological distribution, *Birds, *Arid lands, *Animal behavior, Biological communities, On-site investigations, Environmental effects, Water supply, Xerophilic animals, Surface waters, Temperature, Solar radiation, Diurnal, *Australia.
Identifiers: *Selection pressures (Biological).

Desert conditions exist over almost half of the total land area of the Australian continent. Birds which are primarily diurnal and not fossorial must reconcile the antagonistic demands of evaporative cooling and water balance maintenance. Since the success of many species must be intimately linked with their capacities for locating and utilizing surface waters, field studies were undertaken of the drinking habits of birds at various waterholes in the arid interior of the continent. Over more than 2 years, 20 systematic dawn-to-dusk watches were conducted in each of 10 waterholes. Appendices list 127 species observed and various data on the drinking habits of 118 of them. Although 60% of the species studied were independent of surface water supplies, the majority of the individuals inhabiting the regions where water supplies were available were water-dependent species whose distributions were critically dependent on water availability. All these species had characteristic drinking times related to avoidance of high temperatures and intense solar radiation. While granivorous species are the most dependent on water, they are also the most abundant birds in the arid regions because seeds are a dependable food supply and because stock water developments have increased surface water supplies. Diurnal avian predators undoubtedly exert strong selection pressures at these waterholes. (Casey-Arizona)
W72-12846

TISSUE WATER POTENTIAL, PHOTOSYNTHESIS, C-14-LABELED PHOTOSYNTHATE UTILIZATION, AND GROWTH IN THE DESERT SHRUB LARREA DIVARICATA CAV,
California Univ., Riverside. Dept. of Life Sciences.
For primary bibliographic entry see Field 03B.
W72-12851

EFFECT OF SALINITY ON POLLEN I. POLLEN VIABILITY AS ALTERED BY INCREASING OSMOTIC PRESSURE WITH NACL, MAGNESIUM CHLORIDE, AND CALCIUM CHLORIDE,
Kansas Agricultural Experiment Station, Manhattan.
P. R. Reddy, and J. A. Goss.
American Journal of Botany, Vol. 58, No. 8, p 721-725, August 1971. 5 fig, 14 ref.

Descriptors: *Pollen, *Reproduction, *Saline waters, *Osmotic pressure, *Toxicity, Ions, Magnesium, Sodium, Calcium, Chlorides, Laboratory tests.

Salinity of the growth medium has long been known to reduce plant vegetative growth. Less studied is the effect of salinity on plant reproductive development. The effects of varying concentrations of Ca, Na and Mg chlorides at O-4 bars osmotic pressure on pollen viability as determined both by germination in vitro and the viability stain test. The plant used was the petunia (Petunia hybrida) because its pollen has been well-studied. Grown in single salt solutions, pollen viability decreased with increasing salinity, and the decrease was greater with NaCl than with Mg or Ca chlorides. In vitro studies showed that NaCl inhibited pollen germination and pollen tube growth more than the other salts. Not only was the Mg salt least injurious, it also promoted tube growth at low levels of osmotic pressure. Low concentrations of Mg salt added to NaCl reduced the toxic effects of the latter, while Ca salt additions behaved similarly, though less effectively. It would appear that specific or toxic ion effects were more important than osmotic pressure in reducing pollen viability. (Casey-Arizona)
W72-12853

EXPERIMENTAL CONTROL OF SOIL WATER CONTENT IN THEVICINITY OF ROOT HAIRS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
J. J. C. Hsieh, W. H. Gardner, and G. S. Campbell.
Soil Science Society of America Proceedings, Vol. 36, No. 3, p 418-421, May-June 1972. 5 fig, 8 ref.

Descriptors: *Soil water, *Plant growth, *Plant root systems, *Soil-water-plant relationships, *Laboratory equipment, Water balance, Transpiration, Corn (Field), Leaves, Soil water movement, Root distribution.
Identifiers: *Soil matric potential, *Plant water status, *Root hairs, *Soil water availability.

Information is needed concerning soil water content in the close vicinity of absorbing roots. A technique was developed for maintaining a predetermined soil water content around root hairs. It consists of growing plants on a fine screen placed over the soil in such a way that only root hairs can extend through the screen into the soil beneath. Essentially the screen serves as a mechanical device for growing root hairs in a thin lamina of soil. Water content in the root hair zone was non-destructively measured by gamma-ray attenuation. Soil water content could be adjusted to transpiration losses to within 0.015 cu cm water per cu cm soil. Plant growth in the presence of the root hair screen seemed normal. At soil matric potentials lower than -11 bars, corn growth was reduced and later ceased at lower potentials. The matric potential just outside the root hair zone was only about 1/2 as low as that inside the zone, showing that average water conditions in a soil

volume can be appreciably different from the water conditions existing near the root hairs. Extrapolation of these results to field conditions would not be fully justified until future technical improvements are made. (Casey-Arizona)
W72-12855

EFFECT OF CONSTANT SALINITY LEVELS ON WATER-USE EFFICIENCY OF BEAN AND COTTON,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 03C.
W72-12856

CALORIE-TO-PROTEIN RATIO FOR BROOK TROUT (SALVELINUS FONTINALIS),
New Hampshire Univ., Durham. Dept. of Animal Science.
R. C. Ringrose.
J Fish Res Bd Can. Vol 28, No 8, p 1113-1117. 1971.
Identifiers: *Brook trout, *Fish diets, Calories, Proteins, Ratios, Salvelinus fontinalis.

Based upon a kg of feed, the results suggested that S. fontinalis required approximately 75 kcal of metabolizable energy for each 1% of protein in the feed. Additional feed energy, resulting in greater calorie-to-protein ratios, reduced weight gained but did not significantly increase fat content of the dry carcass. The carbohydrate and protein of wheat middlings were utilized by the trout. A toasted cereal product composed of 80% corn and 20% wheat was metabolized for energy. Delactosed dried whey was found less effective than glucose as an energy source for trout.--Copyright 1972, Biological Abstracts, Inc.
W72-12858

EFFECT OF OSMOTIC SOLUTIONS ON THE GERMINATION OF PEPPER (CAPSICUM ANNUUM) AT SUB-OPTIMUM TEMPERATURES,
Delaware Univ., Newark. Dept. of Plant Science.
J. C. Ryder, Jr.
Ph D Thesis, June 1970. 73 p, 11 fig, 21 tab, 70 ref. OWRR A-010-DEL (4).

Descriptors: *Seed treatment, *Soaking, *Saline water, *Germination, Testing, Temperature, Aqueous solutions, Osmotic pressure, Snalytical techniques, Seeds, Growth rates, Agriculture.
Identifiers: *Pepper seeds (Capsicum Annuum), Physiological effects, Plants.

Tests were made to determine if soaking pepper seeds in salt solutions would stimulate germination under low temperatures and to determine physiological effects of the soaking on the pepper seeds. Soaking pepper seeds in aerated solutions with an osmotic pressure of approximately 13.5 atmospheres for a period of 7 days was effective in increasing the germination rate of the seeds under sub-optimum germination conditions. The nature of the osmotic solution was not a factor in the effectiveness of the soak; however, the osmotic pressure of the solution was a critical factor. The temperature of the soaking solution had a direct bearing on the effectiveness of the soak and also on the respiration rate of the seeds during the soak. The effectiveness of the soak was increased by both daily changing or filtering of the soaking solution. Also, the seed treatment was most effective under sub-optimum germinations. Treated seeds were stored up to 5 months without any reduction in the effectiveness of the soak. (Woodard-USGS)
W72-12885

CONTENTS OF WATER, ORGANIC MATTER AND ASH ELEMENTS IN NEEDLES OF DIFFERENT AGE IN PICEA ABIES,
V. V. Smirnov, and V. G. Semenova.
Lesovedenie. 5. p 57-67. 1969. English summary.
Identifiers: *Plant physiology, Age, Ash, *Needles, Organic matter, Picea abies G, Spruce G, Moisture content.

Fourteen sample spruce trees of various thicknesses were cut in an 85-yr-old large-fern spruce forest (Moscow area). One branch was taken from the middle part of the crown of each tree, in order to count the distribution of needles according to age. Greatest water content was observed in 1-yr-old needles; with increasing age of needles and diameter of the tree, the water content of the needles diminished. The weight of 1000 needles and the total absolute dry weight of needles of the individual age groups were related with weather conditions and the yield of cones and seeds of the preceding year. The ash content of the needles depended mainly on their age and, occasionally, on the size of the tree. The concentration of Si, Ca, Fe, Mn, and, partially, of Al increased with the increasing age of the needles but the content of P and K decreased. For the stand as a whole, the needle contents of minerals/ha were: Ca 157.35 kg, K 93.53, Si 65.65, Mg 36.82, Al 29.57, P. 23.30, Mn 21.72 and Fe 1.14 kg.--Copyright 1972, Biological Abstracts, Inc.
W72-12886

THE DISTRIBUTION OF JUGLANS REGIA IN AZERBAIDZHAN,
A. I. Kuliev.
Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior. 8: p 63-70. 1968.
Identifiers: Azerbaidzhan, *Distribution, *Juglans regia D, Soils, USSR, Moisture availability.

J. regia was found wild in the forests of the Greater and Lesser Caucasus and in the Talysh. This tree was widespread in the Tertiary; because of exploitation and felling, only individual clumps and groves with a density of 0.7-0.5 were preserved in the gorges and river valleys which have sufficient moisture. Persian walnut attains a height of 35 m and belongs to site class I. Most of the walnut plantations are concentrated in the Sheki-Zakataly zone on the southern slope of the Greater Caucasus at an altitude of 500-1100 m. Individual trees are found at 2000 m. Walnut grows successfully in the Kuba-Khacmas zone and in the Caspian lowland.--Copyright 1972, Biological Abstracts, Inc.
W72-12887

SOME MORPHOLOGICAL-ANATOMICAL FEATURES OF PERENNIAL GRASSES GROWN ON SLUDGE TAILINGS OF THE URAL ALUMINUM FACTORY,
M. A. Polovova, and I. I. Shilova.
Uch Zap Ural Univ. 94. p 161-173. 1970.
Identifiers: *Industrial wastes, *Crop response, Aluminum, Factory, Grasses M, Leaves, Morphology, Nutrients, Perennial, Sludge, Tailings, Ural, Wheat, Xeromorphism.

The morphological and anatomical structure of perennial grasses grown on tailings with different substrates (sludge + soil, sludge + mud) were compared with plants of the same species grown on soil. Two plants were studied: awnless brome grass and a 'rhizomeless' wheat-grass 4 yr old. The following changes were noted: decreased height, decreased bushiness and decreased number, length, and width of leaves (and thus also a reduction in assimilation surface); a reduction in the number, length, and thickness of the roots; a reduction in the length of the inflorescences, number of nodes, spikes, flowers, and fruit in the inflorescence. Also noted were intensified xeromorphism as manifested in an increase in the total length of the veins per unit of leaf surface, more cells in the epidermis and stomata with a decrease in their size, growth of the number of rows of assimilation cells with a simultaneous decrease in their size, and greater development of mechanical and conductive tissue in all the organs studied. These changes are caused principally by a shortage of nutrients (especially N), the physiological dryness of the substrate owing to its salt content, and the toxic action of Al, Fe, N salts.--Copyright 1972, Biological Abstracts, Inc.
W72-12896

THE ROLE OF INFUSORIA IN THE NUTRITION OF THE LARVA OF HERBIVOROUS FISHES,
G. S. Kornienko.
Vopr Ikhtiol. Vol 11, No 2: p 303-310. 1971.
Identifiers: *Fish diets, *Carps, Fishes, Herbivores, Infusoria, Larvae, Nutritient requirements, Plankton.

Nutrition of grass carp, golden carp, and silver carp larvae were studied during June-July 1968 and 1969 in the Krasnodar and Rostov regions. The resultant data showed that during their larval period these fishes subsist on infusoria, and that the highest intake is shown by the larva of the grass carp during the II and III stage of their development. The larvae of the silver carp evidenced the lowest consumption of infusoria. Consumption of the infusoria falls sharply when the fish go over to a diet of macrophytes and zooplankton.--Copyright 1972, Biological Abstracts, Inc.
W72-12908

PLANT COMMUNITIES IN THE UPPER REGION OF THE WIEPRZ RIVER WITH PARTICULAR ATTENTION OF MEADOW COMMUNITIES (EASTERN POLAND),
Medical Academy, Lublin (Poland).
M. Izdebska.
Fragmenta Florist Geobot (Krakow). Vol 15, No 3, p 283-332. 1969. Illus. Maps. English summary.
Identifiers: *Plant populations, Grasslands, Alnus D, Calluna D, Carex M, Juncus M, Litorella D, Nardus stricta M, Phragmites M, Plants, Poland, Scheuchzeria M, Soils, *Wieprz River.

On the basis of characteristic species, 29 associations and 4 plant communities within 7 classes were distinguished. In the geobotanic arrangement of the meadow associations upper Wieprz river valley Litorelletea and Potametea, 5 associations of the classes Litorelletea and Potametea were distinguished. These associations cover small surfaces of the Wieprz river, fish ponds, ditches, turf pits and oxbow lakes. Reservoirs are filled with shallow, mainly eutrophic, flowing or stagnant water. The scantiness of species is a common feature of the aquatic associations. Within the class Phragmitetea were distinguished 3 alliances with 11 associations. The associations occur on waterlogged ground with a considerable periodic oscillation of groundwater. Periodic stagnation of water between the hills favors plants of the class Scheuchzerio-Caricetea fuscae. In the valley of the upper Wieprz river have developed 3 associations of the class Alnetea glutinosae. All 3 associations occur on bog soils of various thickness formed of alder wood peats. The mosaic of plants is due to the hill-depression conditions. Within the Scheuchzerio-Caricetea fuscae class are distinguished 3 orders with 5 associations. In the meadows they are favored by moist, poorly aerated and strongly acidic soil. Within the Molinio-Arrhenatheretea class are distinguished 4 associations and 3 communities. Over a large area of meadows in the Wieprz valley they are attached to small, local hills, which are rarely flooded; peaty-mineral and mineral soils predominate. The Nardo-Callunetea class is represented by the Nardo-Juncetum association and a community of Nardus stricta.--Copyright 1972, Biological Abstracts, Inc.
W72-12927

VARIATION IN LEAF CHARACTERISTICS AMONG PROVENANCES OF EUCALYPTUS

CAMALDULENSIS DEHN. GROWN IN ZAMBIA,
Oxford Univ. (England). Commonwealth Forestry Inst.
J. Burley, P. J. Wood, and A. S. Hans.
Aust J Bot. Vol 19, No 2, p 237-249. 1971. Illus.
Identifiers: Plant physiology, *Leaves, Angle, Base, Components, Density, Ecotypes, *Eucalyptus camaldulensis D, Glands, Latitude, Length, Oil, Provenances, Temperature, Width, *Zambia.

Eight morphological characters of leaves were examined in 2-yr-old trees of 25 provenances of E. camaldulensis Dehn. grown in a replicated trial in Zambia. Provenances differed significantly in leaf length and width, base angle, and oil gland density but significant effects were attributed to trees within provenances. Leaf curvature also varied between provenances, trees, and branches. The tip angle and the number of veins did not vary significantly. Leaf length and oil gland density were related to maximum temperature at seed source rather than to latitude but the reverse occurred for leaf width. Significant amounts of variation were explained by a linear combination of temperature and latitude but not by longitude, altitude, or rainfall. Information on 7 traits was combined in principal component analysis in which the first component (a measure of leaf shape) accounted for 36% of total observed variation while the second (weighted largely on leaf length) accounted for 26%. Mapping of both univariate and multivariate results indicated that there are 2 major ecotypes and gave some evidence of clinal and ecotypic variation within them. The conclusions support those of other workers both in natural populations in Australia and in exotic populations elsewhere.--Copyright 1972, Biological Abstracts, Inc.
W72-13004

OAK REGENERATION IN THE UPPER CARMEL VALLEY, CALIFORNIA,
California Univ., Carmel Valley. Hastings Natural History Reservation.
J. R. Griffin.
Ecology. Vol 52, No 5, p 862-868. 1971. Illus.
Identifiers: *Reforestation, *Oak trees, Birds, *California, *Carmel Valley (Calif), Competition, Deer, Drought, Gophers, Grass M, Quercus agrifolia D, Quercus douglasii D, Quercus lobata D, Slopes, Squirrels, Temperature.

Acorn germination and seedling survival were studied in 3 species of foot-hill woodland oaks. Quercus douglasii and Q. lobata acorns matured in Oct. These non-dormant acorns germinated quickly at favorable temperatures. Q. agrifolia acorns matured later and germinated more slowly. Acorns placed on the surface of a south-aspect plot lost viability. On a north-facing plot they survived autumn heat and germinated during the winter, but rooted poorly. Acorns buried on either aspect germinated well. Burial by birds and squirrels, important in regeneration, insulates acorns from autumn heat, partially hides them from animals, and ensures good rooting. Q. douglasii seedlings had the greatest drought tolerance. In grass cover on a south-facing soil even they can survive their first summer only during wet years. On north aspects seedlings of several species can survive grass competition over a broader range of climatic conditions. Deer and pocket gophers are important in eliminating seedlings that survive the summer drought.--Copyright 1972, Biological Abstracts, Inc.
W72-13008

PRINCIPAL LIMNOLOGIC TRAITS OF NORTHERN ARGENTINA,
Instituto Nacional de Limnologia, Santo Tome (Argentina).
J. A. Bonetto.
Bol Soc Argent Bot. Vol 11 (Suppl.) p 184-209. 1970. Illus. Map.
Identifiers: *Argentina, Azolla caroliniana, Azolla filiculoides, Eichornia crassipes M, Fish, *Limnology, Plankton, Salvinia herzogii, Salvinia rotundifolia, Shad.

The Parana, Paraguay and Uruguay rivers, their various tributaries and the numerous lakes, pools and marshes associated with them establish the fundamental features of the limnology of northeastern Argentina. The area also includes the basin of the Plata river which, though occupying only 30% of the national territory, comprises 80% of the country's surface water resources. The Paraguay and middle and lower Parana rivers have almost total biological uniformity. The Parana has rather turbid waters. The Berenjo river presents an annual biologic cycle, shown in graphs. The optical climate of the waters depends mainly on the supply of flood waters. An important factor is the presence of floating masses of water plants, such as Eichhornia crassipes, Salvinia herzogii, S. rotundifolia, Azolla caroliniana and A. filiculoides. The phytoplankton, dissolved O2, periplankton, zooplankton and bentos and the principal species of fish are discussed. The shad is the principal species (61.70%).--Copyright 1972, Biological Abstracts, Inc.
W72-13013

THE ECOLOGY OF THE CHACO,
Instituto Nacional de Tecnologia Agropecuaria, Colonia Benitez (Argentina). Estacion Experimental Agropecuaria.
Jorge H. Morello.
Bol Soc Argent Bot. Vol 11, (Suppl.), p 161-174. 1970.
Identifiers: Argentina, *Chaco (Argentina), *Ecology, Lichens, Polybetes, Psocoptera, Soils, Vegetation.

The Argentine Chaco is an expanse 1/2 million km2 in area, which can be classified into 3 levels graded by density of vegetation as photographed from the air. The geomorphology comprises several types: narrow river valleys averaging 250 m in width, a system of slowly draining prehisotric valleys lying at right angles to extinct rivers which have not left an imprint of their old network of waterways, and finally the remaining space of higher ground. Models of vegetation are classified as pastures and savannahs, active or abandoned cultivated areas. Soils are differentiated into forest soils, pasture and savannah soils, and cultivated soils. In the dense forests of red quebrachos, herbivorous animals outnumber the carnivores. Among the species that live on plant life 90% are sap suckers and only 10% leaf eaters. In the shrub stratum the herbivore: carnivore fauna changes. There is an abundance of bark dwelling (corticolous) spiders of the Polybetes genus and many Psocoptera that eat lichens, and pseudoscorpions that eat Psocoptera.--Copyright 1972, Biological Abstracts, Inc.
W72-13016

EFFECT OF PRINCIPAL SHELTERWOOD FELLINGS AND OF TENDING FELLINGS ON THE WATER-NUTRITIONAL REGIME OF SOILS,
M. V. Vaichis.
Tr Litov Nauchno-Issled Inst Lesn Khoz, (1970) 12: p 205-228.
Identifiers: *Alnus-Incana-D, *Aspen-D, *Birch-D, Fellings, *Nutritional regime, Oxalis-Acetosella-D, Shelterwood, Soils, Spruce-G, Thermal, Vaccinium-Myrtillus-D.

Studies were carried out in aspen, birch and Alnus incana stands of the Birzai dense virgin forest (Lithuanian SSR), on the following aspects: characteristics of the hydrothermal regime; the chemical composition of the precipitation penetrating through the crowns of various tree species; the annual amount and ash composition of litter; the ash composition of leaves and roots; the effect of shelterwood fellings and tending fellings on the biological activity of soils; the nutritional regime of soils according to composition of hydrolyzable N, available P and K forms. The upper horizons of soils of the Oxalis acetosella-Vaccinium myrtillus and V. myrtillus aspen forest types were more acidic than those of the forb type of birch and Alnus incana forests. The amount of available nutrients/tree of the first story in thinned-out stands was 2-4 times higher than in the control. Dominance of spruce results in a delayed biological cycle of nutrients, a low content of bases and an oxidizing effect of the precipitation penetrating through the crowns.--Copyright 1972, Biological Abstracts, Inc.
W72-13019

RESPONSE OF SOME PLANT AND ANIMAL SPECIES TO PHYSICAL STRESS IN THE TROPICAL ENVIRONMENT,
Leopoldo B. Uichanco.
Philipp J. Sci. 98 (2): 155-168. Illus. 1969 (1971).
Identifiers: Adiantum-P, Alocasia-M, Animal, Animals, *Drought, Environmental effects, Epidendrum-M-Spp, Plants, Poinsettia-D, Species, Stress, *Tropics, Vanda-Agnes-Joaquim-M.

Even where irrigation water was available, the 1968-1969 extreme drought, which was said to have been the worst in 100 yr, resulted either in the death of susceptible plants, or in some degree of sterility for the duration of the physical stress. These phenomena are apparently similar to, if not falling under the same category as the reaction of certain plant species when transferred to a warmer location than that to which they had been conditioned. Such responses to environmental factors are compared with those of various plant and animal species. Animals and plants from the temperate zone usually degenerate in the tropics. Animals, which survive the shock from the change in environment, breed; plants seem to follow no consistent trend, although a good many of the perennial species become sterile in the tropics, except at high mountain elevations, which enjoy a subtemperate climate, or in the higher tropical latitudes, as, for instance, near the tropic of Cancer. There are certain plant species, particularly among the annuals, which are resilient enough to be at home in either climate. Within the tropics itself, a small difference in the prevailing temperature maxima between 2 localities has led to sex-repression in various perennial plant species when these are moved from a relatively cooler to a somewhat warmer site. Akin probably to this phenomenon was the extraordinary delay in flowering observed in Vanda Agnes Joaquim, Epidendrum spp., and poinsettia in 1969. The uncommonly high temperature maxima registered during the 100-yr-record drought obviously provoked in these plants a condition of temporary sterility.--Copyright 1972, Biological Abstracts, Inc.
W72-13022

INVESTIGATION OF SCALE PATTERNS AS A MEANS OF IDENTIFYING RACES OF SPRING CHINOOK SALMON IN THE COLUMBIA RIVER,
Oregon Fish Commission, Clackamas.
B. R. Bohn, and H. E. Jensen.
Research Report, Fish Commission of Oreg. 3: p 28-36. 1971. Illus. Maps.
Identifiers: *Chinook salmon, Columbia River, Oncorhynchus-Tshawytscha, *Races, *Salmon, *Scale patterns.

An attempt was made to identify races of spring chinook, Oncorhynchus tshawytscha (Walbaum), from scale samples collected from adult fish in major tributaries of the Columbia River system during 1966. The following characteristics were compared: number of circuli to the first annulus, number of circuli to the end of freshwater growth, and mean distances between circuli. Tributary

streams were grouped into 4 geographic areas: lower Columbia River, middle Columbia River, upper Columbia River, and Snake River. It was concluded that races could not be separated by the methods used. Although counts differed somewhat, the distinction between groups was insufficient for practical separation. Counts to the first annulus did provide a means of identifying wild and hatchery fish in the Willamette River. Examination of scales from known wild and hatchery fish indicated that an error of about 20% would result when 16 or less circuli were used to identify wild fish and 17 or more to identify hatchery stocks.--Copyright 1972, Biological Abstracts, Inc.
W72-13026

GROWTH OF JUVENILE SPRING CHINOOK SALMON IN LOOKINGGLASS CREEK,
Oregon Fish Commission, Clackamas.
W. A. Burck.
Research Report Fish Commission of Oregon, 3: p 37-43. 1971. Illus. Map.
Identifiers: *Chinook salmon, Growth, *Juveniles, *Lookingglass Creek, (Ore), Oncorhynchus-Tshawytscha, *Oregon, Salmon.

Growth of juvenile spring chinook salmon (Oncorhynchus tshawytscha Walbaum) was studied in Lookingglass Creek during 1964-68. Mean lengths of fish sampled increased from about 35 mm in March to over 80 mm in Oct. Growth was rapid and relatively uniform from April to Sept. and averaged between 7.2 and 9.6 mm/mo. Condition factor was near 0.8 in April and ranged between 1.0 and 1.1 in most samples collected from June through Nov. Condition factor increased with fish length. The length-weight regression equation calculated from the sample data is log W= -5.44454 + 3.25386 log L. Fish reared in separate areas of the stream showed some differences in linear growth which may be a reflection of differences in water temperature in these areas.--Copyright 1972, Biological Abstracts, Inc.
W72-13027

CONTACT BETWEEN THE PSEUDOSTEPPE WITH TAMARIX AND THAT WITH ZILLA MACROPTERA IN THE REGION OF BENI--ABBES, (IN FRENCH),
Caen Univ. (France). Laboratoire de Physiologie Vegetale.
For primary bibliographic entry see Field 03B.
W72-13030

LEECHES FOUND ON TWO SPECIES OF HELISOMA FROM FLEMING'S CREEK, MICHIGAN,
Eastern Michigan Univ., Ypsilanti. Dept. of Biology.
H. H. Sarah.
Ohio J Sci. Vol 71, No 1, p 15-20. 1971.
Identifiers: *Fleming's Creek (Mich), Glossiphonia-Complanata, Helisoma-Anceps, Helisoma-Trivolvis, Helobdella-Lineata, Helobdella-Papillata, *Leeches, *Michigan.

A survey of leeches in 3 genera of gastropods collected from Fleming's Creek, near Ypsilanti, Michigan, revealed a selective association between the smaller leech Helobdella papillata and the smaller snail, Helisoma anceps, and between the larger leech Helobdella lineata and the larger snail Helisoma trivolvis. In addition, a few individuals of the leech Glossiphonia complanata were found on both helisomid snails, and this species, together with 9 other species of leeches, was also found either free-swimming or attached to substrate other than one of these snails.--Copyright 1972, Biological Abstracts, Inc.
W72-13031

THE RESULTS OF SETTLING PHYTOPHAGIC FISH IN NATURAL WATERS IN KRASNODAR KRAI, (IN RUSSIAN),
Y. M. Motenkov.
Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 59-61. 1969.
Identifiers: *Bighead, *Carp, Fish, *Grass carp, Krai, Krasnodar, Natural, *Phytophagic fish, Rice-M, Settling, *Silver carp, USSR.

Two-year-old grass carp, silver carp, and bighead were established in Krasnodar Krai natural waters in 1960. In 1962 the young of the silver carp appeared for the first time. Spawning occurred intermittently in the Kuban River in June and July in areas with stony bottoms between Tiflis Station and the Armavir River at depths of 1.5-2.7 m, a current of 1.3-2.15 m/sec and a temperature of 20.8-22.2 deg. C in turbid water. When the young were 4-5 days old they approached the bank and got into the intake of the irrigation systems. After 60-80 days in rice paddies the young reached a weight of 100-140 g; in 1967 there were about 1.8 million silver carp, 1.2 million bigheads, and about 0.3 million grass carp.--Copyright 1972, Biological Abstracts, Inc.
W72-13037

2J. Erosion and Sedimentation

EFFECT OF SPECTRAL COMPOSITION ON PHOTOSYNTHESIS IN TURBID RESERVOIRS--PHOTOSYNTHETIC PRODUCTION IN A TURBID RESERVOIR II. DETAILS OF AN INCUBATION MODEL AND COMMENTS ON THE EFFECT OF LIGHT QUALITY ON PHOTOSYNTHESIS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 05C.
W72-12393

SEDIMENT TRANSPORT AND DEPOSITION, WALNUT AND PACHECO CREEKS, CONTRA COSTA COUNTY, CALIFORNIA, AUGUST 1965-APRIL 1970,
Geological Survey, Menlo Park, Calif.
G. Porterfield.
Geological Survey Open-file Report, 1972. 21 p, 6 fig, 6 tab, 8 ref.

Descriptors: *Sediment transport, *Deposition (Sediments), *Streamflow, *Small watersheds, *California, Flow rates, Sedimentation rates, Sediment discharge, Sediment load, Particle size, Sands, Clays, Silts, Reviews, Hydrologic data.
Identifiers: *Contra Costa County (Calif), Walnut Creek, Pacheco Creek.

A summary of the sediment transported by Walnut Creek at Concord, California, and Pacheco Creek near mouth, and the sediment deposited near the mouth during several periods, August 1965-April 1970, is tabulated. Sediment size classes--sand, silt, and clay-- are included. Peak discharges, which transport most sediment, occurred frequently during the 1966-70 water years. A mean daily discharge equal to or more than 1,100 cfs occurred 2 days in 1967, 1 day in 1969, and 3 days in 1970. The 1970 water year was the second water year since 1958 that a discharge equal to or more than 1,100 cfs occurred on 3 days. Streamflow during 1966-70 water years was 1.3 times the estimated long-term mean during 1909-62. Suspended-sediment discharge during 1966-70 was 1.3 and suspended sand 1.4 times that of the long-term mean. Average streamflow of Walnut Creek ranged from 12,000 to 46,000 acre-feet per year; suspended-sediment discharge ranged from 8,500 to 233,000 tons per year; and suspended-sand discharge ranged from 650 to 74,000 tons per year. (Woodard-USGS)
W72-12409

ON THE BEDDING IN THE NATURAL-LEVE AND THE POINT-BAR DEPOSITS OF TH GOMTI RIVER, UTTAR PRADESH, INDIA,
Lucknow Univ. (India). Dept. of Geology.
I. B. Singh.
Sedimentary Geology, Vol 7, No 4, p 309-31 May 1972. 7 fig, 10 ref.

Descriptors: *Sedimentary structures, *Beddin *Ripple marks, *Alluvial channels, Meander Sand waves, Sedimentation, Sediment transpor Alluvium, Bed loads, Suspended load.
Identifiers: Natural levees, Point bars, Cros bedding, *Gonti River (India).

Channel-fill cross-bedding and ripple-beddi units in the natural-levee and the point-b deposits of the Gomti River, India, are discusse Channel-fill cross-bedding is produced because development of and deposition in channels c across natural levees. Occasionally small-ripp bedding occurs, intricately interlayered wi horizontal bedded units of upper-flow regin origin. Some of the horizontal bedding near the t of the point bars and levee is probably produc by settling of suspension clouds under low-ener conditions as a result of decrease in turbulen with receding water. (Knapp-USGS)
W72-12424

A PLEISTOCENE SUSQUEHANNA RIVE CHANNEL CONNECTS THE LOWE REACHES OF THE CHESTER, MILES, AN CHOPTANK ESTUARIES,
Johns Hopkins Univ., Baltimore, Md. Chesapeal Bay Inst.
For primary bibliographic entry see Field 02L.
W72-12428

SEDIMENT TRANSPORT CAUSED BY WA MOVEMENT (TRANSPORT NANOSOV VO NAMI),
Zakavkazskii Nauchno-Issledovatels Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12435

RELATION BETWEEN BOTTOM-SEDIME AND SUSPENDED-SEDIMENT DISCHARG (NEKOTORYYE SOOBRAZHENIYA O SOO NOSHENII MEZHDU RASKHODAMI VLEK MYKH I VZVESHENNYKH NANOSOV),
Zakavkazskii Nauchno-Issledovatels Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12436

INFILTRATION AND EROSION STUDIES PINYON-JUNIPER CONVERSION SITES SOUTHERN UTAH,
Utah State Univ., Logan. Dept. of Range Scienc
For primary bibliographic entry see Field 04D.
W72-12531

WHISTLING BEACHES AND SEABED SA TRANSPORT,
London Univ. (England). Dept. of Pharmaceuti
K. Ridgway, and J. B. Scotton.
Nature, Vol 238, No 5361, p 212-213, July 28, 19 1 fig, 3 ref.

Descriptors: *Beaches, *Sands, *Particle sha *Sediment sorting, *Sediment transport, Sedim tology, Particle size.
Identifiers: Whistling sands.

Experiments on the whistling sand of Porth C Caernarvonshire, show that the property of wh tling or squeaking, when kicked, scuffed walked on, arises from the very narrow part size distribution, combined with fairly spher particle shape. These two factors enable the s to yield in shear along thin slip planes, instead

roughout its bulk, and the drag of uniform parti-
es over one another results in an audible note of
gular pitch. There is a tendency for the dilation
used by one particle riding up and over its
ighbor to be communicated along the shear
ane, so that all the particles at the plane move in
ison. A close correlation exists between the oc-
rrence of whistling sand and the position of the
ndward end of bed-load springs in the sand of the
ntinental shelf. Certain lines are, in effect,
atersheds for the flow of sand over the seabed,
nd flowing away on each side roughly at 90 deg
the watershed line. These lines are called bed-
ad partings. Sea conditions along bed-load part-
g lines are favorable to the rounding of sand
ains, perhaps because they are locations where
nd residence times are very long. Provided that a
itable site is available for the sand to reach a sta-
e beach, a whistling location will occur at the
ndward end of the sand reservoir on the seabed.
napp-USGS)
72-12699

UBMARINE CANYONS,
ripps Inst of Oceanography, La Jolla, Calif.
P. Shepard.
arth-Science Reviews, Vol 8, No 1, p 1-12, May
72. 7 fig, 19 ref.

escriptors: *Submarine canyons, *Reviews,
Marine geology, *Turbidity currents, Erosion,
diment transport, Topography, Geomorpholo-
.

ie nature and origin of submarine canyons, both
e deep canyons crossing the continental slope
d their shallower continuation seaward as fan-
lleys, are discussed. The sea-floor canyons in-
ide some of the most rugged features on the face
the earth. Great Bahama Canyon, where it cuts
e sea floor between Eleuthera and Great Abaco
and in the Bahamas, reaches a depth of 4,300 m.
ie canyons are mostly winding V-shaped gorges
at extend all the way down to the continental
pes, so that many even reach the great depths
the deep ocean floor. The canyon walls include
narkable steep cliffs. The canyons off southern
ance have vertical and overhanging walls, which
e also found in the canyons that flank the
uthern end of Baja California. The relation of
submarine canyon heads to the adjacent land is
nificant in that the majority are found off river
lleys. Evidence of sediment movement along the
nyon axes has been found wherever sediments
ve been collected. The freshness of the exposed
k on the lower walls of canyons shows that
y are being carved at the present time. In addi-
n to erosion by turbidity currents, mass wasting
y play an important part in excavating or in
intaining submarine canyons. Under the ocean
may have a combination of downcutting of the
nyon axis and upbuilding of the canyon walls.
is possibility appears especially good as an in-
pretation for the extremely high walls of Great
hama Canyon. The Bahama Banks have been
wing upward as the entire platform sank. (K-
p-USGS)
2-12700

**ME CURRENT TRENDS IN
OMORPHOLOGY,**
sconsin Univ., Madison. Dept. of Geography
Geology.
H. Dury.
th-Science Reviews, Vol 8, No 1, p 45-72, May
2. 341 ref.

scriptors: *Geomorphology, *Reviews, Data
cessing, Model studies, Mathematical models,
nputers, Topography, Drainage patterns
ologic), Hortons Law, Climatology, Paleocli-
ology.

common with other earth sciences,
morphology made rapid progress during the 1960's, greatly altering its techniques, concepts, and aims. The most important change was adoption of quantitative methods, especially of those depending on data processing by computer. Researching on stream channels, orginating mainly with the U.S. Geological Survey, was extended into the investigation of minimum variance and into the establishment of thermodynamic analogs for fluvial behavior. Increasingly, the application of stochastic methods has come to emphasize the significance of random variation. Climatic geomorphology, the documentation of which is very bulky, is currently under strong challenge from some quarters, but finds powerful support in field records. Slope research, long a central concern of geomorphic work, has taken a new turn with the establishment of the Virgil Network, which is centrally involved with the speed of operation of contemporary geomorphic processes in general. Applied environmental work, the extended use of remote sensing techniques, and theoretical abstraction in the form of model-building can be expected to continue their development. (Knapp-USGS)
W72-12701

TURBIDITY AND SUSPENDED-SEDIMENT TRANSPORT IN THE RUSSIAN RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. R. Ritter, and W. M. Brown, III.
Geological Survey Open-file Report, October 1, 1971. 100 p, 38 fig, 10 tab, 28 ref.

Descriptors: *Sediment transport, *Turbidity, *Erosion, *Surface water, *California, Streamflow, Colloids, Suspension, Data collections, Sampling, Streams, Lakes, Sport fish, Aquatic environment, Environmental effects, Land use, Runoff, Water properties.
Identifiers: *Russian River basin (Calif).

The Russian River in north coastal California has persistent turbidity, which reportedly has caused a decline in sport fish catches. As a consequence, the number of sports fishermen angling in the river has declined, and industries dependent on their business have suffered. To determine the source of the turbidity and the rate of sediment transport in the basin, a network of sampling stations was established in February 1964. This investigation from 1964 to 1968 found that rainstorms and consequent erosion were the primary causes of turbid water. The most persistently turbid water was the water flowing through the East Fork. This was attributed chiefly to the diversion of turbid water from the Eel River through the Potter Valley powerhouse tailrace, which did not permit the East Fork to become clear between rainstorms. The area of highest sediment yield was the Dry Creek basin; much of its yield was attributed to land use. In general, sediment yield increased downstream. The measurements of turbidity and concentration of suspended sediment correlated well at most stations although the correlation at individual stations was different and the correlation varied slightly from year to year. (Woodard-USGS)
W72-12704

A NEW MATHEMATICAL MODEL FOR THE VELOCITY DISTRIBUTION IN TURBULENT SHEAR FLOW,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 02E.
W72-12872

BED-LOAD SEDIMENTS,
Australian National Univ., Canberra. Dept. of Geology.
A. J. Moss.
Sedimentology, Vol 18, No 3-4, p 159-219, June 1972. 33 fig, 1 tab, 42 ref.

Descriptors: *Bed load, *Sedimentary structures, *Ripple marks, *Dunes, *Sediment transport, Hydraulic models, Regime, Roughness (Hydraulic), Rheology, Saltation, Sand waves, Channel morphology, Alluvial channels.

In natural and artificial bed-load deposits of shallow, unidirectional currents, a textural sequence parallels one of primary structures. With increasing grain size and/or transporting power, sedimentary characteristics followed the stepwise pattern: fine ripple bed stage, coarse ripple bed stage, dune bed stage, rheologic bed stage. Bed roughness strongly influences sedimentation in the first three, the 'bare bed' stages. Respectively, they evidently represent enclosure of particles within the viscous sublayer, their protrusion above the layer which remains influential in their interstices, and the contraction of the layer to insignificance allowing almost fully turbulent flow. Transitions between these bed stages take place on the bed. Transitions involving the rheologic bed stage, however, take place above the bed, reflecting changes in saltation intensity. The rheologic layer, a moving mass of particles kept dispersed by collisions but gravitationally held to the bed, produces distinctive sediments. Ripples and dunes form only if flow conditions near the bed are fairly steady. Ripples, which are sensitive to temporal current direction changes, are more readily prevented from forming than are dunes. The characteristic textural features of the bed stages are shown whether or not the structures develop. The fine to coarse ripple bed stage transition is highly temperature-sensitive and could probably be used as a basis for water palaeothermometry. (Knapp-USGS)
W72-12877

ORIGIN AND DISTRIBUTION OF CALCAREOUS FINES ON THE CAROLINA CONTINENTAL SHELF,
Duke Univ., Durham, N.C. Dept. of Geology.
B. F. Molnia, and O. H. Pilkey.
Sedimentology, Vol 18, No 3-4, p 293-310, June 1972. 13 fig, 37 ref.

Descriptors: *Bottom sediments, *Calcium carbonate, *Continental shelf, *Provenance, Sedimentology, Sedimentation, Calcium, Magnesium, Particle size, Carbonates, Limestones, North Carolina, South Carolina.

The fine carbonate fraction (less than 63 microns in diameter) was studied in 175 sediment samples collected from the Carolina continental margin. This fraction, generally under 5% of the total sample, averages 43% CaCO3. By comparison, the CaCO3 fraction of the total samples averages only 25%. On the inner shelf, the percentage CaCO3 in the fine fraction is 20 or more times greater than the percentage CaCO3 in the total sample. With increased distance offshore, the percentages of CaCO3 in the fine fraction and the total sample approach equality. Beyond the shelf break the percentage of CaCO3 in the total sample is greater than that in the fines. The CaCO3 faunal components are primarily foraminifera, fragments of foraminefera, mollusc-barnacle fragments and echinoid material. Minor constituents include alcyonarian and tunicate spicules, Halimeda and other calcified green algae. Many grains are bored and show solution effects. The coarse carbonate fraction shows distinct regional faunal assemblages, but the fines are essentially uniformly distributed. Two exceptions are a zone of mollusc fragments around Cape Hatteras and a foraminifera zone on a portion of the outer shelf. The average carbonate mineral assemblage consists of 44% low-Mg calcite, 38% aragonite and 18% high-Mg calcite. The principal modes of origin of calcareous fines on the Carolina continental margin are probably biological and physical destruction of coarser particles and primary formation in fine size fraction (as in the case of some foraminifera). (Knapp-USGS)
W72-12880

GRADED-BED SEQUENCES EMPLACED BY TURBIDITY CURRENTS NORTH OF 20 N IN THE PACIFIC, ATLANTIC AND MEDITERRANEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
D. R. Horn, J. I. Ewing, and M. Ewing.
Sedimentology, Vol 18, No 3-4, p 247-275, June 1972. 8 fig, 109 ref. ONR N00014-67-0108-004, N00024-70-C-1344.

Descriptors: *Turbidity currents, *Deposition (Sediments), *Sedimentation, *Submarine canyons, Stratigraphy, Pacific Ocean, Atlantic Ocean, Sediment transport, Sampling, Reviews, Suspended load.

Seaward of all major drainage basins of the world lie vast abyssal plains constructed of multiple layers of deep-sea sand and silt alternating with clay. They mark catchment basins of a large portion of the terrigenous sediment eroded from neighboring continents. A survey of several hundred cores permits definition of the distribution of the deposits of these level features north of 20 deg N latitude. The sediments are products of turbidity flows which have transported material to the ocean basins, have buried the original topography, and have constructed abyssal plains. All core evidence supports the conclusion that abyssal plains are sites of graded-bed sequences deposited from turbidity flows. The deposits appear to be present-day equivalents of thin-to medium-bedded, graded, flysch-type sands and silts of many ancient geosynclines and sedimentary basins. (Knapp-USGS)
W72-12881

STRUCTURE AND PROCESS IN A BRAIDED RIVER,
Ottawa Univ. (Ontario). Dept. of Geology.
B. R. Rust.
Sedimentology, Vol 18, No 3-4, p 221-245, June 1972. 14 fig, 3 tab, 26 ref.

Descriptors: *Sediment transport, *Channel morphology, *Braiding, *Alluvial channels, *Sedimentary structures, Glacial drift, Canada, Sand bars, Sand waves, Gravels, Sands, Geomorphology, Bed load.
Identifiers: *Donjek River (Canada).

The Donjek is a proglacial braided river with a coarse heterogeneous bedload ranging from -7 to +8 phi. Three reaches were studied. In downstream order, they were a zig-zag reach formed by the interaction of the river and tributary fans, a straight reach, and a meandering reach, all with internal braids. The straight to meandering junction is unusual in that slope and discharge both increase. The dominant bed-forms are longitudinal gravel bars, which migrate only during flood. Their internal structure is poorly defined horizontal bedding, which suggests that gravel deposition takes place on the upper bar surfaces, rather than on foreset slopes at the downstream margins. At lower stage sand accumulates in wedge-shaped units lateral to the bars, with internal high-angle cross-stratification and ripple cross-lamination; other sedimentary structures are rare. A simple facies model can be constructed on the basis of two trends; a proximal-distal trend, and an active-stable trend. Both result in the increased abundance of fine-grained sediment. Random directional measurements give good estimates of the river trend from small-scale structures (mainly ripples) and from channels; the channels give the closest approximation. The variability of ripple orientation always exceeds that of channels. Both increase in the meandering reach, although the divergence of the vector mean from the river trend is not significantly greater than in the straight reach. (Knapp-USGS)
W72-12882

EFFECT OF STEEPNESS AND LENGTH OF SLOPE ON SOIL LOSS,
College of Agriculture, Gwalior (India).
For primary bibliographic entry see Field 02G.
W72-12936

2K. Chemical Processes

THE CONTINUOUS DETERMINATION OF SODIUM IN HIGH PURITY WATER BY USING A SODIUM MONITOR INCORPORATING A SODIUM-RESPONSIVE GLASS ELECTRODE,
Electronic Instruments Ltd., Chertsey (England).
A. A. Diggens, K. Parker, and H. M. Webber.
Analyst, Vol 97, No 1152, p 198-203, March 1972. 1 fig, 4 tab, 2 ref.

Descriptors: *Sodium, *Aqueous solutions, *Monitoring, Electrodes, Powerplants, Water analysis, Ions, Automation, Instrumentation, Equipment, Calibrations.
Identifiers: *High purity water, *Ion selective electrodes, Precision, Octadecylamine, Glass electrodes, Amines, Chemical interference, Detection limits.

Tests have been conducted to demonstrate the suitability of a sodium monitoring instrument which utilizes a sodium-responsive glass electrode for power station applications. The sample is pumped continuously through a mixing chamber containing a sodium-responsive glass electrode and a liquid junction tube attached to a reference electrode. Ammonia vapor is fed separately to maintain the necessary alkaline pH during measurement of the sodium ion concentration. The potential developed between the sodium-responsive electrode and the reference electrode is logarithmic with respect to sodium ion concentration. This potential is amplified and its output signal is displayed on a meter and strip-chart recorder. The instrument is designed to determine sodium concentrations as low as 0.0001 ppm and is calibrated up to a maximum of 10 ppm sodium. Results usually lie within plus or minus 10 percent of their true values. The instrument was shown to be basically suitable for monitoring sodium contents of steam and boiler feed and make-up waters, except when filming amines, such as octadecylamine, are present. (Mortland-Battelle)
W72-12482

NUCLEAR TECHNIQUES FOR TRACE ELEMENT AND RADIONUCLIDE MEASUREMENTS IN NATURAL WATERS,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05A.
W72-12489

THE INVERSE AUTOCORRELATIONS OF A TIME SERIES AND THEIR APPLICATIONS,
North Carolina Univ., Chapel Hill. Dept. of Statistics.
For primary bibliographic entry see Field 07B.
W72-12499

AN IMPROVED HOLDER FOR THE DELVES MICROSAMPLING CUP,
Perkin-Elmer Corp., Norwalk, Conn.
F. J. Fernandez.
Atomic Absorption Newsletter, Vol 11, No 2, p 47, March-April 1972. 1 fig.

Descriptors: *Sampling, *Laboratory equipment.
Identifiers: *Delves Microsampling Cup, *Atomic absorption spectrophotometry.

The Pt-Ir wire loop previously used to hold the Delves Microsampling Cup was rather fragile and could easily be bent or broken. It also had a tendency to change position slightly when inserted into the flame. Recent investigations have shown that a cup holder made of Inconel provides a much sturdier mount for the nickel cup. (Holoman-Battelle)
W72-12501

CHROMATOGRAPHIC SEPARATION OF MOLYBDENUM USING AN ALIPHATIC ALPHA-HYDROXY OXIME,
Iowa State Univ., Ames. Inst. for Atomic Research; and Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12649

INTERPRETATION OF ISOPOTENTIAL POINTS: THE COMMON INTERSECTION IN FAMILIES OF CURRENT-POTENTIAL CURVES,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12715

SELF-BALANCING BRIDGE FOR DIFFERENTIAL CAPACITANCE MEASUREMENTS,
Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W72-12716

PULSED NUCLEAR MAGNETIC RESONANCE MEASUREMENT OF RELAXATION TIMES IN ION-EXCHANGE RESINS,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12717

DETERMINATION OF TRACE AMOUNTS OF CHROMIUM (III) USING CHEMILUMINESCENCE ANALYSIS,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05A.
W72-12719

WATER RESOURCES DATA FOR NEW YORK 1970: PART 2. WATER QUALITY RECORDS.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 07C.
W72-12862

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1970 WATER YEAR,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W72-12870

MULTIELEMENT NEUTRON ACTIVATION ANALYSIS OF BIOLOGICAL MATERIAL USING CHEMICAL GROUP SEPARATIONS AND HIGH RESOLUTION GAMMA SPECTROMETRY,
Cornell Univ. Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12924

SIMULTANEOUS MICRODETERMINATION OF NITRATES AND NITRITES BY DIFFERENTIAL GASOMETRIC REACTION,
Ain Shams Univ., Cairo (Egypt). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-12932

NCENTRATION GRADIENTS IN UIFERS, PHASE II,
sa Univ., Okla.
primary bibliographic entry see Field 02F.
2-12952

. Estuaries

NORMAL PRESSURES AND POTENTIAL OTHERMAL RESOURCES IN THE RIO ANDE EMBAYMENT OF TEXAS,
logical Survey, Bay St. Louis, Miss. Gulf st Hydroscience Center.
I. Wallace, Jr.
Proceedings of 2nd Symposium on Abnormal surface Pressure, Baton Rouge, La., January 1970: Louisiana State University School of science and Dept of Petroleum Engineering, p 16, 1970. 16 fig, 44 ref.

criptors: *High pressure, *Earth pressure, ater pressure, *Artesian aquifers, *Texas, thermal studies, Diagenesis, Faults (Geolog- Clay minerals, Aquicludes, Aquifer charac- tics, Sedimentation.
ntifiers: *Rio Grande Embayment (Tex).

aic and near-shore marine deposits of Cenozo- e in the Rio Grande Embayment of Texas con- large quantities of fresh to moderately saline ndwater at abnormally high fluid pressures. tical variations in geothermal gradients in es of geopressure range upward to 16 deg F per feet, and gradients in excess of 2.5 deg F per feet are common. Isogeothermal surfaces at tively shallow depths in the Rio Grande Em- ment probably reflect the shift of the center of osition from south Texas to the Mississippi payment during Neogene time. Igneous and amorphic activity along the margins and within Rio Grande Embayment have been factors in upward displacement of isogeothermal sur- s. In the Tabasco-Weslaco area, Hidalgo nty, Texas, geothermal gradients and eothermal surfaces are strongly affected by vth faulting and diapirism; deep basin rodynamic processes, including thermal enesis of clay minerals, chemical and thermal osis, and redistribution of salinity, are respon- e for the hydrologic conditions. Geologic and rologic conditions in the Rio Grande Embay- t appear favorable for development of hermal resources. (Knapp-USGS)
2-12410

FACE WATER IN DUVAL AND NASSAU UNTIES, FLORIDA,
logical Survey, Tallahassee, Fla.
primary bibliographic entry see Field 02E.
2-12419

INITY CALCULATIONS FROM IN SITU ASUREMENTS,
artment of the Environment, Victoria (British umbia). Marine Sciences Branch (Pacific Re-).
. Perkin, and E. R. Walker.
JEX Bulletin No 13 (Washington University), 5-125, May 1972. 1 fig, 3 tab, 6 ref.

criptors: *Salinity, *Oceans, *Estuaries, ld regions, Regression analysis, Mathematical ies, Ice, Equations, Measurement, Specific ductivity, Water temperature, Pressure, ecasting, Saline water intrusion.
ntifiers: *Salinity calculations, Salinometer.

equations are described for calculating salinity n measured conductivity, temperature and sure. The procedures are valid over a tempera- range of freezing to +20 deg C and a salinity e of about 4 to 40 parts per thousand. The ab- te error within these ranges is less than 0.01 parts per thousand with respect to the averaged data from which the procedures were derived. While intended for use with in situ salinometers in the Arctic, the equations may prove useful for others working in cool estuarial waters. (Woodard-USGS)
W72-12427

A PLEISTOCENE SUSQUEHANNA RIVER CHANNEL CONNECTS THE LOWER REACHES OF THE CHESTER, MILES, AND CHOPTANK ESTUARIES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel, and C. F. Zabawa.
Chesapeake Bay Institute Special Report 24 (Reference 72-8), June 1972. 12 p, 2 fig, 8 ref.

Descriptors: *Geologic formations, *Rivers, *Estuaries, *Valleys, *Maryland, Pleistocene Epoch, Erosion, Paleohydrology, Geology, Chesapeake Bay, Channels, Geologic investigations, Channel morphology.
Identifiers: *Susquehanna River.

A continuous-seismic-reflection-profiling study showed that the valleys of the lower reaches of the Chester, Miles, and Choptank Rivers, Maryland are parts of a Pleistocene valley cut by the Susquehanna River during a period of lowered sea level. The paleochannel was cut before the formation of the modern Chesapeake Bay basin. The sound source used was a modified E.G. and G. boomer--a displacement type sound source. The sound source utilizes stored electrical energy to displace a submerged plate and the surrounding water, thus generating a pressure pulse. The unit was towed on a specially designed catamaran. Line drawings of the records from the transects are presented. The records clearly reveal an ancient river channel buried 40-50 meters beneath the modern estuary floor. (Woodard-USGS)
W72-12428

FRESH WATER AND ESTAURINE SPECIFIC GRAVITY DIAGRAMS,
State Univ. Coll., Fredonia, N.Y.
For primary bibliographic entry see Field 05A.
W72-12458

CHEMICAL EFFECTS OF SALMON DECOMPOSITION ON AQUATIC ECOSYSTEMS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W72-12556

STRUCTURE AND FUNCTIONING OF ESTUARINE ECOSYSTEMS EXPOSED TO TREATED SEWAGE WASTES.
North Carolina Univ., Chapel Hill. Inst. of Marine Sciences.
For primary bibliographic entry see Field 05C.
W72-12567

STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES.
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 05C.
W72-12568

STUDY OF MIGRATORY PATTERNS OF FISH AND SHELLFISH THROUGH A NATURAL PASS,
Texas Parks and Wildlife Dept. Austin.
For primary bibliographic entry see Field 05C.
W72-12579

GULF INTRACOASTAL WATERWAY, TEXAS SECTION, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-12604

EXTENSION OF OCEANOGRAPHIC STUDIES IN PUGET SOUND AND THE NORTHEAST PACIFIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
F. A. Richards.
Available from the National Technical Information Service as AD-735 952, $3.00 in paper copy, $0.95 in microfiche. Report No. Ref-A71-57, December 1971. 38 p. Contract No. Nonr-477 (37).

Descriptors: *Oceanography, *Sampling, *Analytical techniques, *Mathematical models, *Data processing, Seawater, Washington, Oregon, Columbia River, Estuaries, Coasts, Phytoplankton, Zooplankton, Arctic Ocean, Detritus, Organic matter, Pumps, Copepods, *Pacific Ocean, Water properties, Physical properties, Chemical properties, Metals, Trace elements, Nutrients, Fjords, Oxygen, Sulfides, Heavy metals, Zinc, Lead, Cadmium, Copper, Nitrites, Dissolved oxygen, Sediments, Bottom sediments, Geomorphology, Instrumentation, Geophysics, Water temperature, Salinity, Currents, Flow rates, Circulation, Tides, Hydrodynamics, Cyclones, Discharge (Water), Atmospheric pressure, Waves, Computer programs, Statistical analysis, Bibliographics, Pumps.
Identifiers: *Puget Sound, Caribbean Sea, Voltammetry, Anodic stripping voltammetry, Volcanics, Tectonics, Radiolaria, Plankton pumping system.

Laboratory and field studies in the areas of biological, chemical, geological, and physical oceanography, and studies in the use of statistical interference and experimental design in the collection and interpretation of data were carried out over a 6-year period. Very brief summaries of the work done in each of these areas are presented, and an extensive bibliography of papers and reports resulting from the research is provided. (Mortland-Battelle)
W72-12639

THE EFFECTS OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF PIKE PERCH YEARLINGS (LUCIOPERCA LUCIOPERCA) AND ROACH YEARLINGS (RUTILUS RUTILUS HECKELI (NORDM.)) IN VARIOUS REGIONS OF THE SEA OF AZOV,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 05C.
W72-12645

SUBMARINE CANYONS,
Scripps Inst of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02J.
W72-12700

WATER RESOURCES DEVELOPMENT IN THE MULLICA RIVER BASIN, PART I, BIOLOGICAL EVALUATION OF THE MULLICA - GREAT BAY ESTUARY,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
J. B. Durand, and R. J. Nadeau.
Available from the National Technical Information Service as PB-211 330, $3.00 in paper copy, $0.95 in microfiche. Partial Completion Report, July 1972. 138 p, 32 tab, 49 fig, 26 ref, 3 append. OWRR A-018-N.J., B-014-N.J., B-018-N.J (3).

Descriptors: *Estuarine environment, *Fish, *Nutrients, *Salt tolerance, *Zooplankton, *Withdrawal, *Shellfish, Estuaries, Fish food or-

ganisms, Fish populations, Salinity, Aquatic microorganisms, *New Jersey, Biological communities.
Identifiers: *Mullica River-Great Bay Estuary.

The objectives were to determine the maximum possible shipment of water out of the basin that could take place without damage to the ecology of the river-bay system. The water resources of the basin are essentially untapped and the natural hydraulic state of the surface and ground waters were intact. Aquatic biologists had been collecting data on the biological systems for about a decade and within this decade the most severe drought of record occurred. As the flow of fresh water from the basin changes, the salinity changes in the estuary. Also the fluvial flow brings nutrients to the estuary. Thus, the effect of removal of water from the basin over a long period of time was simulated by the natural occurrence of drought. Based upon the observations made over the periods of low and of average and of high flows of fresh water,base lines of desired minimum average flows were drawn for each month of the year. (Whipple-Rutgers)
W72-12706

LEAD IN A CONNECTICUT SALT MARSH,
Yale Univ., New Haven, Conn. School of Forestry.
For primary bibliographic entry see Field 05B.
W72-12710

PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 05B.
W72-12712

PHYTOPLANKTON PIGMENTS IN PORTO NOVO WATERS (INDIA),
Center of Advanced Study in Marine Biology, Porto Novo (India).
For primary bibliographic entry see Field 05A.
W72-12725

THE EFFECT OF CHINA CLAY ON THE SEDIMENTS OF ST AUSTELL AND MEVAGISSEY BAYS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05C.
W72-12792

ORIGIN AND DISTRIBUTION OF CALCAREOUS FINES ON THE CAROLINA CONTINENTAL SHELF,
Duke Univ., Durham, N.C. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-12880

THE WINTER FLOUNDER (PSEUDOPLEURONECTES AMERICANUS) IN LONG POND, CONCEPTION BAY, NEWFOUNDLAND,
V. S. Kennedy, and D. H. Steele.
J Fish Res Bd Can. Vol 28, No 8, p 1153-1165. 1971. Illus. Maps.
Identifiers: *Life history studies, Canada, Conception Bay, *Flounder, Long Pond, Mollusks, Newfoundland, Plants, Polychaetes, Pseudopleuronectes americanus.

Monthly samples of winter flounder taken in Long Pond from Nov. 1962 to Oct. 1963 indicated that the flounder moved into deeper water (7-10 m) during the summer and returned to shallow water (1-2 m) from Sept. to June. These movements corresponded to the end of the spawning season and the ripening of the gonads respectively. Spawning occurred from March until early June, most of it in May and early June. Most males were mature at age 6 and most females at age 7. Fifty percent of the males and females were mature at 21 and 25 cm respectively. The growth rates of the males and females were similar until the age of 8, after which the females apparently outgrew the males. Early growth and fecundity were similar to those reported for other areas. No feeding took place in Dec. or Jan. but the flounder fed in March and continued to feed throughout the summer; food intake decreased in the fall. They were omnivorous and the type of food eaten varied with the locality. Polychaetes, plant material, and mollusks were the most common food items throughout the year. Capelin eggs and fish remains were found only during a few months of the year but were eaten in great quantities.--Copyright 1972, Biological Abstracts, Inc.
W72-12925

INTERDISCIPLINARY MONITORING OF THE NEW YORK BIGHT,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
For primary bibliographic entry see Field 05A.
W72-12941

SOME ASPECTS OF POLLUTION IN SOUTHAMPTON WATER,
Southampton Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W72-13001

THE VEGETATION OF MARSHES, PONDS AND RIVER BANKS IN SHIVPURI, MADHYA PRADESH,
Government Science Coll., Gwalior (India).
J. P. Kaushik.
Bull Bot Surv India. Vol 11, No 1/2, p 84-88. 1969.
Identifiers: *Madhya Pradesh (India), *Marshes, *Ponds, Record, Ruppia maritima M, *Vegetation.

Phenology and distribution are included. The vegetation is compared with that of other parts of Madhya Pradesh. Species collected included 101 ssp. in 82 genera and 37 families. Ruppia maritima is a new record.--Copyright 1972, Biological Abstracts, Inc.
W72-13003

AN ECOLOGICAL STUDY OF GALLINAS CREEK, A SLOUGH OF THE SAN FRANCISCO BAY SYSTEM: I. HYDROGRAPHY, MATERIALS AND METHODS,
San Francisco Univ., Calif. Dept. of Biology.
A. Mahood, and F. P. Filice.
Wasmann J Biol. Vol 28, No 2, p 219-232. 1970. Illus. Map.
Identifiers: *Ecology, *Gallinas Creek (Calif), Hydrography, Materials, Methodology, Plankton, San Francisco Bay, Slough.

Plankton samples were collected from various stations in Gallinas Creek slough over 4 different tidal cycles. At the same time, physical and chemical characteristics were determined in order to understand the ecology of the microplankton in the stream.--Copyright 1972, Biological Abstracts, Inc.
W72-13006

ENVIRONMENTAL FACTORS AFFECTING SEEDLING ESTABLISHMENT OF THE BLACK MANGROVE ON THE CENTRAL TEXAS COAST,
Texas Univ., Austin. Dept. of Botany.
C. McMillan.
Ecology. Vol 52, No 5: p 927-930. 1971. Illus.
Identifiers: *Environmental effects, Avicennia germinans D, *Black mangrove, Coasts, Depth, Environment, Salinity, Seedlings, Temperatures, *Texas, Turbulence.

The effects of salinity, water turbulence, water depth, and temperature on the establishment of seedlings of black mangrove (Avicennia germinans L.) on the central Texas coast were evaluated in the laboratory. Salinity was not the chief factor limiting seedling establishment, because seedlings rooted in distilled water and in salinities approaching twice the concentration of sea water. Water turbulence, either of distilled or sea water, inhibited root and seedling development. Seedlings tumbled for as much as 12 wk showed rapid root development when subsequently stabilized. Various water depths promoted extensive root systems, but seedlings did not become established until water depth was reduced to 5 cm or less. High temperature treatment, exposure to 39 -40C for 48 hr was lethal to stemless seedlings, but not to seedlings with stems and roots. The results suggest that viviparous development in this A. germinans population is probably phenologically timed by environmental relations during winter and early spring as a protection against the lethal effects of the high temperatures that prevail on beaches and in shallow water during late spring and summer.--Copyright 1972, Biological Abstracts, Inc.
W72-13009

TAGGING OF WHITE HAKE, UROPHYCIS TENUIS MITCHILL, IN THE SOUTHERN GULF OF ST. LAWRENCE,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
A. C. Kohler.
Int Comm Northwest Atl Fish Res Bull. 8. p 21-25 1971. Illus. Maps.
Identifiers: Canada, *White Hake, Movements, Petersen, *Gulf of St. Lawrence, *Tagging, Urophycis-Tenuis.

White hake (2271), U. tenuis Mitchill, were tagged with yellow Petersen disc tags in the southeastern Gulf of St. Lawrence in Aug. 1967. This was the first recorded mass tagging of hake. A total of 60 returns had been received to the end of 1969. Previous attempts to tag hake had been foiled by mortalities caused by rapidly and greatly expanding air bladders. High mortalities were avoided in this experiment by choosing a relatively shoal water tagging area and by using a hypodermic needle to remove excess air bladder gas. Returns from the tagging indicated that this hake population was resident in the southern Gulf of St. Lawrence the year round. Movements of the fish around Prince Edward Island and toward the western shore of Cape Breton were recorded.--Copyright 1972, Biological Abstracts, Inc.
W72-13028

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PWR WATER: VARYING CHEMISTRY AND 'HOT' CONTAMINANTS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05D.
W72-12465

PRODUCING FRESH WATER FROM BRINE,
Long Beach Dept. of Water, Calif.
W. B. Murray.
Water and Sewage Works, Vol 119, No 1-2, Part II, p 40-43, 54-57, Jan-Feb 1972. 7 fig, 2 tab, 8 ref.

Descriptors: *Freshwater, *Brine, *Demineralization, *Nuclear powerplants, *Fog, *Evaporation, *Desalination, Electric power production, Geothermal studies, Water source, Water resources development, Costs, Precipitation (Atmospheric), Oceans, California, Thermocline, Nuclear desalting.

entifiers: *Geothermal power, Nuclear power, eothermal resources, Evaporation reservoirs, iclear desalting.

veral methods of producing fresh water from ne are discussed. Fresh water may be extracted m salt water in the process of nuclear power neration, through use of geothermal steam and ne, and by the production of coastal fog. hough recovery methods differ, in each in- nce, the energy necessary for system operation obtained from the process itself. A 1000-mw clear power station equipped with special con- nsing devices could produce fresh water at the e of 30 to 36 mgd. Recovery processes and costs reviewed. Use of geothermal steam as a source heat and water to saturate dry desert air is cussed. By passing the saturated air through a ge existing fresh water supply, water could be covered by natural condensation. A third thod produces coastal fogs moving inland and positing water by atmospheric precipitation. e sea fog could be created artificially by pump- the cold sea water from below the thermocline the surface of the ocean at locations just off the st of Southern California and allowing the fog be swept inland by wind. The fog cools the land as, causing rain to fall. (USBR)
72-12661

3. Water Yield Improvement

ATER USE EFFICIENCY IN PLANT ROWTH AND AMBIENT CARBON DIOXIDE EVEL,
xas A and M Univ., College Station. Water sources Inst.
H. M. Van Bavel.
ailable from the National Technical Informa- n Service as PB-211 281, $3.00 in paper copy, 95 in microfiche. Technical Report No 42, June 72. 115 p, 28 fig, 10 tab, 39 ref, 2 append. OWRR 013-TEX (1).

scriptors: *Carbon dioxide, Evapotranspira- n, Hydrology, *Micrometeorology, Plant ysiology, *Stomata, Stomatal resistance, ranspiration, *Water conservation, Water use iciency, Photosynthesis, Humidity, Antitrans- ants, Model studies, Computer programs, ybeans.
entifiers: Carbon dioxide assimilation, Carbon xide level, Stomatal sensitivity, Pepper, uthern pea plants.

e validity and practical implications are cussed of the proposition that CO_2 enrichment the leaf environment enhances plant growth d, simultaneously, decreases plant water use. A oretical analysis of the water and carbon diox- balance of plant leaves was made in the form a computer program based upon known ysiological facts. It predicts significant in- ases in water use efficiency by plants as CO_2 is iched, the size of the increase depending upon external conditions. Experimental tests were nducted in an environmental simulator with nds of soybean, pepper and southern pea nts. The predictions of the model were substan- ly verified, with CO_2 concentrations ranging m normal to six-fold normal. Although CO_2 is viously an ideal antitranspirant, the efficacy of release in open stands is doubtful in view of usible economic factors. But, in enclosures this uld be a different matter, and for such situa- ns a scientific basis is given for engineering and tems analysis. (Runkles-Texas A and M)
72-12391

AILABILITY OF WATER IN KALAMAZOO UNTY, SOUTHWESTERN MICHIGAN,
ological Survey, Washington, D.C.
primary bibliographic entry see Field 04B.
2-12408

ABNORMAL PRESSURES AND POTENTIAL GEOTHERMAL RESOURCES IN THE RIO GRANDE EMBAYMENT OF TEXAS,
Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 02L.
W72-12410

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN MARSHALL COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, S. Dak.
For primary bibliographic entry see Field 04B.
W72-12412

GROUNDWATER LEVELS IN NEBRASKA--1971,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 04B.
W72-12433

WATER USE STUDIES ON FORAGE GRASSES IN NORTHERN NEVADA,
Nevada Agricultural Experiment Station, Reno; and Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W72-12522

EVALUATION OF TRANSPIRATION SUPPRESSANTS AS AN ALTERNATIVE TO THE ERADICATION OF SALTCEDAR THICKETS,
Arizona Univ., Tucson. Dept. of Watershed Management.
R. S. Cunningham.
M.S. Thesis, 56 p, 1972. 17 tab, 4 fig, 57 ref.

Descriptors: *Transpiration control, *Water management (Applied), *Evapotranspiration, *Water yield improvement, *Tamarisk, Water conservation, Wildlife inhabitats, Evaluation, Weed control, Consumptive use, Arid lands, Planting management, Environmental effects, Greenhouses, Experimental farms, Costs, Public health, Riparian water loss.
Identifiers: Chemical antitranspirants.

The exotic river bottom plant, saltcedar (Tamarisk), is a western weed which consumes large quantities of water. Saltcedar eradication water conservation has met opposition from those considering cedar thickets to be essential wildlife habitat. Chemical antitranspirants reduce transpiration and reallocate water to underflow or channel flow without harming the plant, environment or human health. Two greenhouse and 2 field experiments with 8-HQS (eight-hydroxyquinoline sulfate) and MDSA (mono-methyl ester of n-decenylsuccinic acid) indicate both compounds were equally effective in reducing saltcedar transpiration, though both compounds were most effective in the greenhouse. Reallocated water may cost 44 dollars per acre-foot if evapotranspiration (ET) of a thicket is reduced by 35 percent for 2 weeks. Reallocated water costs 200 dollars per acre-foot if only a 15 percent reduction in ET is achieved for 1 week. (Popkin-Arizona)
W72-12523

INFILTRATION RATE AND SEDIMENT PRODUCTION TRENDS ON A PLOWED BIG SAGEBRUSH SITE,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 02G.
W72-12526

FLORIDA CUMULUS SEEDING EXPERIMENT FOR DROUGHT MITIGATION, APRIL-MAY 1971,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
W. L. Woodley, J. Simpson, A. H. Miller, J. J. Fernandez-Partagas, and W. Riebsame.
Available from the National Technical Information Service as COM-72-10149, $3.00 in paper copy, $0.95 in microfiche. National Oceanic and Atmospheric Administration Environmental Research Laboratories Technical Memorandum ERL OD-9, November 1971. 160 p, 60 fig, 7 tab, 12 ref.

Descriptors: *Cloud seeding, *Silver iodide, *Artificial precipitation, *Florida, Weather modification, Aircraft, Clouds, Droughts, Rainfall, Rain gages, Data collections.

In the 61-day operational period from April 1 to May 31, 1971, flights were conducted in central and southern Florida on 16 days, with actual seeding on 14 days. Real time runs of the EML one-dimensional cumulus model on the 1200 GMT Miami radiosonde eliminated 38 days as unseedable; seven additional seed days might have been obtained had a back-up seeder aircraft been available. Altogether, 2066 fifty-gram AgI flares were dropped into 196 clouds or cloud complexes. Severe drought and cloud scarcity forced abandonment of planned randomization. Evaluation was by rain gages and 10-cm radars, the WSR-57 of the National Weather Service and the calibrated radar of the University of Miami. Altogether, seeded clouds produced about 180,000 acre-feet of rain. Conservative estimates ascribe about 100,000 acre-feet to seeding, leading to a benefit-to-cost ratio for the program exceeding thirty-to-one. The seeding could not break the drought and contributed only about 3% of the water or 5% to 10% of the actual two-monthly rainfall in south Florida. Nevertheless, the seeded precipitation was highly beneficial locally and quenched numerous drought-produced fires. (Woodard-USGS)
W72-12705

COLLECTION EFFICIENCY OF WATER DROPLETS IN AGCL AEROSOL,
Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry; and Clarkson Coll. of Technology, Pottsdam, N.Y. Inst. of Colloid and Surface Science.
For primary bibliographic entry see Field 05B.
W72-12763

STREAMFLOW MODIFICATION THROUGH MANAGEMENT OF EASTERN FORESTS,
Forest Service (USDA), Asheville, N.C. Southeastern Forest Experiment Station.
J. E. Douglass, and W. T. Swank.
USDA Forest Service Research Paper SE-94, May 1972, 15 p., 19 ref.

Descriptors: *Vegetation effects, *Water yield improvement, *Streamflow forecasting, *Water resources development, *Watershed management, Hardwood, Timing, North Carolina, Stream improvement, Regression analysis.
Identifiers: Experimental watersheds, *Appalachian Highlands.

Equations for predicting the first-year increase, duration of the increase, and the total volume of water which occurs from cutting forests are presented. The equations are based on a summary of 22 experimental cuttings of hardwood forests in the Appalachian Highlands. Predicted yields are compared with actual yields obtained from a logged watershed. The effects of forest cutting on the seasonal distribution of increased annual flow, stormflow peaks and volumes, and water quality characteristics are discussed. (Douglass-Forest Service)
W72-12810

MANAGING A PONDEROSA PINE FOREST TO INCREASE WATER YIELDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.

L. R. Rich.
Water Resources Research, Vol 8, No 2, p 422-428, 1972, illus.

Descriptors: *Watersheds, *Water yield, *Forests, *Sediment yield, Trees, Wildlife, Streamflow, *Forest management, *Arizona.
Identifiers: *Timber harvest, *Even-aged management, *Forest ecosystem, *Castle Creek (Ariz), Wood, Scenic values, Winter precipitation, Summer precipitation.

A forest ecosystem managed for social goals of water, wood production, wildlife, scenic values, and sediment control was applied to the West Fork watershed, Castle Creek, after a 10-year calibration period. Water yields have improved significantly following this timber harvest and improvement cut. During the posttreatment period an increase of 1.4 inches of water was measured during a year of high runoff when 8.77 inches was yielded from the control watershed. In contrast, during years of low runoff when the water yield averaged 0.5 inch from the control watershed, the increase averaged more than 0.4 inch. Streamflow is intermittent. Winter precipitation has been the major source of water yields. Summer rains duiring June through September have accounted for nearly 46% of the annual precipitation but less than 10% of the streamflow. No measurable quantities of sediment have been trapped in the pond above the measuring weir. (Rich-Forest Service)
W72-12811

MANAGEMENT PROBLEMS IN PHREATOPHYTE AND RIPARIAN ZONES,
Forest Service, (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
J. S. Horton.
Journal of Soil and Water Conservation, Vol 27, No 2, p 57-61, 1972, illus.

Descriptors: *Phreatophytes, *Riparian plants, *Tamarisk, *Evapotranspiration, *Water yield improvement, Flood control, Flood plains, Wildlife habitats, Wildlife conservation, Mesquite, Sycamore trees, *Arizona, *Southwest US.
Identifiers: *Doves, *Honey production, *Phreatophyte management, Phreatophyte clearing, Gila River, Tamarisk invasion.

Utilization of the resources of streams, rivers, and flood plains has always received a great deal of attention in the arid Southwest. After the invasion of the aggressive tamarisk some 40 years ago, removal of phreatophyte vegetation for water savings was felt to be paramount. Now the need for wise evaluation of these possible savings in comparison with other resources inherent in phreatophyte and riparian stands has come into prominence. Recreational use, wildlife protection, honey production, erosion prevention, and preservation of esthetic values must all be considered for optimum management. (Horton-Forest Service)
W72-12814

EDAPHIC ARIDITY AS A FACTOR IN ANGIOSPERM EVOLUTION,
California Univ., Davis. Depts. of Geology; and California Univ., Davis. Dept. of Botany.
D. I. Axelrod.
American Naturalist, Vol. 106, No. 949, p. 311-320, May-June 1972. 2 fig, 11 ref.

Descriptors: *Xerophytes, *Ecological distribution, *Ecosystems, *Evolution, *Plant populations, Tropical regions, Soil environment, Soil-water-plant relationships, Soil moisture, Environmental effects, Mode of action, Topography, Climate, Geological formations.
Identifiers: *Edaphic aridity.

Plant evolution would be relatively rapid in arid and semiarid regions because where moisture is limited local physical differences would have a much greater effect on vegetation than in regions where moisture is not limited. Such regional diversity quickly promotes the semi-isolation of small populations that may give rise to new taxa. Additionally, in moister periods, the xerophytes with the right potentialities could give rise to mesophytic groups. While the importance of these factors is not questioned, an alternative evolutionary mechanism is postulated as a result of observations in Brazil. There, ancient terrain of granitic and metamorphic rocks form steep sided mountains, domes, ridges and plains, and provide steeply decreasing edaphic moisture gradients from arid sites to tropical rain forest or other climatic regions. Examination of topographies in other parts of the world provides many similar examples of varying geologic age. Such steep gradients together with their scattered distribution has resulted in the provision of environmental opportunities that have encouraged the origin of taxa adapted to varying grades of drought. Not only may such arid sites have served as loci from which some taxa readapted to nearby moister sites, but they also appear to have served as local refuges for drought-adapted taxa during moister climatic periods. (Casey-Arizona)
W72-12828

TISSUE WATER POTENTIAL, PHOTOSYNTHESIS, C-14-LABELED PHOTOSYNTHATE UTILIZATION, AND GROWTH IN THE DESERT SHRUB LARREA DIVARICATA CAV,
California Univ., Riverside. Dept. of Life Sciences.
W. C. Oechel, B. R. Strain, and W. R. Odening.
Ecological Monographs, Vol. 42, No. 2, p 127-141, Spring 1972. 13 fig, 43 ref.

Descriptors: *Xerophytes, *Photosynthesis, *Plant growth, *Water balance, *Environmental effects, Shrubs, Arid lands, Chemical potential, Phenology, Metabolism, Ecological distribution, Respiration, Leaves, Physiological ecology, Plant physiology.
Identifiers: *Plant water potential.

Larrea divaricata is an evergreen xerophytic shrub, abundant in the warm arid regions of both North and South America. It seems well adapted to withstand and even grow in periods of both moisture and temperature stress. Past field observations have indicated that growth may occur at any time of the year, if moisture is not limiting. Attempts were made to evaluate seasonal variation in photosynthesis in relation to the plant's adaptation to its environment and to elucidate the patterns of utilization of seasonally produced photosynthate in growth and metabolic processes. Measurements were made of tissue water potential in relation to phenology, photosynthesis, and analyses of seasonal C-14 labeled photosynthate distributions. The seasonal water-potential pattern reflected climatic changes closely and was the most important factor in the control of phenological events, photosynthesis, and productivity, in a population growing in Deep Canyon, near Palm Desert, California. Reproductive structure development was initiated at the time of highest water potential and terminated with declining water potentials. Both leaf growth and node growth proceeded at varying rates throughout the year and were supported by photosynthates. This photosynthate utilization from various tissue fractions was similar in all seasons and there was no seasonal tissue storage. The year round growth and development is an important adaptation probably accounting for its wide range. (Casey-Arizona)
W72-12851

GERMINATION, EMERGENCE, WATER USE, AND PRODUCTION OF RUSSIAN-THISTLE (SALSOLA KALI L.),
Utah State Univ., Logan. Dept. of Range Science.
Don D. Dwyer, and K. Wolde-Yohannis.
Agron J. Vol 64, No 1, p 52-55, 1972. Illus.
Identifiers: *Plant physiology, Emergence, Germination, Crop production, *Russian Thistle D, Salsola kali D, Xerophytes.

Studies of Russianthistle (Salsola kali L.) have shown that it is a plant well suited to arid and semi-arid regions. This study was conducted to learn some of the characteristics of the species related to germination and water use that allow it to succeed in these dry areas. Russianthistle seeds were planted in a sandy soil, and various amounts of simulated rainfall were added once. Emergence occurred in 14 hr when as little as 7.6 ml (0.3 in.) was applied. There was no significant difference in numbers of plants emerging and surviving to permanent wilting from 12.7 ml (0.5 in.) to 27.9 ml (1.1 in.) of simulated rainfall. Germination studies showed that Russianthistle seed germinated from 4-68 C with optimum germination from 7-35 C. Plants were grown for 90 days (to maturity) at 4 soil moisture levels--field capacity, 0.5, 0.2, and 0.1 available water--to determine water use and production. Shoot production was greatest at field capacity and least when soil was maintained at 0.1 available water. However, efficiency of water use was greatest at 0.1 available water, requiring only 98 g of water per dry-weight gram of shoot produced. Even under field capacity, Russianthistle used only 181 g of water per dry-weight g of shoot and root produced.--Copyright 1972, Biological Abstracts, Inc.
W72-12911

CONTACT BETWEEN THE PSEUDOSTEPPE WITH TAMARIX AND THAT WITH ZILLA MACROPTERA IN THE REGION OF BENI -ABBES, (IN FRENCH),
Caen Univ. (France). Laboratoire de Physiologie Vegetale.
P. Binet, and A. Coudret.
Nat Monspeliensia Ser Bot. 21: p 9-21. 1970. Illus. Map. English summary.
Identifiers: Algeria, Beni-Abbes, *Halophytes, Moisture, Pseudosteppe, Salinity, Soil, *Tamarix D, Texture, *Xerophytes, *Zilla-Macroptera-D.

A study of the soils and vegetation of an area where some wadi halophytes and some hamada xerophytes intermingle emphasizes the importance part played by moisture content, salinity, and texture of the soil in the establishment and survival of some Saharan plant species.--Copyright 1972, Biological Abstracts, Inc.
W72-13030

3C. Use of Water of Impaired Quality

TRANSACTIONS OF THE THERMAL EFFLUENT INFORMATION MEETING.
For primary bibliographic entry see Field 05D.
W72-12466

UTILIZING WASTE HEAT FOR URBAN SYSTEMS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05D.
W72-12468

HEATED WATER IN AQUICULTURE,
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W72-12469

UTILIZATION OF HOT GROUNDWATER IN ELMORE AND OWYHEE COUNTIES, IDAHO
Idaho Dept. of Water Administration, Boise.
For primary bibliographic entry see Field 05D.
W72-12470

ONSTRAINTS AND GUIDELINES IN HARESSING NUCLEAR POWER PLANT WASTE EAT,
aho Nuclear Corp., Idaho Falls.
or primary bibliographic entry see Field 05D.
72-12472

HERE'S GOLD IN THEM THAR BTUS,
ashington State Office of Nuclear Energy evelopment, Olympia.
or primary bibliographic entry see Field 05D.
72-12473

HE THERMAL-WATER HORTICULTURAL EMONSTRATION PROJECT AT SPRINGELD, OREGON,
tro Corp. of America, Portland, Oreg.
or primary bibliographic entry see Field 05D.
72-12474

LFATE SALINIZATION OF SOILS IN THE K-DAR'YA RAYON OF THE SAMARKAND BLAST (O SUL-FATNOM ZASOLENII POCHV AKDAR'INSKOM RAYONE SAMARKANDKOY OBLASTI),
lskokhozyaistvennyi Institut, Samarkand SSR).
. N. Takhtamyshev.
chvovedeniye, No 11, p 160-164, November 71. 1 fig, 4 tab, 6 ref.

escriptors: *Salinity, *Salts, *Sulfates, *Calcium lfate, *Sodium sulfate, Metals, Carbonates, carbonates, Chlorides, Water table, Groundter, Soils, Soil profiles, Soil analysis, Water alysis, Sampling, Crops, Cotton.
entifiers: *USSR, *Uzbek SSR, *Samarkand blast, *Magnesium sulfate, *Meadow soils, neralization.

vestigations of soils of irrigated cotton fields in Zeravshan River valley in 1968 were based on alyses of 22 soil and 4 groundwater samples ken from 10 soil profiles of Meadow soils in the -Dar'ya Rayon of the Samarkand Oblast in bek SSR. The upper soil horizons contain large ounts of MgS04, CaS04, and Na2S04, which ve a deleterious effect on cotton and other ps. Sulfates account for about 84%-86% of all ts in the soils and MgS04 for 31%-55% of the al salt concentration. Special remedial measures l management practices to increase soil productity are recommended and include improvement water conveyance and drainage systems, riodic leaching of the soil, selection of saltrant crops, and use of land-preparation and tile methods that aid in salinity control. (Josefson-GS)
2-12690

ME UNRESOLVED PROBLEMS IN SOIL DIUM-CARBONATE SALINIZATION (O KOTORYKH NEYASNYKH VOPROSAKH DOVOGO ZASOLENIYA POCHV),
ademiya Nauk SSSR, Moscow. Pochvennyi Inut.
V. Yegorov.
hvovedeniye, No 11, p 126-136, November 1. 2 tab, 14 ref.

criptors: *Land reclamation, *Salinity, *Salts, rbonates, *Sodium, Magnesium, Calcium, Inanic compounds, Sulfur compounds, Aqueous tions, Chemical reactions, Water chemistry, ter analysis, Geochemistry, Mineralogy, drogeology, Groundwater, Crystalline rocks, gation, Irrigation water.
ntifiers: *USSR, *Sodium carbonate, Salinity ard, Mineralization, Steppe soils.

ting theories are reviewed regarding the formion of sodium carbonate and its spontaneous ppearance from natural solutions where it first appears and accumulates. Sodium carbonate is believed to form from the weathering of primary, acid massive-crystalline rocks and their derivatives. The disappearance of sodium carbonate is attributed to its exchange reactions with readily-soluble magnesium salts, which are first to dissolve and earlier to migrate to solution concentration zones. Primary consideration is given to salinity and sodium hazards involved in irrigation of steppe soils without adequate drainage. (Josefson-USGS)
W72-12692

POLYSACCHARIDES IN MOLASSES MEAL AS AN AMELIORANT FOR SALINE-SODIC SOILS COMPARED TO OTHER RECLAMATION AGENTS,
Stellenbosch Univ. (South Africa). Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W72-12825

PHYSICAL AND PHYSICO-CHEMICAL CHANGES IN THE PROFILE OF A SODIC SOIL TREATED WITH GYPSUM,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Rivernina Lab.
For primary bibliographic entry see Field 02G.
W72-12833

QUALITY OF WATER FOR IRRIGATION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. D. Rhoades.
Soil Science, Vol 113, No 4, p 277-284, April 1972. 2 fig, 46 ref.

Descriptors: *Saline soils, *Saline water, *Water quality, *Irrigation water, *Salt tolerance, Environmental effects, Plant root systems, Soil water movement, Osmotic pressure, Soil water, Tension, Irrigation systems, Alkaline water, Alkaline soils.
Identifiers: *Soil water potential, *Matric potential, *Exchangeable sodium percentage, *Sodium adsorption ratio.

A need exists for adequate, exacting criteria and standards for evaluating the sodicity, salinity and toxicity of waters for irrigation. Leaching is necessary for the prevention of soil salt accumulation but it does not entirely eliminate it. Salinity effects are generally more drastic in hot, dry climates. Proposed guidelines for permissible irrigation water salinity levels based on crop salt tolerance studies were derived under ideal, unrealistic field conditions. It has been suggested that root water absorption, from a soil of nonuniform salinity distributions, tends to approach uniformity in all soil strata. This is because osmotic and soil stresses vary inversely in these strata. Plant roots would thus absorb from different strata at different times following an irrigation. It follows that permissible irrigation water salinities may depend not only on crop tolerance but also on profile salinity distribution. After reviewing methods of evaluating water quality with respect to sodicity, it is concluded that it is presently impossible to set widely applicable standards of irrigation water quality. The ultimate method of assessing irrigation water quality awaits the ability to predict soil water composition and matric potential in both time and space and to interpret such information in terms of crop response under a variety of environmental variables. (Casey-Arizona)
W72-12840

EFFECT OF SALINITY ON POLLEN I. POLLEN VIABILITY AS ALTERED BY INCREASING OSMOTIC PRESSURE WITH NACL, MAGNESIUM CHLORIDE, AND CALCIUM CHLORIDE,
Kansas Agricultural Experiment Station, Manhattan.
For primary bibliographic entry see Field 02I.
W72-12853

EFFECT OF CONSTANT SALINITY LEVELS ON WATER-USE EFFICIENCY OF BEAN AND COTTON,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. J. Hoffman, and C. J. Phene.
American Society of Agricultural Engineers, Transactions, Vol. 14, No. 6, p 1103-1106, November-December 1971. 4 fig, 3 tab, 6 ref.

Descriptors: *Salinity, *Osmotic pressure, *Transpiration, *Leaves, *Plant growth, Laboratory tests, Cotton, Beans, Plant physiology, Turgidity, Environmental effects, Photosynthesis, Carbon dioxide, Respiration.
Identifiers: *Plant water potential, *Water-use efficiency.

Water-use efficiency is defined as the ratio of net carbon dioxide assimilation to transpiration (mg carbon dioxide/gm water). In arid and semiarid lands, salinity is an environmental factor that seems to affect crop water-use efficiencies. To determine the relative effects of salinity on net assimilation and transpiration, hourly measurements of net photosynthesis, respiration and transpiration were made on bean and cotton at 3 salinity levels in a microchamber where ambient temperatures, dewpoint temperature, carbon dioxide concentration, photoperiod, light intensity, and air velocity were precisely controlled. Photosynthesis and transpiration decreased with increasing salinity levels while respiration increased. Water and osmotic potential measurements were also made on detached leaves and both decreased with increasing salinity. However, as measured by leaf turgidity, they fully adjusted to the root medium salinity except for cotton plants at -12.4 bar salinity. In the osmotically adjusted plants, calculation of the ratio of the difference in root and leaf water potentials to the transpiration rate indicated that plant resistance to water flow increased with salinity. Water-use efficiencies remained essentially constant in beans and decreased with increasing salinity in cotton. (Casey-Arizona)
W72-12856

3D. Conservation in Domestic and Municipal Use

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W72-12430

URBAN WATER PLANNING--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 06B.
W72-12921

3E. Conservation in Industry

PUMPED-STORAGE POTENTIAL OF THE PACIFIC NORTHWEST, PARTS I, II, AND SUMMARY REPORT.
Corps of Engineers, Portland, Oreg. North Pacific Div.

Corps of Engineers North Pacific Division Report, 2 Vol, January 1972. Vol 1 (Parts I and II) - 115 p, 27 fig, 5 tab, 272 ref. Vol 2 (Summary Report) - 18 p, 5 fig, 1 tab.

Descriptors: *Electric powerplants, *Nuclear energy, *Pumped storage, *Projections, *Pacific Northwest U.S., Peaking capacity, Sites, Coasts, Rivers, Water resources development, Thermodynamics, Hydraulic structures.
Identifiers: *Pumped-storage potential, Peaking power.

Electric power resources are summarized for the Pacific Northwest. In the future, thermal-electric powerplants will carry the major part of the region's base load. There are 242 sites in western Washington, western Oregon, and along the Columbia River below Pasco, Washington, each of which has the capability of furnishing at least 1,000 megawatts of capacity on a daily/weekly operating cycle. These sites represent a total capacity potential of more than 650,000 megawatts. The peaking requirements of the region can be met until about 1990 by adding units at existing conventional hydroelectric projects. When the addition of those units is completed, other sources of peaking power must be developed. Of several alternatives available, one of the most promising is pumped storage. Part I presents a compilation of existing pumped-storage material updated to reflect current practices and price levels. Part II addresses the problem of integrating pumped storage into the Northwest Hydro-Thermal Power System, with emphasis on timing and the amount of pumped-storage generation that can be utilized. In load factor ranges of about 2% to 15%, pumped storage will provide a source of peaking capacity at a lower cost than any other available alternative. (Woodard-USGS)
W72-12411

MISSOURI, LAND OF WATER,
S. C. Casteel.
Water and Sewage Works, Vol 119, No 7, p 68-72, July 1972. 4 fig, 3 ref.

Descriptors: *Water resources development, *Missouri, *Springs, *Dams, Hydroelectric power, Flood control, Recreation, Water supply.

The natural supply of water is one of Missouri's most important natural assets. When Missouri was first settled, springs determined the location of numerous towns. Generally there was a grist mill at the larger springs. They served both as water supply and source of power. In addition to the 47 springs in five counties in an area known as the Big Spring Country there are 104 additional springs in Missouri with an average flow of over 1 cfs (646,000 gpd) located in 26 counties south of the Missouri River. A listing and description of some of these are presented. During the past three decades a number of multiple-purpose projects have been completed to control floods and generate electrical power. Prevention of about $2.9 million flood losses has been attributed to the operation of this system. The Taum Sauk pumped storage hydroplant in the Ozark highlands near Lesterville, Mo., was completed in 1963. It has an output rating of 350,000 kilowatts. (Knapp-USGS)
W72-12418

ADVANCED NONTHERMALLY POLLUTING GAS TURBINES IN UTILITY APPLICATIONS.
United Aircraft Research Labs., East Hartford, Conn.
For primary bibliographic entry see Field 05B.
W72-12450

IN BWR'S, CORROSION CONTROL IS NON-CHEMICAL,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 08G.
W72-12459

USE AND RE-USE OF WATER AND EFFLUENTS IN THE MOTOR INDUSTRY-PART ONE,
For primary bibliographic entry see Field 05D.
W72-12982

USE AND RE-USE OF WATER AND EFFLUENTS IN THE MOTOR INDUSTRY-CONCLUSION,
For primary bibliographic entry see Field 05D.
W72-12983

3F. Conservation in Agriculture

WATER USE EFFICIENCY IN PLANT GROWTH AND AMBIENT CARBON DIOXIDE LEVEL,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 03B.
W72-12391

THE COMBINATION OF A SHORT TERM PUERARIA FALLOW, ZERO CULTIVATION AND FERTILIZER APPLICATION: ITS EFFECT ON A FOLLOWING MAIZE CROP,
University of Science and Technology, Kumasi (Ghana).
A. Kannegieter.
Trop Agr (Ceylon). Vol 125, No 3, 4: p 77-94, 1969. Illus.
Identifiers: *Crop production, *Soil management, Crops, Cultivation, Fallow, Fertilizers, Ghana, Maize M, Pueraria D, Pueraria phaseoloides D.

Large scale tractor plowing was introduced in the forest zone and its fringes in Ghana, putting an abrupt end to the traditional system of natural soil regeneration under a shifting cultivation system. This produces a dire need for quick regeneration of soil fertility for providing a soil cover against insolation, and erosion and for soil moisture conservation. A short term Pueraria fallow, combined with fertilizer application and 'zero cultivation' appeared to fill this need. The Pueraria phaseoloides formed within 3 mo. from sowing a complete soilcover. After 9 mo. it had built up 5 tons of dry matter per acre above ground, containing appreciable amounts of minerals even when not fertilized. When spray-killed, the Pueraria mass compacted into an unbroken mat close to the soil, providing effective soil protection, weed control and moisture-conservation in the following maize crop which was established in the undisturbed soil by punching holes through the 'dead' Pueraria mat. This in combination with fertilizer application to either the Pueraria fallow or later to the maize crop, resulted during the very unfavorable 1965 season in maize yields of around 2000 lbs. of dry grain/acre, about twice the average for the area in normal years.--Copyright 1972, Biological Abstracts, Inc.
W72-12486

RESOURCE REAPPRAISAL AND RESISTANCE TO CHANGE: AN AUSTRALIAN EXAMPLE,
University of New England, Armidale (Australia).
J. J. J. Pigram.
Professional Geographer, Vol 24, No 2, p 132-136, May 1972. 1 fig, 10 ref.

Descriptors: *Semiarid climates, *River valleys, *Irrigation practices, *Regional development, *Social aspects, Environmental effects, Groundwater, Droughts, Grazing, Natural resources, Foreign countries.
Identifiers: *Environmental perception, *Social geography.

So pervasive and decisive are social perceptive processes that different populations, although occupying the same environment, may have literally different resources. Irrigation agriculture is a area in which perceptive man, equipped wit technology, can reduce the rigidity of hithert naturally imposed impediments to resource us The conflicts resulting from different perception of a given environment are illustrated by th semiarid Namoi Valley in northwestern Ne South Wales, where the newly-constructed Keep Dam on the upper Namoi River has brought abo perceptual changes in many, but by no means al of the valley residents. The more reliable riv flow has resulted in so much new irrigated agricu ture that the cotton industry has grown fro nothing a decade ago to a multimillion dollar bus ness. However, many of the older residents of th valley have clung to their traditional outmode perceptions of the regional resources being main for grazing and a little irrigated pasture. This h led to some conflict between the outmoded trad tionalists who have not seen the wisdom and vi bility of long term agriculture and those with t new vision, especially during droughts when t grazier water was entirely taken by the irrigator (Casey-Arizona)
W72-12504

EFFECT OF IMPROVEMENT OF NUTRIEN SUPPLY AND SEEDLINGS GROWING O RICE YIELD INCREASE IN HEAVY CLAYE PADDY FIELDS,
Kyushu Agricultural Experiment Station (Japan)
Kaoru Seino, Jikichi Ito, Nobuo Kosuge, Hidefumi Ito, and Tsutae Yamasaki.
Bull Hokuriku Agric Exp Sta. 11: p 25-80. 1970. lus. English summary.
Identifiers: *Crop production, *Clays, Fertilizin Fields, Nutrients, Paddy M, Rice M, Seedlings.

Silicate nutrient fertilizer was applied at 4 ton/h and magnesium hydroxide at 0.8 ton/ha. Seedlin were planted in upland fashion with deep (30 c plowing, and irrigation water was drained from t period of determination of the number of beari tillers to the ear formation stage. The integrat silicate fertilizer increased brown rice yields d ing 9 yr (1959-1968). The grain weight was cc sistently 6.3 ton/ha. The integrated nutrient sup was effective due to vigorous rooting power. T deep plowing experiments increased yields only the first yr. Yields were decreased by deep plo ing in following years due to lodging and possi derangement of soil nutrients. The highest aver yields in one area for 9 yr were obtained wit combination of seedling raising, water mana ment and deep plowing with integrated nutrien In some cases the treatments were without effe When the relative growth ratio of bearing till from transplanting to the period of determinat was higher than that from the period of determi tion to maximum tillering, the rice yield increas However, the reverse case was without eff Rice yields increased when the ratio of N abso tion to dry matter production was higher from end of active tillering to the maximum tiller stage than the same ratio for a control field. He dressing of these silicate materials for 8 yr creased the cation exchange capacity of he clayey paddy field soils. It also increased the idation-reduction potentials, decreased ferr ions and humus, and increased the available icate and easily reducible Mn. The combinatio an integrated nutrient supply and well-timed N take produces a high yield of rice due to promoted efficiency of absorbed N for g production.--Copyright 1972, Biological Abstra Inc.
W72-12507

ROTATING ACCESS TO WATER TO IMPRO SEMIDESERT CATTLE RANGE NE WATER,
Forest Service (USDA), Tucson, Ariz. Ro Mountain Forest and Range Experiment Statio S. C. Martin, and D. E. Ward.
Journal of Range Management, Vol 23, No 1, p 26, January 1970. 4 tab, 4 fig, 5 ref.

escriptors: *Cattle, *Range management, Water supply, *Pasture management, *Grazing, rid lands, Water demand, Water conservation, osts, Rotations, Xerophytes, Forage grasses, egetation, Crop production, Water utilization, easonal, Range grasses, Arizona.
entifiers: Santa Rita Experimental Range rizona), Semi-arid lands.

anges may be overgrazed even if properly ocked because most semiarid grass-shrub cattle nges are grazed yearlong. Fencing, which helps ntrol overgrazing by deferred rotation, may be o costly on many southwestern ranges. This udy determines whether cattle in a pasture with veral watering places could be made to rotate eir use of forage near water by opening one ater place at a time, and determines changes in ver, production and use of perennial grasses ar water under such a system. Seasonal opening d closing of watering places in a 3,200-acre sture on the Santa Rita Experimental Range in izona showed lighter use of perennial grasses ar water if utilization for pasture was moderate light, and if the closed period included the mmer growing season. Rotating use of watering ces works best in large range units with waters apart. (Popkin-Arizona)
72-12508

N THE MEDITERRANEAN CLIMATIC GIME OF WEST PAKISTAN,
stitut Francais, Pondichery (India).
r primary bibliographic entry see Field 02B.
72-12510

APORATION LOSS NOW REPORTED DAI-
,
tional Weather Service, Lubbock, Tex.
Newton, and O. Wilke.
e Cross Section, Vol 18, No 5, p 1-2, May 1972.
ig.

scriptors: *Water management (Applied), *Irtation practices, *Evaporation, *Water loss, *Irtation programs, Evaporation pans, Crop oduction, Water conservation, Soil moisture, il-water-plant relationships.
ntifiers: Texas South Plains, Nomographs.

new management tool for Texas South Plains irtation farmers is available in daily evaporation orts of the National Weather Service. Five lotions in the area report surface water evaporan every 24 hours, results are averaged and reted by media outlets. A high correlation exists ween water loss from pans and crops which alws for better water conservation and manageent. Effects of soil moisture, crop type and irtation-practice are discussed. An irrigation heduling nomograph is given which requires an ut of the number of inches of pan evaporation ce the last irrigation, and gives the days to the t irrigation. An example is provided. (Popkin-zona)
2-12515

EDICTION OF IRRIGATION ADVANCE NCTION BY DIMENSIONAL ANALYSIS,
ian Inst. of Tech., Kharagpur. Dept. of Agricul-al Engineering.
Sastry, and S. C. Agarwal.
rnal of the Irrigation and Drainage Division, erican Society of Civil Engineers, ceedings, Vol 98, No IR2, p 247-253, June 2. 2 fig, 12 ref.

scriptors: *Irrigation, *Dimensional analysis, mputers, *Field capacity, Mathematical stus, Hydraulic conductivity, Forecasting, Inflow, l types, Infiltration, Soil water movement.

e of the important factors in the design of a sure irrigation system is the prediction of the adce distance-time relationship when estimating in advance for a given entrance stream size and land surface slope under given soil bed infiltration characteristics variation. An attempt has been made to derive an advance equation by dimensional analysis of the fundamental variables involved in water advance phenomena. Dominant variables considered include distance of advance, elapsed time, inflow stream per unit top width of flow, slope of soil bed, acceleration due to gravity, exponent in the Kostiakov type accumulated infiltration function, hydraulic conductivity of soil bed and absolute roughness of the bed. With available field data, the derived equation was tested and found satisfactory. Using the proposed technique, a general equation can be derived with suitable experimentation. (Casey-Arizona)
W72-12518

IS DRIP IRRIGATION FOR ARIZONA,
Arizona Agricultural Experiment Station, Tucson.
D. D. Fangmeier.
Progressive Agriculture in Arizona, Vol 24, No 8, p 6-7, May-June 1972. 3 fig, 2 ref.

Descriptors: *Irrigation practices, *Irrigation design, *Crop production, *Water conservation, *Water costs, Water supply, Irrigation water, Arizona, Irrigation efficiency, Labor, Surface irrigation, Water conveyance, Discharge (Water), Pumping, Filters, Valves, Pipelines, Fruit crops, Trees, Water control, Root zone, Salts, Economics, Tailwater, Runoff, Consumptive use, Capital risks.
Identifiers: *Trickle irrigation.

Decreasing availability and rising labor and water costs are causing growers to consider replacing surface irrigation by drip systems. Drip systems deliver water to the vicinity of a plant where discharge is controlled by an emitter. Systems consist of a pump, filters, meter, control valves, pipe and emitters. Fruit trees are best suited to drip systems as extensive pipe networks are required. Drip irrigation provides better water control where only the actual root-soil volume is watered. Additional water may be required to remove accumulated salts. Systems cost from $150 to $500 per acre and are economical for high value crops. Tailwater runoff is eliminated. A 95% water savings occurred on young trees compared to adjacent surface irrigated trees. Water savings from 20 to 50 percent on mature trees are estimated. Consumptive use requirements, labor savings, emitter designs and irrigation equipment are discussed. Drip systems are useful in Arizona where there are high value crops, high water and labor costs, limited water supply available capital and a willingness to overcome uncertainties involved . (Popkin-Arizona)
W72-12519

SOME NOTES ON WATER SUPPLY IN SOUTH INDIA,
West Midlands Coll. of Education, Walsall (England). Dept. of Geography.
W. Wilde.
Scottish Geographical Magazine, Vol 88, No 2, p 61-66, April 1972. 2 fig, 3 tab, 6 ref.

Descriptors: *Irrigation practices, *Agronomy, *Foreign lands, *Rice, Farm management, Irrigation systems, Water supply, Drainage, Evapotranspiration.

There are about 700,000 villages in India whose daily survival depends upon water supplies. The most efficient uses of water in that country depend not so much on total land area irrigated as on the timeliness of irrigation scheduling. This is illustrated by descriptions of 2 villages, Orakkadu, a small, low-lying coastal village of 636 people and the larger inland village of Kamayagoundampatti, with 8,294 people. In Orakkadu, about 168 of the 208 cropped acres are irrigated. Wells are present but the main water source is a nearby reservoir. Fortunately the local landlord is progressive, charging for tubewell water on a volume rather than an acreage basis, which induces more efficient usage. He has also introduced newer varieties of rice, chemical sprays, fertilizers, and tractors. In Kamayagoundanpatti, which is Cumbum Valley, rice accounts for about 1/2 of the 2093 irrigated acres. About 73% of the land holdings are under 5 acres and 12.5% are less than 1 acre. A minority of the tenant farmers still use wild flooding irrigation methods, which are extremely inefficient in this region of high evapotranspiration. Drainage has also been neglected with a consequent soil salinity buildup. Nevertheless, it is felt that there is occurring a slow awakening to modern agricultural methods in India's villages. (Casey-Arizona)
W72-12521

PREDICTIONS OF AGRICULTURAL IRRIGATION FOR INDIANA AND IRRIGATION POTENTIALS OF SELECTED INDIANA SOIL SERIES,
Indiana State Dept. of Natural Resources, Indianapolis.
K. Kemp.
State of Indiana, Department of Natural Resources, 238 p, 1970. 11 tab, 4 fig, 71 ref.

Descriptors: *Water requirements, *Water policy, *Water management (Applied), *Irrigation water, *Forecasting, *Indiana, Consumptive use, Soil series, Agriculture, Economic prediction, Climate, Water demand, Water resources development.

This report shows predictions of the quantities of water required to support agricultural irrigation in 92 Indiana counties and 9 economic areas in 1980, 1990, 2000, 2010, 2020. Predictions are based on historical information, and were developed to help manage the state's water resources as a result of the state water plan. Soil series and location, climate and future water demands are discussed. Agricultural irrigation water required for the state in 1980, 1990, 2000, 2010, and 2020 are about 39,100, 48,300, 58,000, 67,800, and 77,600 acre-foot respectively. Many small maps and tables present water-consumption predictions. (Popkin-Arizona)
W72-12524

EFFECTS OF NITROGEN SOURCE AND PHOSPHORUS ON CRESTED WHEATGRASS GROWTH AND WATER USE,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
J. F. Power, and J. Alessi.
Journal of Range Management, Vol 23, No 3, p 175-178, May 1970. 2 tab, 2 fig, 6 ref.

Descriptors: *Nitrogen, *Phosphorus, *Wheatgrass, *Water utilization, Effects, Forages, Soil-water-plant relationships, Grasslands, Crop production, Livestock, Efficiencies, Plant growth regulators, Ammonium compounds, Calcium compounds, Ureas, Fertilization, Crop response, Precipitation, Correlation analysis.
Identifiers: Dry matter production.

Grassland production must increase to satisfy projected demands for livestock products. This project obtained information on the relative efficiencies of various nitrogen (N) sources at several rates of annual application. Effects of four N sources upon crested wheatgrass growth were studied for 5 years at Mandan, North Dakota. Ammonium nitrate, ammonium sulfate, Calcium nitrate and urea were applied annually at rates up to 160 lb N/acre with and without phosphorus (P) fertilization. Dry matter production was increased by N and P fertilization in all years. Higher N rate and N source influenced yields only in years of higher production. Responses to N fertilization increased by about 380 and 490 lbs for each acre-inch increase in water supply above 5 inches with

and without P, respectively. Response to P fertilization was about 50 lb/acre-inch regardless of water supply. Dry matter production and N-fertilization response were closely correlated with May precipitation, with a correlation coefficient of 0.89. (Popkin-Arizona)
W72-12525

WATER USE IN RELATION TO MANAGEMENT OF BLUE PANICGRASS,
Agricultural Research Service, Tucson, Ariz. Crops Research Div.; and Arizona Univ., Tucson. Dept. of Agronomy.
L. N. Wright, and A. K. Dobrenz.
Journal of Range Management, Vol 23, No 3, p 193-196, May 1970. 3 tab, 10 ref.

Descriptors: *Water utilization, *Crop production, *Soil-water-plant relationships, *Forages, *Farm management, Efficiencies, Range grasses, Treatment, Moisture stress, Plant growth, Proteins, Weight, Water management (Applied).

Water use efficiency was determined for field grown blue panicgrass. Treatments were soil-moisture stress, clipping height and maturity stage. Water-use efficiency is the number of Kg of water per Kg of forage dry-weight produced. Panicgrass had a broad tolerance to high moisture stress. Efficient use of water and root weight decreased when stress increased, while dry weight was unchanged. The 30-cm clipping height was most efficient in water use, as it gave the highest forage production and produced the highest percentage protein and most roots. The most efficient use of water, the highest forage production and the highest protein percentage were obtained from the same management treatment. This is contrary to the performance of some crops. (Popkin-Arizona)
W72-12527

ENERGY EXCHANGES BETWEEN A PASTURE AND THE ATMOSPHERE UNDER STEADY AND NON-STEADY-STATE CONDITIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 02I.
W72-12528

RADIOISOTOPE UPTAKE BY SELECTED RANGE FORAGE AND WEED SPECIES,
Agricultural Research Service, Reno, Nev. Crops Research Div.
For primary bibliographic entry see Field 04A.
W72-12532

SOIL MOISTURE, FORAGE, AND BEEF PRODUCTION BENEFITS FROM GAMBEL OAK CONTROL IN SOUTHWESTERN COLORADO,
Colorado State Univ., Hesperus. San Juan Basin Branch Station.
For primary bibliographic entry see Field 04A.
W72-12534

GRAZING EFFECTS ON RUNOFF AND VEGETATION ON WESTERN SOUTH DAKOTA RANGELAND,
Agricultural Research Service, Newell, S. Dak. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04C.
W72-12536

A COMPARATIVE STUDY OF THE DEVELOPMENT OF YOUNG TEA UNDER IRRIGATION: II. CONTINUED GROWTH IN THE FIELD,
La Trobe Univ., Bundoora (Australia). School of Agriculture.
S. T. Willatt.
Trop Agric. Vol 48, No 3, p 271-277. 1971. Illus.

Identifiers: *Irrigation effects, *Crop response, Development, Fields, Growth, Irrigation, Lateral, Roots, Tea D.

Root growth, both in depth and lateral spread, was better with irrigation than without after a period of 20 mo. in the field. Four different types of planting material were used and no differences in lateral spread were significant. Top growth, measured both as pruning weight or area or cross-section of stem, showed significant increases due to irrigation, but when planting material was being considered only pruning weight was significant.--Copyright 1972, Biological Abstracts, Inc.
W72-12711

HYDROLOGIC BUDGET OF THE POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-12822

THE SNOWY MOUNTAINS HYDROELECTRIC AND IRRIGATION SCHEME (AUSTRALIA),
For primary bibliographic entry see Field 04A.
W72-12824

AN AGROCLIMATIC PROBABILITY STUDY OF THE ECONOMICS OF FALLOW-SEEDED AND CONTINUOUS SPRING WHEAT IN SOUTHERN SASKATCHEWAN,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
W. Baier.
Agricultural Meteorology, Vol 9, No 5/6, p 305-321, March 1972. 5 fig, 8 tab, 20 ref.

Descriptors: *Wheat, *Model studies, *Soil moisture, *Fallowing, *Economic prediction, Evapotranspiration, Spring, Probability, Agroclimatology, Agronomic crops.
Identifiers: *Potential evapotranspiration.

There is a remarkable similarity in the response of grain yields to the total available soil moisture from storage and seasonal rainfall over much of the Canadian prairies and the Great Plains of the U.S. A regression-type model for estimating daily potential evapotranspiration (PE) was used to synthesize probable wheat yield from observed growing season evapotranspiration and estimated spring soil moisture. The intent was to show the utility of spring soil moisture estimates from a water-budgeting model in order to assess the economics of wheat-fallow rotation practices. The spring soil moisture estimates were significantly correlated with the appropriate observations on fallow and on stubble lands. Using estimated yields from continuous wheat and 2-year rotation fallow wheat, and the average farm wheat price per bushel, annual net returns were estimated for continuous wheat at 13.23 dollars per acre compared to 9.53 dollars per acre for fallow wheat. However, fluctuations in probable net returns were great for continuous wheat. Advantages of wheat fallowing and the efficacy of the evaluation method are discussed. (Casey-Arizona)
W72-12835

CROPPING PATTERNS IN WEST PAKISTAN,
Indiana State Univ., Terre Haute. Dept. of Geography.
A. H. Siddiqi.
Journal of Geography, Vol 71, No 2, p 96-108, February 1972. 7 fig, 1 tab, 7 ref.

Descriptors: Foreign countries, *Crop response, *Irrigation practices, *Arid lands, River basins, Agronomic crops, Saline soils, Cereal crops, *Regional analysis, Geographical regions, Mapping.
Identifiers: *Subsistence crops, *Pakistan, *Crop-combination areas.

West Pakistan's agricultural system consists of intensively operated subsistence farms where only a small percentage of the total crop area is devoted to cash crops. About 3/4 of the nation's land area is not arable because of such environmental problems as poor and salty soils and lack of water resources due to the arid climate. Most of the arable land is in the Indus Valley, where over 70% of it is irrigated annually. This study focuses on regional variations in national cropping patterns by establishing crop-combination areas. This serves to uncover land use distinctions between regions. The country is mainly a producer of cereal and fodder crops. The cultivation of crops in each crop combination reflects a balance between the demands of soil moisture and crop-water needs. Changes in cropland use may result from such negative factors as waterlogging, salinization, overcropping, or such positive factors as response to organizational and input improvements. (Casey-Arizona)
W72-12842

QUALITY OF SURFACE IRRIGATION RUNOFF WATER,
Agricultural Research Service, Kimberly, Idaho Snake River Research Center.
For primary bibliographic entry see Field 05G.
W72-12845

CITRUS VS. WEATHER: A BRIEF HISTORY,
R. Rock.
Citrograph, Vol. 56, No. 3, p 71-72, 80-82, January 1971. 3 tab.

Descriptors: *Weather data, *Weather patterns, *Crop production, *Citrus fruits, *Farm practices, Marketing, Storms, Costs, Droughts, Freezing, Hurricanes, Floods, Seasonal, Rainfall, *California, Florida, Texas, Arizona, Europe.

Past weather conditions should be related to producing California citrus with respect to crop yield and market supply. A brief summary is provided of weather conditions in California, Florida and Texas which have affected citrus production and economics during the last 75 years. Freezes and storms best remembered by citrus growers fall in two categories--the ones which cost them money in lost fruit and the ones which made them money because of someone else's misfortune. Included are summaries of relevant information in Arizona and Europe. Emphasis is on drought, freezes, hurricanes, flooding, mildness of season, rainfall and fruiting policy. (Popkin-Arizona)
W72-12849

THE DROUGHT OF 1886,
J. Lackey.
The Ranch Magazine, Vol. 51, No. 5, p 16-17,2 February 1971. 3 fig.

Descriptors: *Droughts, History, *Crop production, *Texas, Winter, Corn, Harvesting, Cotton, Grains (Crops), Wells, Rivers.

History of drought is reviewed in West Texas because of the impact of the winter 70-71 drought. Drought was so severe in 1886 that all types of crops dried up; not a single bushel of corn per acre was harvested, cotton did not average a half a bale to ten acres, and small grains did not yield. Wells in towns went dry and there was not water in creeks. Quotations from Texas papers are used to describe the 1886 drought in West Texas communities. (Popkin-Arizona)
W72-12854

SUBIRRIGATION--A COMING INNOVATION
The Cross Section, Vol. 17, No. 6, p 2-3, June 1971. 5 fig, 2 ref.

Descriptors: *Subsurface irrigation, *Farm management, *Irrigation practices, *Irrigation

ncy, *Water management (Applied), Water servation, Groundwater mining, Texas, Water e, Runoff, Weed control, Labor, Fertilization, p production, Maintenance, Alkalinity, Salini-Water costs, Plastic pipes, Orifices, Spatial dis-ution.
tifiers: Capillary action.

drawal of water from the Ogallala Formation e Texas High Plains is actually a mining opera-. As the water table goes down, interest in con-ation of underground water goes up. Subir-tion is a new farming practice that may result reater savings of water. Advantages of subir-tion include elimination of runoff problem, ction in weed problems, increase fertilization nods, and increase in maturing of crops. Disad-ages include possible maintenance, alkalinity salinity problems. There are high initial costs. t designs include plastic pipes for economy maintenance. Orifice designs, spacing and llarity are discussed. Subsurface irrigation ires small labor costs. Subirrigation is a nising experimental method of irrigation water servation. (Popkin-Arizona)
2-12859

OID SPRINKLING PUBLIC ROADS.

Cross Section, Vol. 17, No. 6, p 1-2, June

criptors: *Sprinkler irrigation, *Roads, *Water servation, *Irrigation efficiency, *Irrigation tices, Groundwater, Water supply, Water s, Public lands, Hazards, Regulation, Irriga-water, Texas.
tifiers: Texas High Plains, High Plains Un-round Water Conservation District No. 1 as).

nkler irrigation systems are most efficient in erous areas of the Texas High Plains. Sprin-meeting individual requirements include move, tow lines, boom or giant sprinklers, or wheel roll, side move with and without r line, center pivot self-propelled, straight al self-propelled, traveler or big gun, and solid ystems. Sprinklers are good for conservation oundwater and water supply; they aid in sav-noney for irrigators. Sprinklers used close to ic roads waste water and present hazards to rists, school buses and mail carriers. Irriga-water leaving the farm to a public road is in tion of the statutes of Texas and regulations e High Plains Underground Water Conserva-District No. 1. A metal shield or a sprinkler which turns only 180 degrees can be em-d to prevent 'irrigating' a public road. (Pop-rizona)
-12860

GATION INVENTORY,
Plains Underground Water Conservation ict No. 1, Lubbock, Tex.
. Sechrist.
Cross Section, Vol. 17, No. 6, p 4, June 1971. 1 ref.

criptors: *Irrigated land, *Groundwater min-*Irrigation efficiency, *Crop production, eys, Irrigation wells, Texas, Water conser-n, Soil-water-plant relationships.
ifiers: Ogallala Aquifer, Texas Water elopment Board.

curate accounting of irrigation and irrigated is a basic need of many agriculturalists. us records are maintained in partial answer ese needs. The Texas Water Development l issues inventories based on the work of nu-s cooperating agencies. A summary of the tion inventory is presented for 1958, 1964 and for 15 West Texas Counties, including acres ed, acre-feet used, number of irrigation wells, quantity of water per acre irrigated and quantity of water pumped per well. Results of a 1969 survey (acres irrigated and number of irrigation wells) are presented for the 15 counties. Depletion data for these counties in West Texas are also presented, showing a volume of 2,283,605 acre-feet mined from the Ogallala Aquifer. (Popkin-Arizona)
W72-12861

AGROMETEOROLOGICAL INVESTIGATIONS OF HEAT BALANCE AND WATER BALANCE IN AGRICULTURAL FIELDS: II. COMPONENTS OF THE WATER BALANCE,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
W. Mueller.
Arch Meteorol Geophys Bioklimatol Ser B Klimatol Bioklimatol Strahlungsforsch Climatol Bioclimatol Radiat Res. Vol 19, No 2, p 199-224. 1971. Illus. English summary.
Identifiers: Agriculture, *Water balance, *On-site investigations, Germany, Heat, Marchfeld (Germany), Meteorology, Moisture, Soils.

Results are discussed of observations of the components of the water balance: precipitation, evaporation, dew, duration of humectation, soil moisture, and groundwater during a 5 yr period from the Marchfeld-area (Obersiebenbrunn).--Copyright 1972, Biological Abstracts, Inc.
W72-12888

WATER UPTAKE BY COTTON ROOTS DURING AN IRRIGATION CYCLE,
Alabama Agricultural Experiment Station, Auburn.
H. M. Taylor, and B. Klepper.
Aust J Biol Sci. Vol 24, No 5: p 853-859. 1971. Illus.
Identifiers: *Cotton D, *Irrigation effects, *Root systems, Moisture uptake.

Two-month-old cotton plants, growing in a rhizotron compartment filled with loamy fine sand surface soil, were subjected to an irrigation cycle. Estimates of rooting density, soil water content, soil water potential, water extraction per unit length of root, plant height, and leaf water potential were made throughout this cycle. The soil dried progressively from top to bottom. Water extraction per unit length of root was greater in wetter soils and decreased exponentially with soil water potential. In general, deep roots were as effective as shallow roots in water extraction. Rooting intensity was greater in the upper soil at first, but became uniform later. After irrigation, water extraction per unit length of root was about the same at all depths.--Copyright 1972, Biological Abstracts, Inc.
W72-12893

SPRINKLING IRRIGATION CONDITIONS FOR COTTON IN THE REGION OF THE STATE IRRIGATION SYSTEM-STARA ZAGORA,
Academy of Agricultural Sciences, Stara Zagora (Bulgaria). Experiment Station of Irrigated Agriculture.
G. Hristov.
Rastenievod Nauki. Vol 7, No 9: p 45-60, 1970. Illus. English summary.
Identifiers: Bulgaria, *Cotton D, Irrigation practices, *Sprinkler irrigation, Stara-Zagora.

During the period prior to inflorescence and fruit formation, border irrigation should be maintained so that the pre-irrigation soil moisture at a depth of 0.80 m is over 80-80% of the field capacity. This level was maintained by 2-3 irrigations at 750-800 m3/ha water applied from July 10-Aug. 10. Sprinkling during the period prior to inflorescence should be applied 2-4 times, depending on the amount of rainfall. Application of 500 m3/ha water should maintain the field capacity of the soil at 80-80% to a depth of 0.50 m. During the periods of emergence-inflorescence and florescence-fruit formation, 3-6 sprinkler irrigations annually at 350 and 270 m3/ha should be applied, depending on the rainfall, to maintain a pre-irrigating moisture level of 80-85% of the field capacity to a 0.35 m depth.--Copyright 1972, Biological Abstracts, Inc.
W72-12894

THE SURVIVAL OF ALFALFA UNDER IRRIGATION CONDITIONS,
Academy of Agricultural Sciences, Pazardzik (Bulgaria). Experiment Station of Irrigated Agriculture.
M. Sarkizov, and L. Delcev.
Rastenievod Nauki. Vol 7, No 9: p 35-43, 1970. Illus.
Identifiers: Crop response, *Crop production, *Alfalfa D, Corn M, Hay, Irrigation, Rotation, Survival, Wheat M.

Research was done at the irrigated Station for Agricultural Experiments at Pazardzik, on channelled forest soil, from 1960-1967. The test included types that lasted for 2, 3, 4 and 5 yr. These same types were tested in spring, summer, and autumn sowings. In aging, the alfalfa gradually loses its vitality, its potency and its ability to germinate. The hay yields are highest during the second yr, when the alfalfa attains its maximum growth and development. Good results are also obtained with alfalfa lasting 3-4 years, depending on the care with which the sowing is managed. From the fifth yr, the productivity of the alfalfa lowers suddenly, due to the rapid thinning out of the seedlings. The most rational effort would be to cultivate the alfalfa in the same field for 3-4 consecutive yr. The largest amount of root mass is found in the tillable layer (0-30 cm) after the third yr of alfalfa exploitation. The best production following crop rotation would be when corn and wheat are cultivated after 3-4 yr of alfalfa, when the total production and net yield per hectare are the highest.--Copyright 1972, Biological Abstracts, Inc.
W72-12895

THE EFFECTS OF SEVERITY OF DEFOLIATION AND SOIL MOISTURE STRESS ON DESMODIUM INTORTUM,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropical Pastures.
B. C. Imrie.
Aust J Exp Agric Anim Husb. Vol 11, No 52: p 521-524. 1971.
Identifiers: *Crop response, *Defoliation, Desmodium intortum D, *Moisture stress, Soils, Crop production.

The responses of 5 introductions and 1 cultivar of Desmodium intortum to 2 defoliation intensities under stress and nonstress soil moisture regimes were studied in a pot experiment. Both defoliation and moisture stress reduced yield. Significant line x defoliation interactions occurred, including differences among the component lines of the cultivar 'Greenleaf.' Evidence was found that genetic shift has occurred in Greenleaf in the direction of the lower yielding components which were more adversely affected by severe defoliation. The wisdom of releasing mixtures of 'pure' lines as commercial varieties of perennial pasture species is questioned.--Copyright 1972, Biological Abstracts, Inc.
W72-12897

EFFECT OF VARIOUS TREATMENTS ON HARDENING AND SOFTENING OF SEEDS IN PODS OF BARREL MEDIC (MEDICAGO TRUNCATULA),
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
R. Kirchner, and W. D. Andrew.

Aust J Exp Agric Anim Husb. Vol 11, No 52: p 536-540, 1971. Illus.
Identifiers: *Seed treatment, *On-site investigations, Australia, Barrel medic, Hardening, Medicago truncatula D, Pods, Rainfall, Seeds, Softening.

Experiments to determine ways of softening seeds in the field were designed to maintain stands of barrel medic (Medicago truncatula). Under moist temperate conditions, at Canberra, seeds in pods above ground readily hardended during Dec. but none softened duringthe following 2 mo. At Coonamble, under hotter conditions and with less rainfall, approximately 13% of the hard seeds in pods above ground softened during the summer but 96% of pods contained at least one soft seed. Covering the pods with about 1 in. of soil early in Dec. greatly increased softening of their seeds both at Canberra and Coonamble, but the response to seed burial was seen at Coonamble only after 134 days. Holding pods in a hot humid atmosphere also hastened seed softening. In all experiments, seed softening in pods began at the peduncle end and proceeded along the spiral as time went on. A method of determining intensity of hard-seededness is described. Although the method is arbitrary it indicated a reduction in intensity of hardseededness preceding softening of the seed.--Copyright 1972, Biological Abstracts, Inc.
W72-12898

FORAGE PRODUCTION OF SORGHUM VARIETIES IN RELATION TO DIFFERENT LEVELS OF NITROGEN,
Central Arid Zone Research Inst., Jodhpur (India).
S. D. Singh, D. K. Misra, D. L. Vyas, and H. S. Daulay.
Indian J Agric Sci. Vol 41, No 3: p 216-220, 1971. Illus.
Identifiers: Forages, *Nitrogen, *Crop production, Rainfall, Sorghum M, Varieties, Fertilization, Crop response.

The 'Sojat Bavni' cultivar of sorghum was superior to 'RS 610,' 'Local Pali' and 'NK 210,' but was similar to 'Meta Type' in forage yield. The low stem:leaf ratio of 'Sojat Bavni' (3.5) indicates its palatability and consequent suitability for forage more than 'Merta Type,' which has a stem:leaf ratio of 7.5. The yield of green forage increased with increasing N levels, N at 53.7 kg/ha was optimum for 'Sojat Bavni.' Seasonal changes occurred in varietal performance and response to N, perhaps owing to the differential rainfall distribution during the growing season. The response to N increased at the normal rainfall, but decreased with high rainfall.--Copyright 1972, Biological Abstracts, Inc.
W72-12899

RELATION OF WEATHER TO THE INFLUENCE OF HAY CROPS ON SUBSEQUENT CORN YIELDS ON A CHALMERS SILT LOAM,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
S. A. Barber.
Agron J. Vol 64, No 1: p 8-10, 1972. Illus.
Identifiers: *Crop production, *Rotations, Alfalfa D, Brome grass, Bromus inermis M, Corn M, Crops, Grass M, Hay, Loam, Medicago sativa D, Silts, Weather, Zea mays M.

The effect of hay crops (alfalfa (Medicago sativa L.), bromegrass (Bromus inermus L.), and a mixture of the two) on soil productivity as measured by corn (Zea mays L.) yields was investigated in field experiments conducted from 1952 to 1969. Corn following hay yielded more than corn following corn. The greater the number of years of corn subsequent to hay, the lower the corn yield. There was a negative linear correlation between corn yield and log of year of corn subsequent to hay. The slope of this relation varied with year and was correlated with 8-wk precipitation and 4-wk degree days following corn planting. The slope was greater as precipitation decreased below 15 cm or increased above 20 cm and also as degree days increased.--Copyright 1972, Biological Abstracts, Inc.
W72-12900

EFFECTS OF FERTILIZATION AND IRRIGATION ON CORN YIELDS, P CONTENT OF CORN LEAVES, AND AVAILABLE P IN SOIL,
Virginia Polytechnic Inst., and State Univ., Blacksburg.
J. A. Lutz, Jr., G. D. Jones, P. H. Hoepner, H. C. Porter, and D. C. Martens.
Commun Soil Sci Plant Anal. Vol 2, No 6: p 449-460, 1971. Illus.
Identifiers: Corn M, *Fertilization, *Irrigation effects, Leaves, Phosphorus, Silage, Soils, Crop production, Grains (Crops).

Experiments were conducted on Congaree loam at Orange, Virginia, in 1963, 1964, and 1965 to measure the response of corn to irrigation and to 3 levels of P. Rate of N was 140 kg/ha. Levels of P were 0, 37.5, and 75 kg/ha; while the rate of K was 70 kg/ha. All micronutrients were applied in recommended amounts. Excellent corn silage and grain yields were obtained and there was no response to added P except for grain yields on irrigated plots. Cropping with corn, irrigation, and fertilization appeared to have little effect on the P content of the 0- to 15-cm soil layer. Irrigation and P fertilization did not affect the P content of the corn leaves. Fractionation of P indicated appreciable amounts of Al-P, Fe-P, and Ca-P to a depth of 140 cm with less Al-P than the other forms. Moisture extraction by the corn, as measured with Bouyoucos blocks, indicated that the corn was utilizing moisture to a depth of 120 cm during siling and tasseling. The corn roots, therefore, had access to appreciable amounts of P below the)- to 15-cm soil depth. Since there was essentially no change in the P content of the O- to 15-cm soil depth, the corn apparently was either utilizing most of its P from soil depths below 15 cm, or available P was being maintained at a fairly constant amount from the various forms in which it was found in the soil. This is in contrast to the usual situation in which plants utilize appreciable amounts of P from the O- to 15-cm soil depth.--Copyright 1972, Biological Abstracts, Inc.
W72-12901

WHEAT PROTEIN PREDICTION FROM CLIMATIC FACTORS IN SOUTHERN NEW SOUTH WALES,
Agricultural Research Inst., Wagga Wagga (Australia). Dept. of Agriculture.
A. C. Taylor, and A. R. Gilmour.
Aust J Exp Agric Anim Husb. Vol 11, No 52: p 546-547. 1971.
Identifiers: Climatic data, New South Wales, *Forecasting, *Proteins, *Wheat M, Temperature.

Association between regional wheat protein levels and numerous rainfall, temperature, and sowing time variables in southern New South Wales over the period 1948-49 to 1968-69 was assessed from simple linear correlation coefficients. Of all the simple variables, average maximum temperatures in Oct. and Nov. were most highly correlated (positively) with protein. On the basis of the preliminary assessment, a small number of combined rainfall and temperature variables were built up for screening through a series of multiple regression analyses. The best of the multiple regression models took in a further variable, time (in years), to take account of the factors not covered by the other variables. This model accounted for more than 85% of regional protein variation over 21 yr and included 3 highly significant variables ($P < 0.01$): time (in years), midseason (May to July) rainfall, and late (Aug. to Nov.) rainfall and one significant variable ($P < 0.05$): midseason rainfall squared. Protein level increased by approximately 0.1% per annum ove the study period once significant climatic effect were removed.--Copyright 1972, Biological Abstracts, Inc.
W72-12902

SOIL TEMPERATURE, WATER, AN PHOSPHORUS EFFECTS UPON BARLE GROWTH,
Agricultural Research Service, Mandan, N. Da Northern Great Plains Research Center.
R. F. Follett, and G. A. Reichman.
Agron J. Vol 64, No 1: p 36-39, 1972. Illus.
Identifiers: *Soil-water-plant relationships, *Cro production, Barley M, Fertility, Plant growt Hordeum vulgare M, Phosphorus, Soils, Temper ture.

Barley (Hordeum vulgare L.) growth in t northern Great Plains is often limited by s water, soil temperature, or soil fertility. Therefo the response of 'Sacramento' spring barley to levels each of soil temperature (T), water (W), a P fertility (P) was investigated in a grow chamber. The yield of oven-dry tops, crowns, a roots showed the beneficial effects of increased and P on barley growth for all soil temperatur studied. Response of top and crown weight added P declined as T increased or W decrease Crown weight was highly correlated with numbe of tiller plus root buds initiated at the crown. T addition of P increased the numbers of tiller a root buds. Low available water and high soil te perature decreased the number of root buds p tiller bud. When low W limited barley growth, ro weights were maintained in preferenceto t weight, and top weight in preference to cro weight. Where the fertilizer needs to barley ha been met, methods devised to conserve water a control soil temperature at or slightly below c timum near developing root systems should fav yield responses.--Copyright 1972, Biological A stracts, Inc.
W72-12903

OAT VARIETY TRIALS IN HEDMARK A OPPLAND 1962-1968,
S. Frogner.
Forsk Fors Landbruket. Vol 20, No 5: p 495-5 1969. English summary.
Identifiers: *Crop production, *Oats, Hedma Oppland, Trials, Varieties, Weather, Gra (Crops).

Several foreign and Norwegian varieties and lin were tested, of which the 16 locally most pertin are dealt with. The location of the trial plots, experimental design, fertilizers used, the variet tested, together with soil classification and most important meteorological data are describ. Yield and agronomic data for oat varieties gro at the State Agricultural Experiment Stat Moystad are presented. As to grain quality, the fluence of weather conditions on hull percenta kernel size and volume weight is also treate Copyright 1972, Biological Abstracts, Inc.
W72-12904

UNIFORMITY OF WATER APPLICATI FROM REVOLVING HEAD-SPRINKLER,
Central Arid Zone Research Inst., Jodhpur (Ind Wasi Ullah, C. P. Mathur, and S. D. Singh.
Inidan J Agric Sci. Vol 41, No 3: p 253-259, 1 Illus.
Identifiers: *Irrigation efficiency, *Sprinkler rigation, Uniformity, Crop production, Wheat.

The pattern and application efficiency of wate wind velocities less than 3 km/hr were high wi a revolving sprinkler. The loss of water by evapo tion and wind drift was within 10-15%. The ap cation rate was satisfactory. The water distri tion pattern as evident from the uniformity coe cient was uniform. Wind velocities higher th 6

m/hr resulted in considerable loss and non-niform application of water. The data on water aught in cans approximately reflected the pattern f internal distribution of soil moisture. The ob-erved non-uniform application of water signifi-antly affected the yield of wheat.--Copyright 972, Biological Abstracts, Inc.
/72-12905

VATER IN AGRICULTURE - ITS USE AND EUSE,
or primary bibliographic entry see Field 05D.
/72-12964

OW COST METHODS OF WASTEWATER REATMENT,
/ater Science Labs., Melbourne (Australia).
or primary bibliographic entry see Field 05D.
/72-12971

UTLINE OF A TOPOLOGICAL MODEL FOR HE INTERACTIONS BETWEEN AGRICUL-URAL MEASURES AND THE ENERGY ALANCE OF THE SOIL, DEMONSTRATED IN ASE OF A STRAW COVER,
grarmeteorologische fuer Forschungsanstalt, runswick (West Germany).
. Schrodter, and J. Von Hoyningen-Huene.
rch Meteorol Geophys Bioklimatol Ser B Kli-atol Bioklimatol Strahlungsforsch Climatol ioclimatol Radiat Res. Vol 19, No 2, p 183-198. 971. Illus. English summary.
lentifiers: *Model studies, *Farm management, Land treatment, Agriculture, Heat balance, nergy, Interactions, Moisture, Soils, Straw ver.

or the complex relations between cultural treat-ents (straw cover) and the components of heat ılance and moisture balance of a soil without egetation a relational model is developed. The ructure of the model is analyzed by methods of e theory of graphs. It is shown that there are me basic cycles in the relations between the mponents of the heat balance or moisture ılance, respectively, which are the control echanisms in the system. The concatenation of e basic cycles gives new subsystems with a feed-ck effect which is responsible for the stabiliza-n of the system. By means of a special evalua-n of the graph a qualitative assertion is given out the interactions of the components and out the influence of the agricultural measure on ese interactions with regard to the totality of the stem and in consideration of the results ofils; the tritional regime of soils according to composi-n of hydrolyzable N, available P and K forms. e upper horizons of soils of the Oxalis acetosel--Vaccinium myrtillus and V. myrtillus aspen rest types were more acidic than those of the rb type of birch and Alnus incana forests. The ount of available nutrients/tree of the first story thinned-out stands was 2-4 times higher than in control. Dominance of spruce results in a layed biological cycle of nutrients, a low content bases and an oxidizing effect of the precipita-n penetrating through the crowns.--Copyright 72, Biological Abstracts, Inc.
72-13017

'SIMETRIC INVESTIGATION ON THE ELATIONSHIP BETWEEN THE DEPTH OF OIL AND CROP YIELD,
stitut National de la Recherche Agronomique, rsailles (France).
Monnier.
n Agron (Paris). Vol 22, No 2, p 183-195. 1971. s. English summary.
entifiers: *Crop production, Deficiencies, epth, Lysimeters, Relationships, Soils.

e relationship between the depth of soil and p yield was investigated in lysimeter plots over 14 yr. The classification of crops according to the reaction to the depth of soil approximates a classification that would be derived from the period and duration of vegetation. A better forecast is achievable by considering year times crop interaction, as shown in the form of the climatic water deficiency evaluated yearly during the growth of the crop involved. Comparing such deficiency with the growth-water available at the various depths permits improving the classification and identification of the conditions in which the plants are supplied with water; the relationship of the depth of soil with the crop yield. Study of the yield components of maize corrobrates this conclusion and shows the importance of the time at which water deficiencies occur, duly allowing for the moisture available in the soil.--Copyright 1972, Biological Abstracts, Inc.
W72-13025

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

WESTCHESTER-HILLSIDE FLOOD CONTROL STUDIES.
Harza Engineering Co., Chicago, Ill.

Metropolitan Sanitary District of Greater Chicago, Illinois, May 1971. 80 p, 19 fig, 6 tab.

Descriptors: *Urban drainage, *Flood control, *Storm drains, *Drainage engineering, *Storm runoff, Illinois, Retention, Streams, Rivers, Floods, Flooding, Combined sewers, Flood protection, Storage, Detention reservoirs, Storm water, Surface runoff, Urbanization, Runoff, Planning, Sewers, Water pollution control.
Identifiers: *Westchester (Ill), *Hillside (Ill).

A plan is presented for eliminating widespread flooding problems in the Westchester-Hillside area. Some areas within the two-villages presently experience damaging flooding almost annually. Surface flooding, caused by waters in excess of storm sewers and drainage way capacity, come mainly from neighboring unincorporated areas. Improper sewer connections and storm water infiltration were found to be of minor importance. Most sanitary sewer back-ups were found to occur because of flat sewer gradients in these particular areas. Because of channel improvements to Salt Creek, flood water elevations will increase and it is recommended that the flood control plan of the U. S. Soil Conservation Service be implemented. Flood control improvements are recommended for Lower Salt Creek in Cook County. An alternative would be to make provision for detention storage of flood waters in DuPage County. High flows from Addison Creek obstruct outflow from storm sewers and cause flooding. The recommended flood control plan is based on the principle of retention of storm flows near the point of origin both to eliminate overloads on the local sewer systems and to moderate flood flows in the creeks. The recommended plan consists of three new retention basins, expansion of two existing retention basins, and facilities to convey flood water into the basins. Total construction costs for the recommended plan, exclusive of Salt Creek flood control plans, is $5,432,000. It is recommended that design criteria be changed from providing protection against the 'storm of record' to designing for handling the 100-year recurrance interval storm. This would reduce construction costs to $3,007,000. (Poertner)
W72-12395

WEST BRANCH DUPAGE RIVER FLOOD CONTROL PLAN.
Harza Engineering Co., Chicago, Ill.

Village of Hanover Park and the Metropolitan Sanitary District of Greater Chicago, Illinois, October 1971. 35 p, 9 fig, 3 tab.

Descriptors: *Drainage systems, *Detention reservoirs, *Planning, *Flood control, *Storm runoff, Illinois, Retention, Floods, Flooding, Flood recurrence interval, Storm water, Basins, Sewerage, Sewers, Urbanization, Drainage engineering, Urban runoff.
Identifiers: *Hanover Park (Ill), Metropolitan Sanitary District of Greater Chicago, DuPage River.

Overbank flooding results from increased runoff from urbanized areas and inadequate channel capacity. River channel capacity has been reduced by construction in the channel and flood plain by lack of maintenance so that the channel capacity is now exceeded for all storms with a recurrence interval greater than one year. Sanitary sewer surcharge problems are caused by low and leaky manholes and by the practice of removing sanitary sewer manhole covers in flooded areas in order to drain ponded storm water. In order to alleviate the damages caused by overbank flooding and related storm sewer back-ups, a plan incorporating the principle of retaining storm flows near their point of origin is recommended. This should prevent overbank flooding caused by runoff from the 100 year storm if the recommended plan is implemented. The total plan for the area is consistent with the policy of the Metropolitan Sanitary District in controlling flows at the Cook County boundary. By use of retention basins the flooding problem will be solved along with some of the anxiety which now prevails among the residents of flood-prone areas. Total construction cost of the project is estimated to be $3,848,000. The construction program would require about two years. Financing is recommended to be done by various state and local agencies because of the benefits that will acrue to communities other than where the actual construction is done. (Poertner)
W72-12396

STREAMFLOW CHARACTERISTICS OF THE POTOMAC RIVER,
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
M. S. Baloch, E. N. Henry, and W. H. Dickerson.
1972. 276 P, 82 FIG, 39 TAB.

Descriptors: *West Virginia, *Streamflow, *Flow characteristics, *Potomac River, *Gaging, *Streamflow forecasting, Streams, Rivers, Dams, Hydrologic data, River forecasting, Reservoirs, River basins, River flow, Measurement, Flood recurrence interval, Flood forecasting, On-site investigations.

This report is used in conjunction with the publication 'Water Resources Data for West Virginia' which contains information on surface water records and water quality. This report enhances the usefulness of the surface water data by summarizing, for the available period of record, flow characteristics for the Potomac River Basin including extremes of high and low flows, flow durations, and estimates for the frequency or return period for given flows. It also gives information on the season or time of year when the extremes of flow can be expected. To aid in the interpretation of these data, the report contains a brief description of the physical features of the basin and some information on the hydrological characteristics of surface waters and groundwater. As an aid in the understanding of streamflow characteristics, a more detailed description of climate has been added. The primary data were obtained from 23 gaging stations, some small reservoirs, and numerous small flood detention dams. (Poertner)
W72-12401

STORM DRAINAGE STUDY, KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City Region, Mo.

May 1971. 49 p, 2 fig, 41 ref.

Descriptors: *Drainage programs, *Urban drainage, *Flood plain zoning, *Ordinances, *Flood control, Drainage practices, Planning, Flood plains, Storms, Stormwater, Census, Financing, Zoning, Drainage engineering, Missouri, Kansas, Drainage systems, Regional analysis, Urban runoff, Storm runoff, Regional development, Urbanization, Retention, Storage, Detention reservoirs.
Identifiers: *Kansas City (Missouri).

To provide some preliminary guidelines for the growth of the region until more specific plans can be developed, the Metropolitan Planning Commission has prepared a weries of interim studies of which this is one. This study is a comprehensive review of storm drainage problems within the eight-county Kansas City Metropolitan Region. An inventory is included on: (1) areas which are subject to frequent flooding; (2) the major flood control projects and storm drainage improvements including methods for financing; and (3) the location and extent of special drainage improvement districts. The report also includes: a list of priorities for all projects that are proposed; a discussion of methods which are used to assure flood protection in new urban developments; a statement of policies relating to flooding and storm drainage requirements in the planning area; an appraisal of the relative levels of flood problems found in the planning area; and model storm drainage and flood plain zoning ordinances that may be used by governmental units in the Planning Area to assess storm drainage needs. Maps are included with the study to show existing and proposed reservoirs, flood plains, and levee and channel improvements in the eight-county area. (Poertner)
W72-12402

NATURAL RESOURCE PLAN-WATER RESOURCES.
McLean County Regional Planning Commission, Bloomington, Ill.
For primary bibliographic entry see Field 06D.
W72-12405

PUMPED-STORAGE POTENTIAL OF THE PACIFIC NORTHWEST, PARTS I, II, AND SUMMARY REPORT.
Corps of Engineers, Portland, Oreg. North Pacific Div.
For primary bibliographic entry see Field 03E.
W72-12411

ENVIRONMENTAL STUDY OF THE UNZMARKT AREA, STYRIA (INNER ALPINE BEECH TREE ISLAND),
Forstliche Bundesversuchsanstalt, Vienna (Austria).
K. Zukrigl.
Forstl Bundesversuchsanst Inst Standort. 23. p 1-65. 1969.
Identifiers: Austria, Beech D, Elevation, *Environment, Fir G, Larch G, Precipitation, Spruce G, *Styria (Austria), Temperature, Trees.

The geographic location, climate, geology, and topography, the soil (methods, description of profiles, analytical data), the vegetation (floristic character, specific groups, forest associations, tree species) and the environmental structure (vertical, horizontal, growth areas) are described. The area is located on the slopes of the Rosskegel range and includes an elevation span of from 1000 to 1479 m. The area forms part of the northern alpine intermediary zone where beech and fir stands border on spruce and larch stands. Temperature increases while precipitation decreases with increasing altitude and the area is divided into a moderately warm level and a cool level of deciduous stands and a cold level of conifers. The geology of the area is polymorphic which divides it into numerous segmental units.--Copyright 1972, Biological Abstracts, Inc.
W72-12413

WATER IMPORT STUDIES,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
F. A. Rayner.
The Cross Section, Vol 17, No 8, p 1-2, August 1971.

Descriptors: *Water transfer, *Water conveyance, *Mississippi River Basin, *Texas, *New Mexico, History, Water demands, Groundwater development, Groundwater mining, Irrigation practices, Economics, Water levels, Monitoring, Surveys, Aquifers, Appropriation, Water sources, Water costs, Benefits, Water supply, Water users.
Identifiers: *Texas High Plains.

The history, value, proposal and findings of water import studies are discussed. The studies are supported by the U.S. House of Representatives, and concern importation of water to West Texas-Eastern New Mexico. Early water demands in the Texas High Plains were limited and groundwater easily met these needs. Groundwater resources were mined and diminished as irrigation agriculture became the basic economy. Studies by the Federal Public Works Administration and Works Progress Administration led to continual water-level monitoring. This work showed the depletion of the aquifer. About $4,652,000 have been appropriated for the import studies. The U.S. Army Corps of Engineers have been studying the lower Mississippi River Basin area as a water source for importation. An interim report concluded that it is physically feasible to transport about 16.5 million acre feet of Mississippi water annually, costs of imported water exceed irrigator's ability to pay regardless of route, economic benefits to non-farmers are large, and delivery costs can be reduced by incorporating benefits other than water supply. (Popkin-Arizona)
W72-12511

SLICING UP THE OPEN SPACE: SUBDIVISIONS WITHOUT HOMES IN NORTHERN CALIFORNIA,
J. J. Parsons.
Erdkunde, Vol 26, No 1, p 1-8, 1972. 1 fig, 1 tab, 16 ref.

Descriptors: *Social aspects, *Land development, *Land use, *Rural areas, *Water pollution, Sewage, Septic tanks, Recreation development, Lakes, Economic feasibility, Urban sociology, Economic impact, California.
Identifiers: *Recreational subdivisions, *Corporations.

Land speculation is an American tradition and has been mainly centered in urban fringe areas or just beyond suburbia. A new form of land speculation involves recreational subdivisions in regions remote from cities. It is mainly practiced in California, where urban population increases have led to physical congestion and emotional anxiety. Possession of a parcel of land, however small, in a remote, clean section of the state has therefore become a middle class ambition. The methods used by the promoters to attract and sell to buyers are described. Many large corporations have joined local developers in slicing up large tracts of remote and inexpensive property and packaging it for subdivisions. In California, the largest is Boise-Cascade Corporation, with 12% of its 1969 net sales accounted for by such developments. This company considers water access a sine qua non of its developments and builds many lakes. The high pressure advertising and sales probably create artificial demands, because few people actu build in such subdivisions and there is little or lot resale market. Other unfavorable econor aspects for the buyer are discussed and it appe in general that such lots are very poor investmer The subdivisions pose threats to domestic wa supplies. In some areas septic tanks have beco unacceptable while sewage lines are too impra cal and costly. The root of the problem lies in basic values of American society concerning l ownership. (Casey-Arizona)
W72-12520

EFFECTS OF NITROGEN SOURCE A PHOSPHORUS ON CRESTED WHEATGR GROWTH AND WATER USE,
Agricultural Research Service, Mandan, N. D. Northern Great Plains Research Center.
For primary bibliographic entry see Field 03F.
W72-12525

RADIOISOTOPE UPTAKE BY SELECT RANGE FORAGE AND WEED SPECIES,
Agricultural Research Service, Reno, Nev. Cr Research Div.
R. E. Eckert, Jr., and C. R. Blincoe.
Journal of Range Management, Vol 23, No 5 367-369, September 1970. 1 tab, 11 ref.

Descriptors: *Isotope studies, *Plant growth re lators, *Radioactivity effects, *Forages, *Wee Range grasses, Ranges, Depth, Volume, Gam rays, Soil horizons, Root systems, Wheatgrass, Annual, Copper, Molybdenum, Iodine, Chro um, Energy, Solubility, Acidity, Soil chemi properties, Moisture availability, Leachg, Tracers.

Growth and survival of perennial grass seedlgs on rangelands are closely related to depth, spad and volume of root systems of competing spec This study evaluates the uptake of a group of gamma-emitting isotopes from an important ra soil by range plants, and estimates their value root-tracing studies. Two wheatgrasses, one annual grass and one annual forb were used with isotopes. Uptake of copper, molybdenum d selenium ranged from moderate to very good in soil horizons. Iodine and chromium uptake w poor on the surface and lower soil horizons, moderate to very good in other horizons. H lives of from 12.8 hours to 128 days, and ener differences which permit detection of each isope in the presence of others are desirable cha teristics for root tracing. Tracer solubility, soil moisture level and leaching are factors prese in isotope mobility. (Popkin-Arizona)
W72-12532

TEMPERATURE AND MOISTURE STRESS F FECT GERMINATION OF GUTIERRIA SAROTHRAE,
Forest Service (USDA), Flagstaff, Ariz. Rky Mountain Forest and Range Experiment Stati W. H. Kruse.
Journal of Range Management, Vol 23, No, p 143-144, March 1970. 2 fig, 3 ref.

Descriptors: *Weed control, *Germination, *Te perature, *Moisture stress, *Soil-water plant tionships, Effects, Limiting factors, Cont Weeds, Forages, Crop production, Consumive use, Pinyon Pine trees, Juniper trees.
Identifiers: *Gutierrezia sarothrae.

Reduction of the noxious broom snakeweed the southwestern pinyon-juniper regions incre production of usable forages. This laborat study measures effects of temperature and moisture stress on snakeweed germinon Moisture stresses of 0.2, 1.2, 2.4, 6.0 and 12.0 and temperatures of 40, 50, 60, 70, 80 a 90 degrees F were tested on snakeweed seeds. mination was best at 60 and 70 degrees F. Seeds

id not germinate at 40 and 90 degrees F. Germina-
ion was inversely related to moisture stress. (Pop-
in-Arizona)
V72-12533

OIL MOISTURE, FORAGE, AND BEEF RODUCTION BENEFITS FROM GAMBEL AK CONTROL IN SOUTHWESTERN OLORADO,
olorado State Univ., Hesperus. San Juan Basin
ranch Station.
. W. Marquiss.
ournal of Range Management, Vol 25, No 2, p
46-150, March 1972. 4 fig, 4 tab, 9 ref.

escriptors: *Oak trees, *Range management, Soil moisture, *Productivity, Grazing, Livestock, and use, Herbicides, Forages, Grasses, Forests, Colorado.
lentifiers: *Foothill rangelands.

ambel oak is widespread in the foothill range-
nds of the southwestern U.S., growing with
nyon pine and juniper at 7,000 ft and with spruce
id aspen at its upper elevation limits of 10,000 ft.
s value on rangelands is unknown, but livestock
azing oak rangelands tend to overgraze open
eas and graze only lightly under the oak. Soil
oisture determinations were made over 4
immer seasons in a Gambel oak-grass type range.
he study sites included open areas between oak
umps, undisturbed oak clumps and 100% con-
olled oak. Significantly greater soil moisture was
und on totally controlled plots compared to non-
eated oak sites. The greatest soil moisture dif-
rences occurred from the 2- to 5-ft depths. Two
i-acre pastures were used in a paired plot grazing
udy. On the treated pasture all brush was killed
herbicides. Both pastures were grazed
oderately. Forage production determinations
owed a substantial increase in forage as a result
brush control, particularly in the oak thickets.
his was reflected in livestock gains of 18 lb/acre
er a 5-year period on the brush-controlled
isture. Controlling Gambel oak obviously pro-
des more soil moisture for grass use when good
ntrol is achieved of both stems and sprouts.
asey-Arizona)
72-12534

OTIC AND HYDROLOGIC VARIABLES IN RAIRIE POTHOLES IN NORTH DAKOTA,
eological Survey, Denver, Colo.
E. Sloan.
urnal of Range Management, Vol 23, No 4, p
0-263, July 1970. 3 fig, 2 tab, 4 ref.

escriptors: *Hydrologic aspects, *Biota, otholes, *Grasslands, *Depressions, Vegeta-
n, *North Dakota, Glaciers, Geomorphology, issouri River, United States, Wildlife habitats, aterfowl, Stock water, Water supply, Hydrolo-
, Climate, Geology, Topography, Groundwater, nd management, Wetlands, Plants, Precipita-
n, Surface runoff, Seepage, Dissolved solids, ater quality, Dynamics, Environment, Spatial istribution, Temporal distribution, Variability, emical analysis, Plant groupings, Soil-water-
nt relationship.

airie potholes (sloughs) are depressions of gla-
l origin north of the Missouri River in the prairie
gion of the United States and Canada which pro-
de valuable wetland habitat for migratory water-
wl. Potholes are widely used for stock-water
pplies. Wide variations in pothole hydrology are
used by differences in climate, geology, topog-
phy, ground-water hydrology and land use. Wet-
id plants are adjusted to hydrologic regimen.
tholes water results from precipitation, surface
w and seepage inflow of groundwater. Seepage
low prevents slough drying and affects water
ality. Dissolved solids from precipitation, sur-
e flow and seepage inflow are about 5, less than
, and greater than 500 mg/l. Prairie potholes oc-
cupy a dynamic hydrologic environment of wide spatial and temporal variations, where wetland plants smooth out short-term hydrologic variations. Tables give chemical analysis of pothole water and relate water quality to 5 types of plant associations. (Popkin-Arizona)
W72-12535

LEHMANN LOVEGRASS ON THE SANTA RITA EXPERIMENTAL RANGE, 1937-1968,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Cable.
Journal of Range Management, Vol 24, No 1, p 17-21, January 1971. 5 fig, 1 tab, 6 ref.

Descriptors: *Vegetation establishment, *Revegetation, *Range grasses, *Range management, *Soil-water-plant relationships, *Plant growth regulators, Plant growth, Experimental farms, Ranges, Forest fires, Southwest U.S., Soil, Rainfall, Seeds, Summer, Dominant organisms, Mesquite, Crop production, Winter, Spring, Grazing, Arid lands, Forage palatability, Arizona.
Identifiers: Santa Rita Experimental Range.

Lehmann lovegrass has been widely used to revegetate drier portions of southwestern ranges and burned areas since the 1930's. Thirty years experience with the grass under varying soil, rainfall and seeding conditions are reported. Objections to Lehmann are lower palatability than native perennial grasses during the summer growing season, and eventual domination over native grasses. Assets include (1) rapid establishment from seed under adverse conditions, (2) automatic reseeding after fire or other disturbance, (3) invasion of mesquite areas to produce high herbage yields, (4) excellent yearly carryover of herbage, (5) production of green herbage during winter and early spring, and (6) ability to withstand repeated close grazing. Results of studies between 1937 and 1968 on the Santa Rita Experimental Range are presented in text and figures. (Popkin-Arizona)
W72-12539

SOME WATER MOVEMENT PATTERNS OVER AND THROUGH PINYON-JUNIPER LITTER,
Utah State Univ., Logan. Dept. of Range Science.
G. F. Gifford.
Journal of Range Management, Vol 23, No 5, September 1970, p 365-366. 2 fig, 4 ref.

Descriptors: *Soil-water movement, *Litter, *Pinyon pine trees, *Juniper pine trees, *Penetration, *Water distribution (Applied), Water loss, Spatial distribution, Temporal distribution, Rainfall disposition, Interception, Transpiration, Soil properties, Fluorescent dye, Canopy, Density, Vegetation, Biological properties.

Water movement patterns may exist due to unique spatial and temporal characteristics of rainfall, or because of floral characteristics which influence interception, transpiration, etc. and/or because of soil characteristics. This paper investigates water movement pattens over and through pinyon-juniper leaf litter. Fluorescent dye patters depicting water movement over and through litter accumulations varied according to canopy density of trees. Where canopy was closed, dye was confined to the surface 1-inch of litter with no lateral movement; where canopy was open, dye was found to a maximum of 6 inches beneath litter and lateral downhill movement of at least 25 inches; where dye penetrated litter, both a streaked and a uniform pattern of water movement occurred. Water movement patterns are variable and related to tree canopy density. (Popkin-Arizona)
W72-12540

EFFECTS OF CLIPPING AND SUPPLEMENTAL NITROGEN AND WATER ON LOAMY UPLAND BLUESTEM RANGE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
C. E. Owensby, R. M. Hyde, and K. L. Anderson.
Journal of Range Management, Vol 23, No 5, September 1970, p 341-346. 6 tab, 3 fig, 22 ref.

Descriptors: *Bluegrasses, *Environmental effects, *Plant growth regulators, *Nitrogen, *Moisture availability, Effects, Loam, Ranges, Fertility, Crop production, Farm management, Water conservation, Seasonal, Water utilization, Consumptive use, Grasslands.
Identifiers: *Clipping.

Moisture availability and nitrogen fertility are implicated as principal environmental factors limiting herbage production in grasslands. The relative importance of supplemental moisture and nitrogen (N) for bluestem range, with attention to haying management, is investigated. N and water separately and combined, were added to loamy upland bluestem range for 4 years, where plots were clipped at different dates. Moisture addition failed to increase total herbage yields, but supplemental N substantially increased yields particularly on coal-season species. Clipping reduced moisture uptake and nitrogen addition increased it. (Popkin-Arizona)
W72-12541

GULF INTRACOASTAL WATERWAY, TEXAS SECTION, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-198 927-F, $3.00 in paper copy, $0.95 in microfiche. March 15, 1972. 59 p, 1 map.

Descriptors: *Texas, *Environmental effects, *Project planning, *Channel improvement, Dredging, Disposal, Alternate planning, Administrative agencies, Adoption of practices, Coordination, Water resources development, Turbidity, Benthic fauna, Comprehensive planning, Federal government.
Identifiers: *Environmental Impact Statements, *Gulf Intracoastal Waterway (Tex), *Matagorda Bay, *Corpus Christi Bay.

The project involves relocation of two portions of the authorized shallow-draft navigation project in Matagorda and Corpus Christi Bays in Texas. The relocation of the main channel at present dimensions of 12 feet deep and 125 feet wide will be between mile 454.3 and mile 471.3 in Matagorda Bay and between mile 539.4 and mile 550.0 in Corpus Christi Bay. The action will result in reduced maintenance dredging requirements for the realigned channels, thus reducing periodic disturbance of the bay environment by dredging and disposal operations. The action will remove or disturb some motile and benthic organisms, cover some vegetation, and result in a temporary increase in turbidity from dredging and disposal operations. The alternatives include no action and alternate methods of spoil disposal. Destruction of the small amount of benthic organisms and marine habitat involved in channel deepening would be irretrievable. Additionally, any losses incurred through destruction of historical or archeological resources would be irreversible. Included are comments from various interested state and federal agencies. (Widman-Florida)
W72-12604

TORTIOUS WATER AND LAND USE IN THE BIG CYPRESS SWAMP,
S. D. Robinson.
Miami Law Review, Vol 25, No 4, p 690-712, 1971. 2 fig, 113 ref.

Descriptors: *Surface drainage, *Drainage patterns (Geologic), *Riparian rights, *Watercourses (Legal aspects), Drainage, Ecosystems, Hydrology, Water law, Drainage systems, Drainage effects, Drainage area, Drainage water, Surface waters, Hydrologic cycle, Hydrologic systems, Water conservation, Legal aspects, Judicial decisions, Regulation, Water rights, Natural flow, Public rights, Water resources development, Water pollution, Diversion, Flow augmentation, Reasonable use, Florida.
Identifiers: *Everglades National Park, Common enemy doctrine.

Scientists predict a damaging ecological change if the Big Cypress Swamp in the Everglades National Park is drained for development. To prevent this development a number of courses are open, including government condemnation and zoning ordinance. A third possible remedy is injunctive relief. The Florida rule as to interference with natural drainage flow is that the upper landowner may not unreasonably appropriate or divert the flow without incurring liability. But he may increase the flow without incurring liability even if it damages the lower landowner. Such a rule is not justified in logic or public policy. A better disposition would be to use a test of reasonableness of increased flow and to compare the parties' equities. The uniqueness of the Everglades renders a complainant's damages at law a nullity. Damages would be of no use to a public which stands to lose its irreplaceable wildlife. Thus an injunction should lie to protect this ecosystem. A concise description of the hydrology, the geological characteristics, and the ecosystem of the area is included. (Brackins-Florida)
W72-12605

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION--UNIT NO. 3, BEESLEY'S POINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08C.
W72-12628

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA--A COMPILATION OF PEAK DATA, OCTOBER 1958 TO SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02E.
W72-12703

MANAGING A PONDEROSA PINE FOREST TO INCREASE WATER YIELDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 03B.
W72-12811

LITTER PRODUCTION BY OAK-MOUNTAINMAHOGANY CHAPARRAL IN CENTRAL ARIZONA,
Forest Service, (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02A.
W72-12812

HYDROLOGIC PERFORMANCE OF ERODED LANDS STABILIZED WITH PINE,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
S. J. Ursic, and P. D. Duffy.
In: Proceedings Mississippi Water Resources Conference, April 11, 12, 1972, Jackson, Mississippi, p. 203-216. Water Resources Research Institute, Miss. State University.

Descriptors: *Storm runoff, *Sediment yield, *Soil surveys, *Forecasting, *Water yield, *Demonstration watersheds, *Watershed management, Hydrologic aspects, Loblolly pine trees, Groundwater recharge, Erosion control, *Mississippi.
Identifiers: Runoff-sediment prediction.

Analyses of annual surface runoff and sediment yield data from eight small (2.6- to 7-acre), severely eroded, north Mississippi catchments stabilized with southern pine have emphasized the importance of soil surveys for predicting hydrologic behavior. Average annual and probable maximum runoff/precipitation (RO/P) ratios can be predicted satisfactorily from annual precipitation data and the proportion of catchment area in soils with internal drainage restrictions. For years of average rainfall, differences in annual surface water yields due to soils alone may exceed 8 inches. Differences in probable maximum annual RO/P ratios may approach 0.25. Stormflows from eroded catchments of well-drained soils can largely be eliminated. Results have confirmed the efficinecy of pine plantings in controlling sediment production from deeply eroded and gullied headwaters. The 25-year-old pines have reduced sediment production to an annual average of 0.03 ton per acre. Average annual sediment yields in tons per acre can be predicted by multiplying the average annual runoff in area-inches by 0.0066. Results provide additional insight on how erosion-control tree plantations can be managed to reduce storm runoff and enhance groundwater recharge. (Ursic-Forest Service)
W72-12815

PROBLEMS AND TRENDS IN DRAINAGE RESEARCH, MIXED BOUNDARY CONDITIONS,
Iowa State Univ. of Science and Technology, Ames.
D. Kirkham.
Soil Science, Vol. 113, No. 4, p. 285-293, April 1972. 4 fig, 46 ref.

Descriptors: *Flow nets, *Mathematical analysis, *Drainage, *Seepage, Reviews.
Identifiers: *Boundary values.

Recent trends in drainage research are briefly reviewed. A method of solving seepage problems having mixed-boundary conditions is described. A mixed-boundary value problem is one where the potential is given on part of a boundary and the normal of the potential on the remainder of the boundary. In developing the method, a solution is found for a 2-dimensional dam seepage problem with a known (conformal transformation) solution that can be used as a check. By this method, as opposed to conformal transformations, it is easy to prepare a flow net, and one is presented. The procedure is then generalized in 4 steps. (Casey-Arizona)
W72-12823

THE SNOWY MOUNTAINS HYDROELECTRIC AND IRRIGATION SCHEME (AUSTRALIA),
W. Hudson.
Proceedings of the Royal Society, London, Series A., Vol 326, No. 1, p. 23-37, 1971. 3 fig, 2 tab, 3 ref.

Descriptors: *River systems, *Diversion structures, *Water resources development, *Social aspects, *Arid lands, Hydroelectric power, Economic feasibility, Irrigation systems, Engineering geology, Environmental effects, Vegetation effects, Political aspects, Personnel management, Topography, Foreign lands, *Australia.
Identifiers: *Snowy Mountains Scheme.

Although Australia is richly endowed with mineral resources, nature has been far less generous with water. It is the driest of all continents with an average annual rainfall of less than 18 inches compared with 29 inches for North America and 26 inches for the total land areas of the world. Evaporation and transpiration consume 90% of t rainfall, compared to 70% for the U.S. There is paucity of reliable fresh water supplies bo because of the low average rainfall and because the absence of any high mountain ranges. T Snowy Mountains, located in the southeaste part of the country, are the nation's highest la mass. From this region 2 important river syste arise. The Murray and Murrumbidgee Rivers flo westward through thousands of sq km of dry b fertile alluvial plains while the Snowy River flo to waste across the well-watered coastal strip. T Snowy Mountains Scheme is designed to trap t unused waters of the Snowy River and its tribu ries and to divert them to the Murray and Murru bidgee Rivers to augment agricultural and pasto production. The project should result in bringi over 1000 sq mi of arid lands into agricultu production and producing 3.75 million kw much-needed peak load power. Power sales sa irrigation water revenues must bear the econon burden of the Scheme. Engineering and ecologi problems of the Scheme are treated with so detail as well as the methods devised in handlin large work force including many foreign scienti and technicians. (Casey-Arizona)
W72-12824

TORDON: A NEW BRUSH HERBICIDE,
N. Spray.
The Cattleman, Vol 57, No 10, p 42,54, Mar 1971. 1 fig.

Descriptors: *Brush control, *Weed contr *Costs, *Herbicides, *Weeds, Mesquite, 2-4-5 Texas, Rates of application.
Identifiers: Lotebush, Prickly pear.

Tordon, a new brush herbicide, controls mesqu and other brush. It will kill at least twice as mu brush as 2,4,5-T, the most commonly used her cide in brush control. Several thousand acres Texas brush have been sprayed by Tordon (sor times called Picloram) at application rates of quart (half pound) per acre in West Texas a twice that in South Texas at costs from $5 to $ an acre. In West Texas, Tordon killed 42 perc of mesquite, compared to 22 percent kill usi 2,4,5-T. Tordon increased the kill of lotebu prickly pear and annual broomweed. In South T as, Tordon killed 24 to 25 percent of the mesqu at half and full concentrations. At other Sou Texas sites, Tordon at one-pound per acre kil 74, 68, 68, 61, 35, 34 percent of the mesqu prickly pear, black brush, granjeno, lime pric ash and white brush respectively. The new he cide is welcomed to areas in Texas threatened vi business failure because of brush. (Pop Arizona)
W72-12848

PROBLEMS OF FORESTRY AND IMPRO MENT OF AGRICULTURE BY FORESTR MEASURES. THE REPUBLIC 2ND C FERENCE OF YOUNG SCIENTISTS AND PO GRADUATES. SYNOPSES OF REPORTS.

Kharkov. 1969. 200 p. Illus.
Identifiers: *Forest management, *Fores Agriculture, Pest control, Forests, Regenerati Plant growth, Industries.

The following problems are discussed: fo typology and characteristics of growth of i dividual stands and their productivity; introc tion, selection and grafting of tree species; fo growth conditions of individual regions, variation in stands of different composition cording to management measures; natural and tificial regeneration; forest seed study; effect the field productive belts on erosion processe cluding mechanization of forest cultivation. pests and control measures and application of bicides in coniferous broadleaved young st are described.--Copyright 1972, Biological stracts, Inc.

/72-12912

OG FORESTS AND THEIR AMELIORATION,
..P. Smolyak.
Jauka i tekhnika: Minsk. 1969. 209p. Illus. Pr. 82 opecks.
dentifiers: Amelioration, *Bogs, *Forests, Nutrion, Soils, USSR.

general characterization and classification is iven of forests growing on bogs and bogged areas f Belorussia, as well as their structure and roductivity in relation to the degree of moistening nd the fluctuation of the groundwater level. roblems concerning both the soil nutrition and ie hydrological regime of forests on bogs are elucidated. The biological basis of amelioration of og forests is expounded; norms are established r draining according to bog type and category, as ell as the order of priority and amelioration ethods. Recommendations are given for designg amelioration projects.--Copyright 1972, iological Abstracts, Inc.
/72-12918

RAINING OF YOUNG AND MIDDLE-AGED INE FORESTS IN MOIST, FAIRLY INFERILE PINE SITES OF THE POLESIE IN THE KRAINIAN SSR,
.I. Mikhovich and A. S. Ryabukha.
esovod Agrolesomelior Resp Mezhved Temat auchn Sb. 16. p 41-54. 1969.
lentifiers: *Drainage effects, *Pine trees, orests, Plant growth, Ukrainian SSR, Crop sponse.

he effects of 70-yr draining amelioration on the crease of wood standing volume, increment, and se of site class are presented. The growth period stands after draining was 43-55 yr; stand site-ass draining rose in strips not over 150 m away om the drainage channels. Pine forests on moist tes should be drained as much as possible.--opyright 1972, Biological Abstracts, Inc.
'72-12920

MPROVING THE PRODUCTIVITY AND THE ESISTANCE OF FOREST PLANTATIONS OF HE DON AND NORTHERN CAUCASUS TEPPE ZONES, (IN RUSSIAN).

ovocherkassk. Inzh. Melior. Inst. 1969. 291 p.
entifiers: Caucasus, Don, Fertility, *Forests, ant growth, Plantations, Productivity, Reistance, *Shelterbelts, Soils, Steppes, Trees, SSR.

ie problems of shelterbelt afforestation in the ppe regions of the northern Caucasus and the wer Don are examined. The effectiveness of elterbelts particularly on steep slopes and on nds is shown. Data are given on the formation d growth of stands and on their effect on the fer-ity of soils. The cultivation of fruit and nut trees d the problems of green plantings are scussed.--Copyright 1972, Biological Abstracts,
72-13018

SICCATION OF ROBINIA PSEUDOACACIA RAVINE AND GULLY PLANTATIONS IN IE STEPPE,
A. Lokhmatov.
sovod Agrolesomelior Resp Mezhved Temat uchn Sb. 16. p 120-129. 1969.
ntifiers: Cattle, Deficiency, *Desiccation, razing, Gully, Moisture, Plantations, Ravine, obinia-Pseudoacacia-D, Steppe, USSR.

siccation was connected with moisture defiicy in the second half of the growth season in years, disturbance of the stand due to grazing tle, and deterioration of the forest environment. ensification of shoot formation and replacement of the desiccated part of the crown is possible only with sufficient moisture. Selection fellings do not provide for the preservation and sanitation of desiccating plantations. Clearcutting in the fall and cutting the stump low are necessary.--Copyright 1972, Biological Abstracts, Inc.
W72-13020

THE ECONOMIC AND ECOLOGIC ROLE OF GRASSLANDS IN POLAND,
Polish Academy of Sciences, Warsaw. Inst. on Agricultural and Forestry Economics.
J. Pronczuk.
Postepy Nauk Roln. 2. p 27-38. 1971. Illus.
Identifiers: Ecology, Economics, *Grasslands, *Poland.

Grasslands occupy some 1/7 of the geographical area of Poland. Permanent grasslands influence water retention, regulate flood water, protect slopes and influence development of the flora and fauna settled in a given grassland environment. More than 60% of cattle feed is derived from grasslands which likewise cover some 14% of the feed unit requirements of all domestic animals in the country. Yields of grasslands in Poland are low and consequently they are not fully utilized. It is of urgent importance to pay more attention to the management of permanent grasslands in Poland.--Copyright 1972, Biological Abstracts, Inc.
W72-13024

4B. Groundwater Management

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE, PHASE II,
Oklahoma Univ. Research Inst., Norman.
J. F. Harp, and J. G. Laguros.
Available from the National Technical Information Service as PB-211 278, $3.00 in paper copy, $0.95 in microfiche. June 1972. 33 p, 4 fig, 6 tab. OWRR A-039-OKLA (1).

Descriptors: Aquifers, *Groundwater recharge, *Artificial recharge, *Oklahoma, *Kansas, *Well data, Pumping, *Regression analysis, Permeability, Rainfall, *Observation wells, Water table, Withdrawals.
Identifiers: *Dimensionless parameters, *Aquifer models.

The method of coefficients has been used to predict groundwater recharge for several years. A new approach was attempted using a 'dimensionless parameter' concept to relate recharge to other known parameters, i.e., pumpage, permeability, rainfall, recharge area, etc. Data from a total of fifteen observation wells from two locations in Oklahoma and two locations in Kansas were used. The high-use municipal wells in southwestern Oklahoma show periodic 'mining' which can be avoided if pumpage rates are modified. The wells in Kansas are located very far from other pumping locations thus rendering the recharge area excessively large. Regression analysis was performed encompassing recharge periods of one month, six months, and twelve months. The resulting linear equations are multiterm, wherein positive coefficients imply no overuse while negative coefficients substantiate 'water mining,' and these equations predict groundwater recharge rates more accurately than heretofore.
W72-12389

GOALS, POLICIES AND MANAGEMENT OF WATER RESOURCES IN THE RIO GRANDE VALLEY, (APJ-1).
Herkenhoff (Gordon) and Associates, Albuquerque, N. Mex.

Middle Rio Grande Council of Governments of New Mexico, Albuquerque, New Mexico, January 1971. 70 p, 11 fig, 12 ref. HUD, New Mexico P-75.

Descriptors: *Water conservation, *Water management (Applied), *Water resources development, *Rio Grande River, *Water policy, *Regional analysis, Water supply, Water distribution (Applied), Planning, Storage, New Mexico, Water utilization, Water treatment, Pumps, Water rights, Water law, Comprehensive planning, Urbanization.

General guidelines are established for the development and management of water resources and the provision of water services within the entire Rio Grande Valley area, known as the APJ-1 area. A basis is provided for certification and showing eligibility for federal assistance to local governmental agencies in their development of needed water utility systems. Part I presents the adopted goals for water conservation and use within the region, defines the role of local governments in the development and operation of water services, and summarizes the general content of the technical report. Part II, presents and identifies all factors which must be considered in developing water systems or expanding existing systems. The purpose of this area-wide plan is to provide management guidelines to insure compatability concerning local plans and programs related to development of municipal-type water resources. (Poertner)
W72-12398

AVAILABILITY OF WATER IN KALAMAZOO COUNTY, SOUTHWESTERN MICHIGAN,
Geological Survey, Washington, D.C.
W. B. Allen, J. B. Miller, and W. W. Wood.
Available from the GPO, Wash. DC, 20402-Price $6.25. Geological Survey Water-Supply Paper 1973, 1972. 129 p, 36 fig, 9 plate, 16 tab, 34 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Michigan, Watershed management, Water yield, Water quality, Aquifer characteristics, Hydrologic data, Water utilization, Hydrologic cycle, Precipitation (Atmospheric), Runoff, Streamflow, Flow rates, Water levels, Water storage, Water wells, Water analysis, Pumping, Groundwater recharge, Maps, Hydrographs, Model studies, Forecasting.
Identifiers: *Kalamazoo (Mich).

Water facts are appraised that aid in planning the orderly development of the water resources of Kalamazoo County, Michigan, and serve as a guide for management. The report defines the relationship between surface and sub-surface water units and maps variations in water-yielding characteristics of principal groundwater units. The availability of water in streams, the location of surface-storage sites, and the use of storage to augment streamflow are described. Average annual recharge was determined by means of water budgets utilizing precipitation, temperature, streamflow and water level data. The physical and chemical quality of ground and surface water are related to water use. Present and potential development of the principal subsurface reservoirs and existing pumping centers are described using mathematical models. Areas favorable for development of additional centers of pumping and their practical limits of development are defined. Problems may arise with excessive subsurface reservoir development. These problems include changes in streamflow, the need for artificial recharge ponds, and deteriorating water quality. (Woodard-USGS)
W72-12408

ABNORMAL PRESSURES AND POTENTIAL GEOTHERMAL RESOURCES IN THE RIO GRANDE EMBAYMENT OF TEXAS,
Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 02L.
W72-12410

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN MARSHALL COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, S. Dak.
N. C. Koch.
South Dakota Geological Survey Information Pamphlet No 1, 1972. 9 p, 3 fig, 1 tab.

Descriptors: *Groundwater resources, *Aquifers, *Water wells, *Water yield, *South Dakota, Water quality, Hydrogeology, Aquifer characteristics, Well data, Water properties, Water analysis, Hydrologic data.
Identifiers: *Marshall County (S Dak).

Three major glacial aquifers, the Veblen, James, and Coteau-Lakes aquifers, are in Marshall County, South Dakota. The Veblen aquifer underlies an area of about 24 square miles in the northeastern section and yields as much as 500 gpm to wells at depths ranging from 130 to 180 feet. The James aquifer is in the north-central section and yields as much as 500 gpm to properly constructed wells. The Coteau-Lakes aquifer is in the southeastern part of the county. It occurs at or near land surface and is hydraulically connected with the waters in Buffalo, Red Iron and Clear Lakes. Water in the aquifer may be under water-table or artesian conditions, and water levels range from that of the lake levels to 40 feet below land surface. The Dakota sandstone aquifer underlies all of Marshall County at depths ranging from 900 feet ot 1,500 feet. Water in the aquifer occurs under artesian conditions. Yields of up to 200 gpm may be obtained from properly constructed wells. (Woodard-USGS)
W72-12412

LIQUID-WASTE DISPOSAL AT THE LINFIELD DISPOSAL SITE, DALLAS, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05B.
W72-12414

MISSOURI, LAND OF WATER,
For primary bibliographic entry see Field 03E.
W72-12418

HYDRAULIC TESTING OF HOLE UA-1-HTH-1, AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 08B.
W72-12421

GROUNDWATER LEVELS IN NEBRASKA--1971,
Geological Survey, Lincoln, Nebr.
C. F. Keech.
Nebraska Water Survey Paper, No 33, May 1972. 90 p, 10 fig, 1 tab, 18 ref.

Descriptors: *Water wells, *Groundwater resources, *Water level fluctuations, *Nebraska, Basic data collections, Hydrographs, Water supply, Irrigation water, Water levels, Water table, Observation wells.

During 1971, installation of irrigation wells in Nebraska increased by 1,952 for a total of 37,244 wells. Holt County, with 82 new wells, led other counties, and Custer and Merrick Counties had 78 well installations each. Adams, Chase, Clay, Hamilton, Hall, Buffalo, Platte, Phelps, Kearney, and Logan Counties increased their number of wells by 50 or more. A little more than four-fifths of the urban water supplies, all the domestic supplies is rural areas, and most livestock supplies are obtained from wells. Also, several public institutions and industrial and commercial firms are self-supplied with water from wells. Average water levels in the fall of 1971 were lower than those in the fall of 1970 in 64 of the 93 counties in the State. The most significant declines occurred in the Big Blue River basin where groundwater was heavily pumped for irrigation. Declines averaged 1.41 feet in Adams County, 1.61 feet in Clay County, 1.82 feet in York County, 1.32 feet in Polk County, 1.39 feet in Seward County, and 1.42 feet in Thayer County. Water-level data from observation wells are presented in tables and hydrographs. (Woodard-USGS)
W72-12433

FORMATION AND DISTRIBUTION OF NATURAL FRESH GROUNDWATER RESOURCES ON THE ASIAN MAINLAND (O FORMIROVANII I RASPREDELENII YESTESTVENNYKH RESURSOV PRESNYKH PODZEMNYKH VOD AZIATSKOGO MATERIKA),
For primary bibliographic entry see Field 02F.
W72-12443

UTILIZATION OF HOT GROUNDWATER IN ELMORE AND OWYHEE COUNTIES, IDAHO,
Idaho Dept. of Water Administration, Boise.
For primary bibliographic entry see Field 05D.
W72-12470

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT JULY-DECEMBER 1970,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-12481

THE LOCAL INSTITUTION FOR GROUNDWATER BASIN MANAGEMENT--A REPORT TO THE NATIONAL WATER COMMISSION,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
F. A. Rayner.
The Cross Section, Vol 17, No 10, p 3, October 1971. 1 ref.

Descriptors: *Groundwater basins, *Water management (Applied), *Water resources development, *Groundwater mining, *Water pollution, Governments, Groundwater movement, Water wells, Regulation, Water control, Benefits, Water costs, Income, Budgeting, Groundwater resources, Human resources, National Water Commission, Texas.
Identifiers: High Plains Underground Water Conservation District No. 1 (Texas).

The public in recent years has gained a general understanding of the importance of groundwater and its problems of development, depletion and contamination, though appreciation of the mechanics and management of groundwater is generally lacking. Groundwater basin management is the regulation of water wells by owners, and is a people management problem not solved by government. Management by local government has the following benefits: (1) controlling agency overlies the local regimen, (2) local government is more directly answerable to groundwater users, (3) direct benefactors of management pay the governmental costs, (4) local governmental costs are small, and (5) there are existing governmental frameworks to facilitate local management. Limited income and nearly unlimited responsibilities are major problems of local control. Periodic public review of local management funding and policy give the groundwater users ultimate control over the water resource. The High Plains Underground Water Conservation District No. 1, operating in West Texas, is used as a model for local groundwater management. (Popkin-Arizona)
W72-12502

THE ANNUAL WATER STATEMENT, 1971--1972,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
D. D. Smith.
The Cross Section, Vol 18, No 4, p 1-8, April 197
16 tab, 16 fig.

Descriptors: *Water wells, *Water levels, *Wat
level fluctuations, *Observation wells, *Groun
water mining, Measurement, Texas, Statistic
methods, Locating, Mapping, Groundwat
resources, Economics, Rainfall.
Identifiers: Texas High Plains.

Presented are tables of water-level measuremen
made by the Texas Water Development Board
January 1972, in 756 observation wells in t
Texas High Plains. Statistical tables and locati
maps are presented for the wells. Tables inclu
depth to water, water-level fluctuation during t
past year, average annual decline during the 196
72 period, and the standard deviation of all me
surements. These data will be used in computi
the depletion allowance given by the Intern
Revenue Service. Measurement validity
discussed. Only one county of the 15 report
showed a net rise in water table. Heavy rainfall
the late 1971 growing season reduced over
pumpage and allowed for recovery of the cone
depression around pumped wells. Average dep
of water for 1962 and 1972 ranged from 67 to 2
feet and from 86 to 243 feet respectively. (Popk
Arizona)
W72-12503

WATER IMPORT STUDIES,
High Plains Underground Water Conservati
District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04A.
W72-12511

**WATER CONSERVATION SYSTEMS ON I
CREASE,**
High Plains Underground Water Conservati
District No 1, Lubbock, Tex.
A. W. Sechrist.
The Cross Section, Vol 17, No 8, p 2-3, Augu
1971. 3 fig.

Descriptors: *Water conservation, *Irrigati
practices, *Tailwater, *Playas, Irrigation wat
Groundwater mining, Water resources devel
ment, Water management (Applied), Surve
Surface water, Water demand, Groundwat
Economics, Agriculture, Farm practices.
Identifiers: *Texas High Plains, Ogallala aquife

Irrigators in the Texas High Plains are becom
more aware of the use and depletion of the
derground water resources in the Ogallala aqu
according to surveys conducted in 1968 and 19
Tailwater return pits and playa lake modificati
installations increased by 105 and 47 respectiv
between these years within one county alone. S
face water is being conserved to reduce pump
demands on groundwater. As much as one-fifth
irrigation water can be saved by using a tailwa
return system. This can extend the life of t
aquifer for many years. The economy of the Hi
Plains is based on irrigation agriculture. W
conservation policy in the area makes good l
management. Figures show location of recov
and lake modifications in Parmer County, a c
structed tailwater return system and a playa l
modification installation. (Popkin-Arizona)
W72-12512

WELL LOCATION MEASUREMENTS,
High Plains Underground Water District No
Lubbock, Tex.
A. W. Sechrist.
The Cross Section, Vol 18, No 5, p 1 and 3, M
1972. 2 fig.

Descriptors: *Locating, *Well permits, *Irrigati
wells, *Well regulations, *Legal aspects, Si
Well data, Texas, Groundwater, Water manag
ment (Applied), Roads.

ntifiers: Texas High Plains, High Plains Un-
ground Water Conservation District No 1 (Tex-

e correct legal description of property and well
ation are required for a permit to drill a well in
High Plains Underground Water Conservation
trict No. 1. Measurement requirements are
ined. Location to existing roads, section lines
nearby existing wells are discussed in terms of
proposed well site. Well location is important
naging the limited groundwater resources of
Texas High Plains. Two figures show township
ge location and location of well from the center
of a road. (Popkin-Arizona)
2-12516

TER SUPPLY SYSTEM STUDIED,
as Tech Univ., Lubbock. Water Resources
ter.
. Baker, and S. Rae.
Cross Section, Vol 18, No 5, p 4, May 1972. 2

criptors: *Mills, *Water supply, *Documenta-
, *History, *Water wells, Engineering struc-
s, Sites, Southwest U.S., Water resources
elopment, Railroads, Boilers, Cattle, Texas,
undwater.

Historic American Engineering Record, De-
tment of the Interior, records and documents
ificant engineering achievements. About 50
s are being studied in the Southwest. The wind-
was one of the most important engineering
ievements which influenced the development
West Texas. Windmills, often 50 to 100 feet in
neter, were used in Europe since before the
century. The first remarkable American wind-
was built by Connecticut mechanic Daniel
laday in 1854. Windmills came to west Texas in
with the railroads to provide a dependable
ply of good quality water for steam locomotive
ers. The Dixie Ranch in Lubbock County was
first to use windmills on the Texas High Plains
884, where 6 mills were installed for watering
le. Two photographs show one of the few
aining Eclipse Windmills with a 22 1/2 foot
neter. (Popkin-Arizona)
2-12517

VEY OF WESTERN STATES' UN-
GROUND WATER MANAGEMENT PROVI-
NS,
as Tech Univ., Lubbock. School of Law.
primary bibliographic entry see Field 06E.
-12529

IGATION AIDS TO STABILIZE ECONOMY,
Plains Underground Water Conservation
rict No. 1, Lubbock, Tex.
ymour.
Cross Section, Vol 17, No 7, p 4, July 1971. 1

criptors: Economics, *Irrigation practices,
p production, *Feed lots, *Texas, Droughts,
ndwater, Agriculture, Stability, Transporta-

tifiers: Texas High Plains.

ation agriculture is the basic economy in the
is High Plains. Drought in the Summer of 1971
ed nearly continuous pumping of the ground
r supply. High crop yields are due to irrigation
rdless of drought. Irrigation practices stabilize
gricultural economy, without reducing trans-
ation and other related needs. This stability is
cted in stabilizing related industries, such as
e feeding. Feedlots are an industry developing
nd the stable irrigation economy. (Popkin-
ona)
-12530

A DEVICE FOR REMOVING WATER OR MUD FROM SHALLOW WATER WELLS (USTROYSTVO DLYA UDALENIYA VODY ILI PUL'PY IZ NEGLUBOKIKH GRUNTOVYKH SKVAZHIN),
E. Ya. Balsar.
Pochvovedeniye, No 11, p 165, November 1971. 1 fig.

Descriptors: *Instrumentation, *Analytical techniques, *Wells, *Water sampling, *Mud, Depth, Investigations.
Identifiers: *USSR, *Latvian SSR.

A device used at the Latvian Scientific Research Institute of Forest Management to remove water, mud, or cuttings from wells is described. The device is a graduated cylinder equipped with an inverted elastic funnel valve at the bottom. The cylinder is lowered into the well to the desired depth, permitting free entry of water. The funnel valve is pulled up tightly against the bottom, sealing the cylinder, after which the device containing the sample is withdrawn with a minimum of disturbance. The device can be used to obtain water samples at various depths for soil and groundwater investigations. (Josefson-USGS)
W72-12689

APPLICATION OF ARTIFICIAL RECHARGE TECHNOLOGY FOR MANAGING THE WATER RESOURCES - ANCHORAGE, ALASKA,
Alaska Univ., College. Inst of Water Resources.
G. L. Guymon.
Available from the National Technical Information Service as PB-211 331, $3.00 in paper copy, $0.95 in microfiche. Institute of Water Resources, University of Alaska Report No. IWR-24, June 1972. 40 p, 7 fig, 40 ref. OWRR B-006-ALAS (1).

Descriptors: *Induced infiltration, *Groundwater recharge, *Water spreading, *Water management (Applied), Aquifers, Groundwater basins, Heat flow, Temperature control, *Alaska, *Artificial recharge.
Identifiers: *Anchorage (Alas).

In spite of an abundant water resource in Alaska, water supply shortages exist in many communities primarily because of quality consideration. Water temperatures are particularly important because of distribution costs and problems associated with low ambient winter temperatures. As a result there are management needs for water resources in Anchorage, Alaska. Past and current knowledge related to artificial recharge is examined in relation to increasing water table elevation and temperatures of the groundwaters underlying Anchorage, Alaska. Long term infiltration processes are considered from the standpoint of the design and operation of off-stream artificial recharge basins. Significantly the geometry of recharge ponds is related to the temporal infiltration relationship. Because of a noticeable lack of knowledge, it is difficult to determine aquifer response resulting from artificial recharge. The damped character of groundwater basins seems to preclude warming of groundwaters by selective recharge of warm summer stream flows.
W72-12707

GROUND-WATER POLLUTION IN MICHIGAN,
Michigan State Geological Survey, Lansing. Dept. of Conservation.
For primary bibliographic entry see Field 05B.
W72-12797

UNDERGROUND WASTE DISPOSAL,
Underground Surveys, Inc., Rockford, Ill.
For primary bibliographic entry see Field 05D.
W72-12802

UNDERGROUND WASTE DISPOSAL AND CONTROL.
American Water Works Association, New York. Committee on Underground Waste Disposal and Control.
For primary bibliographic entry see Field 05B.
W72-12804

ROLE OF GROUND WATER CONTAMINATION IN WATER MANAGEMENT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 05B.
W72-12807

GROUNDWATER IN THE SANTA CRUZ VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. G. Matlock, and P. R. Davis.
Arizona Agricultural Experiment Station, Technical Bulletin 194, April 1972. 37 p, 17 fig, 7 tab, 9 ref.

Descriptors: *Groundwater resources, *Groundwater mining, *Groundwater recharge, *Specific yield, *Arizona, Water sources, Water levels, Withdrawal, Hydrographs.
Identifiers: Santa Cruz Valley (Arizona).

New information is provided for water users and planners of groundwater, the only dependable water source in the Santa Cruz Valley, Arizona. Groundwater levels continued to decline as much as 50 feet during the 1965-70 period as a result of water use in excess of natural replenishment. Recharging streamflow along ephemeral channels lessens the decline and in some areas causes a rise in water levels. Declines of more than 125 feet since 1947 have occurred. Depth to water in 1970 ranged from less than 10 feet along some channels to over 600 feet near the mountains. Total 5-year pumpage averaged 187,000 acre-feet per year. A specific yield of 0.12 and an average recharge rate of 55,000 acre-feet are estimated. Location maps, well hydrographs, water level maps, and a graph of specific yield versus recharge are included with water-level tables. (Popkin-Arizona)
W72-12850

SUBIRRIGATION--A COMING INNOVATION.
For primary bibliographic entry see Field 03F.
W72-12859

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1971.
Geological Survey, San Antonio, Tex.

Edwards Underground Water District Bulletin 29, June 1972. 8 p, 1 tab, 11 ref.

Descriptors: *Groundwater resources, *Water wells, *Withdrawal, *Water utilization, *Texas, Groundwater movement, Aquifers, Limestones, Pumping, Discharge (Water), Water yield, Springs, Water supply, Hydrologic data, Data collections, Groundwater recharge, Rainfall.
Identifiers: San Antionio Area (Tex).

The estimated total well and spring discharge from the Edwards and associated limestones in the San Antonio, Texas, area during 1971 was 679,500 acre-feet, about 7% less than 1970. The total discharge was 26% greater than the average for 1934-70. About 60% of the total discharge came from wells, and approximately two-thirds of this discharge was from wells in Bexar County. Well discharge in 1971 was 24% greater than in 1970, while springflow decreased by about 30%. Deficient rainfall during the spring and early summer of 1971 was mainly responsible for the increased demand for water from wells and the decrease in the discharge of the springs. (Woodard-USGS)
W72-12863

SUBSURFACE HYDROLOGY AT WASTE DISPOSAL SITES,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 05B.
W72-12864

GROUND WATER IN THE TORTUGUERO AREA, PUERTO RICO AS RELATED TO PROPOSED HARBOR CONSTRUCTION,
Geological Survey of Puerto Rico, San Juan.
G. D. Bennett, and E. V. Giusti.
Commonwealth of Puerto Rico Water-Resources Bulletin 10, 1972. 25 p, 6 fig, 13 ref.

Descriptors: *Groundwater resources, *Water quality, *Construction, *Harbors, *Puerto Rico, Environmental effects, Aquifer characteristics, Forecasting, Saline water intrusion, Model studies, Planning.
Identifiers: *Tortuguero (P.R.), Proposed harbor, Construction effects.

The Aymamon Limestone of northern Puerto Rico, together with the overlying blanket deposits, forms an important water-table aquifer. At present its use is small, but its potential for development is great. Regional groundwater flow is toward the north, with discharge into coastal swamps and lagoons and also directly into the sea. The discharge occurs both through springs and through areal seepage. The flow is on the order of 7 cubic feet per second per east-west mile of aquifer. Construction of a harbor in a part of Laguna Tortuguero would provide a new avenue of discharge for part of the regional groundwater flow, but would not appreciably alter the amount of flow. Pumpage of groundwater can theoretically be increased to 70% or 80% of the regional flow, provided some control is exercised over the location, depth, and pumping rate of wells. Development of the aquifer to this degree would cause Laguna Tortuguero to become salty even if the harbor were not constructed. If the harbor is constructed, groundwater quality can be protected by diverting fresh water into the parts of the lagoon beyond the harbor levees. If the harbor is not constructed, water quality in the lagoon can possibly be protected against the effects of pumpage by the same method. (Woodard-USGS)
W72-12883

GROUND WATER ALONG RIO BUCANO AT PONCE, PUERTO RICO AND THE EFFECTS OF A PROPOSED FLOODWAY ON GROUND-WATER QUALITY,
Geological Survey of Puerto Rico, San Juan.
G. D. Bennett.
Commonwealth of Puerto Rico Water-Resources Bulletin 11, 1972. 28 p, 10 fig, 2 tab, 6 ref.

Descriptors: *Groundwater resources, *Construction, *environmental effects, *Water quality, *Puerto Rico, Floodways, Aquifer characteristics, Saline water intrustion, Model studies, Forecasting, Planning.
Identifiers: *Ponce (P.R.), Proposed floodways, Construction effects.

The coastal alluvium in the vicinity of the Rio Bucana, on the south coast of Puerto Rico, is an anisotropic water-table aquifer which is heavily utilized for irrigation and other purposes. The rate of both recharge due to irrigation and of withdrawal by pumping are much greater than the rate of lateral groundwater movement through the aquifer. A disruption in the balance between these factors could cause influx of sea water and the gradual development of water-quality problems. A proposed floodway channel on the Rios Bucana and Portugues will, in itself, have relatively minor effects on the groundwater system. A general increase in groundwater utilization or a decrease in irrigation recharge would cause seepage of saline water from the proposed channel; but these developments also would induce inflow of salt water from the sea, or from the mangrove swamps, regardless of the construction of the floodway. A proposed fabric dam in the floodway channel would produce a small increase in recharge to the aquifer, sufficient to balance any increase in drainage that might occur due to the lowering of the channel bed near the sea. (Woodard-USGS)
W72-12884

CONCENTRATION GRADIENTS IN AQUIFERS, PHASE II,
Tulsa Univ., Okla.
For primary bibliographic entry see Field 02F.
W72-12952

4C. Effects on Water of Man's Non-Water Activities

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W72-12430

EFFECTS OF FOREST COVER ON WATER REGIME OF SOME MOUNTAIN RIVERS IN THE SOUTH GEORGIAN UPLANDS (O VLIYANII LESA NA REZHIM NEKOTORYKH GORNYKH REK YUZHNO-GRUZINSKOGO NAGOR'YA),
Zakavkazskii Nauchno-Issledovatelskiy. Gidrometeorologicheskiy Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12438

THE EFFECT OF FORESTS ON THE WATER BALANCE OF DRAINAGE BASINS,
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
I. S. Shpak.
Available from NTIS, Springfield, Va. 22151 as TT70-50172; Price $3.00 paper copy. Israel Program for Scientific Translations, Jerusalem, 1971. 258 p. (TT 70-50172, Originally published by Naukova Dumka, Kiev, 1968.)

Descriptors: *Forests, *Forest watersheds, *Forest soils, *Vegetation effects, *Water balance, Hydrologic aspects, Hydrologic budget, Precipitation (Atmospheric), Snow cover, Surface runoff, Evaporation, Soil water, Soil moisture, Moisture content, Groundwater, Groundwater recharge, Soil physical properties, Geomorphology, Meteorology, Analytical techniques.
Identifiers: *USSR, *Ukraine, *Forest hydrology, Soil hydrology, Water-balance method, Tretyakov precipitation gages.

Water-balance investigations were carried out in 1958-66 by the Ukrainian Hydrometeorological Scientific Research Institute at the Desna, Velikii-Anadol, and Transcarpathian runoff stations in the Ukraine. Principles of soil hydrology and sources of groundwater recharge are examined in conjunction with the climatic and physiographic characteristics of drainage basins. Special consideration is given to methods for measuring various items in the water balance. The hydrological role of the forest is evaluated in terms of its effect on precipitation, snow cover, surface runoff, soil hydrophysical properties and moisture content, evaporation, and groundwater. A critical examination of the literature on forest influences will provide data for formulating conclusions on the significance of forest vegetation in the regulation of streamflow and in influencing other watershed values. (Josefson-USGS)
W72-12442

INFILTRATION AND EROSION STUDIES ON PINYON-JUNIPER CONVERSION SITES IN SOUTHERN UTAH,
Utah State Univ., Logan. Dept. of Range Scienc
For primary bibliographic entry see Field 04D.
W72-12531

GRAZING EFFECTS ON RUNOFF AND VEGETATION ON WESTERN SOUTH DAKOTA RANGELAND,
Agricultural Research Service, Newell, S. D. Soil and Water Conservation Research Div.
C. L. Hanson, A. R. Kuhlman, C. J. Erickson, and J. K. Lewis.
Journal of Range Management, Vol 23, No 6, p 418-420, November 1970. 3 tab, 2 fig, 7 ref.

Descriptors: *Grazing, *Storm runoff, *Vegetation effects, *Range management, *Pasture management, Effects, *South Dakota, Crop production, Watershed management, Precipitation, Temperature, Soil-water-plant relationships, Cattle, Forage grasses, Range grasses, Dikes, Drainage practices, Flumes, Raingages, Harvesting, Surveys, Chestnut soils, Analysis, Average, Statistical methods, Storms, Arid lands.
Identifiers: Turkey's test, Semi-arid lands.

The need for increased rangeland production requires knowledge of how watersheds function under various grazing intensities. This study investigates grazing effects on runoff and vegetation on four 2-acre watersheds on each of the pastures grazed at three intensities from 1940 to 1962. The watersheds are at the Cottonwood Range Field Station, South Dakota, where mean annual precipitation is about 15 inches and average annual temperature is about 47 degrees F. Chestnut soils and short and midgrasses abound. Confining dikes establish drainage areas, and flumes and rain gages measure runoff and precipitation. Vegetation samples were harvested from 10 transects. Variance was analyzed and means were separated by Turkey's test. Runoff data follow a log-normal distribution. Average seasonal runoff was 0.79, 0.56 and 0.42 inches from heavy, moderately and lightly grazed watersheds. Runoff from long-duration storms might be the same on all the watersheds if storms follow wet periods. Mean weight of live and dead standing vegetation in late July was 1,752, 2,092 and 3,700 pounds per acre for heavily, moderately and lightly grazed watersheds. (Popkin-Arizona)
W72-12536

SUBDIVISION PLANNING THROUGH WATER REGULATION IN NEW MEXICO,
New Mexico Univ., Albuquerque. Coll. of Law
C. J. Noya, and T. B. Stribling.
Natural Resources Journal, Vol 12, No 2, p 285-297, April 1972. 25 ref.

Descriptors: *Domestic water, *New Mexico, *Water law, *Legislation, *Water resource development, Arid lands, Human populations, Water supply, Recreation demand, Water pollution, Septic tanks, Land use.

The state of New Mexico has carefully managed its water resources but land developers are using a new population to migrate into the Southwest and, with New Mexico's diminishing water supplies, there will not be enough water to supply future subdivision needs. New Mexico's water is fully allocated already. However, a review of the state water resources indicated that not all the resources have been developed. Adding to the water shortage problem is greatly increased recreational usage springing from increase in population, urbanization, income, leisure, and improved transportation networks. Competition from this source may greatly decrease supplies of water available for subdivisions. Finally, the septic tanks of the new developments are becoming more of a danger to domestic water supplies. It is felt that if unregulated growth of subdivisions

sponds to the depletion of New Mexico's water sources, then such growth should be regulated th water resources in mind. Current laws are viewed, and recommendations for new legisla- n implementing such regulation are presented. asey-Arizona)
72-12831

BAN WATER PLANNING--A BIBLIOG- APHY.
fice of Water Resources Research, Washington, C. Water Resources Scientific Information nter.
r primary bibliographic entry see Field 06B.
72-12921

D. Watershed Protection

FILTRATION AND EROSION STUDIES ON NYON-JUNIPER CONVERSION SITES IN UTHERN UTAH,
ah State Univ., Logan. Dept. of Range Science.
F. Gifford, G. Williams, and G. B. Coltharp.
rnal of Range Management, Vol 23, No 6, p 2-406, November 1970. 2 fig, 4 tab, 5 ref.

scriptors: *Infiltration, *Erosion, *Pinyon pine es, *Juniper trees, *Watershed management, tations, Range management, Sediment yield, nge grasses, Rainfall simulators, Utah, United tes, Ranges, Biota, Climate, Vegetation.
ntifiers: *Vegetation conversion programs.

rge-scale pinyon-juniper conversion programs the western United States require knowledge ncerning range and watershed values as in- enced by vegetation manipulations. The objec- is to investigate infiltration rates and sediment duction on converted and nearby untreated yon-juniper sites in southern Utah. Infiltration sediment data from small-plot studies using h intensity simulated rainfall indicate that areas ared of pinyon-juniper trees and seeded to grass w no consistent change in sediment yields or ltration rates at given points. Of 14 sites, 4 in- ated decreased infiltration rates; 2 indicated in- ased infiltration during one or more time inter- s at specified points on treated areas; one site significantly less sediment yield; and 2 sites significantly higher sediment yields from the ted areas. Results parallel those obtained from ilar studies in central Utah. Many biotic, phic and climatic variables interact to deter- e infiltration and erosion rates. (Popkin- zona)
2-12531

POSAL FOR A DEMONSTRATION WATER ALITY MANAGEMENT PROGRAM ON THE LSTON RIVER IN EASTERN TENNESSEE,
nell Univ., Ithaca, n.y. Water Resources and ine Sciences Center.
primary bibliographic entry see Field 05G.
-12602

BIDITY AND SUSPENDED-SEDIMENT NSPORT IN THE RUSSIAN RIVER BASIN, IFORNIA,
logical Survey, Menlo Park, Calif.
primary bibliographic entry see Field 02J.
-12704

ROLOGIC PERFORMANCE OF ERODED DS STABILIZED WITH PINE,
st Service (USDA), Oxford, Miss. Southern st Experiment Station.
primary bibliographic entry see Field 04A.
-12815

GULLY FORMATION IN THE LOESSES OF CENTRAL NEBRASKA,
Nebraska Univ., Omaha. Dept. of Geography and Geology.
N. Bariss.
Rocky Mountain Social Science Journal, Vol 8, No 2, p 47-59, October 1971. 11 fig, 1 tab, 17 ref.

Descriptors: *Semiarid climates, *Gully erosion, *Loess, *Geomorphology, *Topography, Gullies, Stabilization, On-site investigations, Land erosion, Channel erosion, *Nebraska.

Although the phenomenon of gullying has received considerable attention in the arid southwest, very little work has been done in the semiarid midwest where gullying is responsible not only for extensive damages in agriculture but also for significant changes in the loess-mantled topography. Using field observations and measurements, topographic maps, comparison of aerial photographs taken in 1936 and 1964, and interviews with various people, gullying was studied in the Broken Bow region of central Nebraska, where loess deposits are up to 80 ft thick. Regions where there was large relative relief between the rim of tablelands and the surrounding lowlands seem to offer the highest potential for gullying. Loess has little resistance to vertical erosion, and this results in high speed gullying to considerable depths. The gullying process seems to follow at least a rough program of development, beginning with an initial unstable preparatory phase, followed by stable phases of channel development. If this is so, then prediction about stabilization might be possible. There is much evidence in the region for the furthering of gullying processes by human land mismanagement. (Casey-Arizona)
W72-12844

WATER EROSION OF SOILS AND ITS CONTROL AT THE CHUVASH AGRICULTURAL EXPERIMENTAL STATION,
A. V. Osanov.
Tr Chuv S-Kh Opyt Stn. 1, p 66-71. 1969.
Identifiers: Agriculture, *Erosion control, Erosion, Hydraulic structures, *Cultivation, Shelterbelts, Soils, USSR, Soil management.

Eroded soils occupy 68.4% of the total arable land (5952.5 ha). Erosion control practices include soil management, suitable culture practices (plowing across slopes, boardless plowing on slopes > 5 deg, terracing, harrowing), hydraulic structures (discharge flumes, weirs, wattle-work dams in gullies), and permeable and semipermeable shelterbelts.--Copyright 1972, Biological Abstracts, Inc.
W72-12909

NITROGEN NUTRITION OF OAK IN EROSION CONTROL STANDS ON SOILS WITH VARYING DEGREES OF EROSION,
V. N. Ugarov.
Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 18. p. 88-94. 1969.
Identifiers: Adsorption, Erosion control, Erosion, *Nitrogen, *Oak D, Quercus robur D, Soils, Nutritional requirements.

With the increase of soil erosion, the total reserves of N in the soil diminish, and the N requirements of oak (Quercus robur) increase. The biological absorption coefficient and the expenditure of N/unit of biomass of the stand also increase. With the increase of the depth of soil bedding with gravel (to 120 cm), stands can be established for growing timber. Increasing the density of oak stands leads to the increase of nutrient expenditure/unit of biomass and timber.--Copyright 1972, Biological Abstracts, Inc.
W72-12919

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

TENNESSEE WATER QUALITY, SURFACE STREAMS.
Tennessee Water Quality Control Board, Nashville.

Tennessee Water Quality Control Board, Nashville, 1972. 102 p, 48 tab.

Descriptors: *Tennessee, *Water quality, *Water sampling, *On-site data collections, *Water analysis, Rivers, Coliforms, Temperature, Turbidity, Streams, Irrigation, Recreation facilities, Fish management, Water pollution effects, Monitoring, Pollutant identification, Analytical techniques.

The major part of the water quality data available from January 1, 1968 to December 31, 1971 are brought together. The data are of benefit in the location of public and industrial water supplies, and the development of recreational facilities, fish management and irrigation. Stream monitoring programs, begun in 1967 and continued through 1968, gave additional information on the quality of surface streams and the effects of sources of pollution. These programs were later discontinued due to increased demands for other types of sampling. Water samples were collected in 250 milliter glass bottles fitted with glass stoppers. Aseptic techniques were followed throughout the sampling and culturing procedures. Determinations were made for coliform bacteria. The membrane filter techniques used were those outlined in the twelfth edition of 'Standard Methods for the Examination of Water and Wastewater'. Samples from stations too far distant from Nashville to permit their return to the laboratory were analyzed using portable incubators. (Poertner)
W72-12400

RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS AND PRECIPITATION COLLECTED IMMEDIATELY BEFORE AND AFTER THE SECOND PRODUCTION-TEST FLARING, PROJECT RULISON,
Geological Survey, Denver, Colo.
H. C. Claassen.
Available from the National Technical Information Service, $3.00 in paper copy, $0.95 in microfiche. Geological Survey Report USGS-474-122 (Rulison-10), 1971. 10 p, 1 fig, 2 tab, 4 ref. AEC AT (29-2)-474.

Descriptors: *Pollutant identification, *Radiochemical analysis, *Nuclear explosions, *Colorado, Oil industry, Streams, Precipitation (Atmospheric), Natural gas, Rock properties, Tritium, Data collections, Water pollution sources, Water analysis.

The U.S. Geological Survey established a water-sampling network in central and western Colorado to sample the hydrologic environment prior to, during, and following the various phases of Project Rulison. Project Rulison is an experiment designed to stimulate production of natural gas by explosion of a nuclear device in the gas-reservoir rock. Data obtained by analysis of samples collected from the network stations are presented. All of the precipitation samples are routinely analyzed for tritium. Stream samples collected at Plateau Creek near Cameo and Colorado River near DeBeque are routinely analyzed for tritium, gross alpha, and gross beta contents. Data are tabulated from samples collected in conjunction with the second production flaring (December 1 to December 20, 1970). The period of observation

was one of undetectable amounts of tritium in precipitation and lower than the first production flaring values for both tritium and gross radioactivity in streams. (Woodard-USGS)
W72-12422

HEAVY METAL CONTENT OF SOME RIVERS AND LAKES IN WALES,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-12425

COMPARISON OF THERMAL DATA FROM AIRBORNE AND VESSEL SURVEYS OF LAKE ERIE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. M. Beeton, J. W. Moffett, and D. C. Parker.
In: Proceedings Twelfth Conference on Great Lakes Research, University of Michigan, Ann Arbor, May 5-7, 1969, p 513-528. 11 fig, 1 tab. 10 ref.

Descriptors: *Thermal pollution, *Remote sensing, *Infrared radiation, *Water temperature, *Lake Erie, Chlorides.
Identifiers: *Airborne surveys, Vessel surveys, *Detroit River, Infrared scanner, Infrared radiometer.

An airborne radiometer and infrared scanners were evaluated for detecting water masses and currents in fresh water. Infrared scanners used indium antimonide and mercury doped germanium detectors which had recording capabilities in the 1.0 to 5.5 micron and 8.5 to 13.5 micron region, respectively. The radiometer also used a mercury doped germanium detector. The scanners were used to make thermal strip maps and the radiometer was used to obtain surface temperatures of the western end of Lake Erie and the lower Detroit River. Simultaneously, surface water temperatures were taken and water samples were collected for chloride determinations from four vessels making a 4 day synoptic survey of the test area. The remote infrared measurements are compared with shipboard temperature data to evaluate their usefulness in demonstrating thermal structure, water masses, and currents in the test area. The distribution of temperatures in the Lake was not as detailed in the imagery as in the data from synoptic sampling from the vessel. (Upadhyaya-Vanderbilt)
W72-12455

A PROGRAM TO ASSESS THE THERMAL DISCHARGE FROM A PLANNED NUCLEAR POWER PLANT ON CAYUGA LAKE,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 05B.
W72-12456

FRESH WATER AND ESTAURINE SPECIFIC GRAVITY DIAGRAMS,
State Univ. Coll., Fredonia, N.Y.
J. A. Jones.
Lake Erie Environmental Studies, Technical Data Report No. 3, February 1970. 10 p, 5 fig, 6 ref.

Descriptors: *Specific gravity, *Dissolved solids, *Lake Erie, Salinity, Density, Winds, Water temperature, Currents (Water), Hydrometers, Conductivity, Sodium chloride, Calcium carbonate, Profiles, Depth, Estuaries, Lakes, *Pollutant identification.
Identifiers: *Pycnocline.

If pollutant concentrations cannot be measured by conductivity methods as in the case of organic pollutants, effluent densities may be readily obtained using a hydrometer. The wide-range diagrams provided may be used in connection with an inexpensive hydrometer in estuarine studies for a rough approximation of salinity at the sampling location. Three first approximation diagrams have been constructed within the ranges of total dissolved substances normally found in fresh waters, saline inland waters, and coastal estuaries. The total dissolved substances in solution may be obtained from the specific conductance of the water sample by the method suggested if conductivity determinations are corrected to 25C. To use the specific gravity diagrams provided, the total dissolved substances are plotted against the water sample temperature for each depth sampled. Four examples have been plotted to illustrate the use of the profiles with data from lakes showing strong gradients in temperature and total dissolved substances. However, with these data a minor error in the determination of temperature or total dissolved substances probably exists. (Osborne-Vanderbilt)
W72-12458

FORECASTING OF THE AIR TEMPERATURE AND HUMIDITY OVER THE WATER SURFACE ON THE BASE MEANS METEOROLOGICAL ELEMENTS FROM LAND STATIONS (PROGNOZOWANIE TEMPERATURY I WILGOTNOSCI POWIETRZA NAD POWIERZCHNIA JEZIORA NA PODS TAWIE WARTOSCI ELEMENTOW METEOROLOGICZNYCH NA LADZIE),
State Inst. of Hydrology and Meteorology, Warsaw (Poland).
E. Kasprzycka.
Prace Panstwowego Instytutu Hydrologiczno-Meteorologicznego, No. 100, p 85-90, 1970. 7 fig, 2 tab, 2 ref.

Descriptors: *Forecasting, *Temperature, Humidity, Cooling, Powerplants, Vapor pressure, On-site investigations, Theoretical analysis, *Air pollution.
Identifiers: *Patnow Lake (Poland), Floating data stations.

Experimental work was started in April 1969 on the transformation of air masses at Patnow Lake which is included in the open cooling cycle of two power stations. Using full meteorological observations made during May 1969, air temperature and water vapor pressure over the Patnow Lake surface were computed theoretically. The values of air temperature and water vapor pressure obtained theoretically were compared to the values obtained experimentally during observations taken on a floating station. (Upadhyaya-Vanderbilt)
W72-12462

METEOROLOGICAL EFFECTS OF THE HEAT AND MOISTURE PRODUCED BY MAN,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna, and S. D. Swisher.
Nuclear Safety, Vol 12, No 2, p 114-122, March-April 1971. 2 tab, 42 ref.

Descriptors: *Weather patterns, *Heat, *Moisture, Cooling towers, Meteorology, Temperature, Precipitation, Powerplants, Kinetic energy, Heat budget, Energy dissipation, Climates, *Air pollution.
Identifiers: Cooling ponds, Plumes.

Weinberg and Hammond calculated that the energy released artificially by man is now equal to 4.9 x 10 to the 19th power erg per sec and will approach a maximum level of about 4 x 10 to the 21st power erg per sec (for 20 billion people). Energy production per unit area for natural and artificial processes is estimated. The flow of heat and moisture involved in cooling heated water from power plants in lakes, in rivers, in the ocean, and at a city's surface has been studied by several investigators and is discussed. The discussion of small-scale effects of waste heat and moisture is limited mainly to cooling-tower plumes. Ten 1000 Mw power plants produce about 10 percent of heat and moisture produced in a large lake-eff storm. This artificial-energy production can fluence clouds, storms, snowfall, and convec activity. Atmospheric processes are now being nificantly influenced on length scales up to ab 20 Km. Needs for future research efforts dea with small, medium, and large scale effects man's activities are emphasized. (Upadhya Vanderbilt)
W72-12464

THE CONTINUOUS DETERMINATION SODIUM IN HIGH PURITY WATER BY USI A SODIUM MONITOR INCORPORATING SODIUM-RESPONSIVE GLASS ELECTROD
Electronic Instruments Ltd., Chertsey (Englan
For primary bibliographic entry see Field 02K.
W72-12482

INTERVAL SCANNING PHOTOMICR RAPHY OF MICROBIAL CELL POPU TIONS,
Pennsylvania State Univ., University Park, D of Microbiology.
For primary bibliographic entry see Field 05B.
W72-12483

INITIAL STUDIES ON THE MICROB BREAKDOWN OF TRIALLATE,
Saskatchewan Univ., S, Regina, Dept. of Biol
For primary bibliographic entry see Field 05B.
W72-12485

COLOR INFRARED (CIR) PHOTOGRAPH TOOL FOR ENVIRONMENTAL ANALYSIS,
Dartmouth Coll., Hanover, N.H. Dept. of Ge raphy.
D. T. Lindgren.
Available from the National Technical Infor tion Service as PB-204 472, $3.00 in paper c $0.95 in microfiche. Final Report, August 1974 p, 8 ref. Contract No. DI-14-08-0001-12958.

Descriptors: *Remote sensing, *Pollutant ide fi cation, Water pollution, *Monitoring, Aeri photography, *Infrared radiation, Water qu Algae, Water quality control, Eutrophica Waste water treatment, Sedimentation rates spills, Water pollution sources.
Identifiers: *Color infrared photography.

The nature of color infrared film (CIR), its bilities and limitations, are described and its po tial as a tool in environmental studies is discu Included is a section on the use of CIR in w quality analysis. The growth of algae is easil tected by this technique, which can be used indicator of undesirable conditions. In treatm facilities, CIR has been used to identify trick filters that are overloaded since they rec greater amounts of infrared than those that operating efficiently. CIR can also be us determine the degree of sedimentation of bod water. For detection of oil spills, CIR ha proven as reliable as other types of film beca its sensitivity to sun angles. Finally, CIR c used for dead-fish counts where some toxic stance has been released in the water. (Morn Battelle)
W72-12487

NUCLEAR TECHNIQUES FOR TRACE EL MENT AND RADIONUCLIDE MEASU MENTS IN NATURAL WATERS,
Battelle Memorial Inst., Richland, Wash. Fift Northwest Labs.
R. W. Perkins, and L. A. Rancitelli.
Available from the National Technical Infor tion Service as BNWL-SA-3993, $3.00 in pa copy, $0.95 in microfiche. Report No. BNWL-SA-3933; July 1971, 31 p. 10 fig, 5 tab.

escriptors: *Trace elements, *Radioisotopes, Water analysis, Pollutant identification, Industri- wastes, Radioactive wastes, Nuclear wastes, idioactivity techniques, Water pollution urces, Neutron activation analysis, Spectrome-, Ion exchange, Chlorine, Bromine, Lead, nc, Manganese, Cobalt, Chromium, Cesium, pper, Iron, Mercury, Potassium, Sodium, Radi- radioisotopes, Radiochemical analysis, Stron- m, Alkaline earth metals, Sodium chloride, lts, Spectrophotometry.
entifiers: Ge (Li) diode, Gamma-ray spec- metry, Selenium, Scandium, Rubidium, romium radioisotopes, Sodium radioisotopes, sium radioisotopes, Chlorine radioisotopes, mple preservation, Aluminum oxide, Antimony, anium, Chemical interference, Silver, Arsenic.

clear techniques are described for the analysis trace elements and radioisotopes in natural ters. In trace element analysis, sodium chloride sks many of the short-lived radioisotopes that st be identified if certain trace elements are to measured. Chemical separation of sodium and orine must be accomplished; a method to pro- e this separation involves freezing the sample lowed by irradiation, etching surface contami- nts, melting, and filtering. Counting particulate tter on the filter is done by Ge (Li) diode mma-ray spectrometry. Measurement in sea ter is much more difficult due to lower concen- tions of the trace elements and greater inter- ence from sodium. For measurement of dioisotopes a large volume water sampler, utiliz- aluminum oxide, has been developed to permit separation of radioisotopes from sample umes up to tens of thousands of liters. The effi- ncy of aluminum oxide for retention of several dioisotopes of interest has been demonstrated h in the laboratory and in situ in the Pacific ean. (Mortland-Battelle)
2-12489

RRECTED IDENTIFICATION OF A TEST GANISM (ATCC 4352) PREVIOUSLY OUGHT TO BE ESCHERICHIA COLI,
wn (Claude P.) and Associates, Philadelphia,
. Brown, and F. H. Wilson.
plied Microbiology, Vol. 23, No. 3, p 661, rch 1972. 1 tab.

criptors: *Bioindicators, *Pollutant identifica- , *Systematics, E. coli, Analytical techniques, chemistry, Disinfection, Testing, Enteric bac- a, Coliforms, Bactericides, Biological proper- .
ntifiers: *Klebsiella pneumoniae, Biochemical s, Sensitivity, Antiseptics.

ing tests to evaluate an antiseptic, a gram- ative test organism, (ATCC 4352), previously ntified as E. coli, was found to show con- rably different susceptibility than another E. strain, ATCC 11229. In subsequent biochemi- studies, ATCC 11229 produced the proper tions for E. coli, but the ATCC 4352 strain duced the reactions of Klebsiella pneumoniae. TCC 4352 has been used extensively as a test or- sm so its true identity is considered signifi- . (Mortland-Battelle)
-12492

ROFLORA OF SOIL AS VIEWED BY NSMISSION ELECTRON MICROSCOPY,
sylvania State Univ., University Park. Dept. icrobiology.
. Bae, E. H. Cota-Robles, and L. E. Casida, Jr.
lied Microbiology, Vol. 23, No. 3, p 637-648, ch 1972. 14 fig, 1 tab, 35 ref.

criptors: *Cytological studies, *Soil microor- isms, Electron microscopy, Soil bacteria, Cen- fugation, Soil microbiology, Soil fungi.
Identifiers: *Transmission electron microscopy, Culture media, Agromyces ramosus, Agars, *Ludox gradients.

Several procedures were evaluated for separating and concentrating indigenous microorganisms from soil without the occurrence of growth. The procedures included the use of Ludox gradients, simple and exhaustive centrifugal washing, and a two-phase polyethylene glycol system. The exhaustive centrifugal washing of soil was time consuming but yielded the greatest number of sectioned cells for viewing. Ludox gradients, on the other hand, were quite alkaline and provided plate counts that were two orders of magnitude less than those of other procedures. Electron microscopy of nontangential, thin sections through the separated cells revealed that all of the cells examined were less than 0.9 millimicrons in diameter, and up to 72 percent were 'dwarf' cells less than 0.3 millimicrons in diameter. Some were small enough that they should not be resolved with the light microscope. Approximately 27 percent had a fine structure bearing some resemblance to that of a bacterial cyst or microcyst, but this value may be low because cells having their outer layers partially stripped off were not included in the count. Approximately 25 percent showed a distinct periplasmic space, which often contained stainable material. Other fine structure features are presented together with frequencies of occurrence for the populations examined. (Mortland-Battelle)
W72-12493

EFFECT OF TYPE OF ENRICHMENT AND DURATION OF INCUBATION ON SALMONELLA RECOVERY FROM MEAT-AND-BONE MEAL,
Agricultural Research Service, Philadelphia, Pa. Marketing and Nutrition Research Div.
For primary bibliographic entry see Field 05C.
W72-12494

FLUORESCENT-ANTIBODY TECHNIQUES FOR THE IDENTIFICATION OF GROUP D STREPTOCOCCI: DIRECT STAINING METHOD,
Massachusetts Univ., Waltham. Dept. of Environmental Sciences.
M. T. Pavlova, E. Beauvais, F. T. Brezenski, and W. Litsky.
Applied Microbiology, Vol. 23, No. 3, p 571-577, March 1972. 1 fig, 4 tab, 26 ref.

Descriptors: *Streptococcus, *Sewage, Cultures, Microscopy, Photography, Bioindicators, *Pollutant identification, Pathogenic bacteria, Anaerobic bacteria, Enteric bacteria, Water pollution sources, Fluorescence, E. coli, Salmonella.
Identifiers: *Staining, *Fluorescent-antibody techniques, Serology, Precipitin tests, Biological samples, Biochemical tests, Feces, Globulin, Fluorescein isothiocyamte, Staphylococcus, Streptococcus liquefaciens, Streptococcus faecium, Streptococcus zymogenes, Streptococcus durans, Streptococcus bovis, Streptococcus faecalis.

Fluorescent-antibody (FA) techniques were employed in an attempt to develop a rapid test for the identification of group D streptococci. Fresh isolates were obtained from sewage and feces of sheep, cattle, horses, rabbits, chickens, geese, and rats. Identification to species was made by conventional physiological, biochemical, and serological tests. Both whole and disrupted cells of representative strains of each species were used for the preparation of the group D streptococcus vaccine. Globulin fractions of individual and pooled antisera were labeled with fluorescein isothiocyanate, and the resulting conjugates were tested with homologous and heterologous antigens. The specificity of the conjugates and staining was addressed by adsorption and inhibition tests utilizing controls with homologous and heterologous antigens. Employing the direct staining method and individual and pooled conjugates, it was possible to obtain 84 and 85 percent positive FA reactions, respectively, with group D streptococcal strains. Trypsinization of the smears prior to staining eliminated all FA cross-reactions observed with non-group D streptococci and staphylococci. These findings suggest that the direct staining method will be of value in the rapid identification of group D streptococci. (Mortland-Battelle)
W72-12495

BACTERIAL CELL PRODUCTION FROM HEXADECANE AT HIGH TEMPERATURES,
Wisconsin Univ., Madison. Dept. of Biochemistry.
For primary bibliographic entry see Field 05B.
W72-12496

BACTERIOPHAGES OF CLOSTRIDIUM BOTULINUM,
British Columbia Univ., Vancouver. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W72-12497

TIME SERIES ANALYSIS OF WATER POLLUTION DATA,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
F. C. Fuller, Jr., and C. P. Tsokos.
Biometrics, Vol 27, No 4, p 1017-1034, December 1971. 11 fig, 5 tab, 5 ref.

Descriptors: *Water pollution, *Statistical methods, *Time series analysis, Forecasting, Model studies, Statistical models, Water pollution control, *Dissolved oxygen, Light intensity, Biochemical oxygen demand, Temperature, Mathematical models, Mathematical studies, Equations, Water quality control, Correlation analysis, Water quality.

Techniques of time series analysis are presented for application to certain non-stationary water pollution data for a more effective analysis of such data and to be able to obtain better water quality. The technique of time series analysis was utilized in order to analyze certain dissolved oxygen water quality data. The dissolved oxygen concentration which exists in a stream while it is receiving an organic waste load is the variable by which the waste assimilation capacity of a stream is measured. Application to non-stationary time series provides forecast values and sample spectra for the observed dissolved oxygen series, which when interpreted lends insight into the mechanisms which generated the DO series. (Byrd-Battelle)
W72-12498

THE INVERSE AUTOCORRELATIONS OF A TIME SERIES AND THEIR APPLICATIONS,
North Carolina Univ., Chapel Hill. Dept. of Statistics.
For primary bibliographic entry see Field 07B.
W72-12499

A SHORT LIFE TEST FOR COMPARING A SAMPLE WITH PREVIOUS ACCELERATED TEST RESULTS,
General Electric Co., Schenectady, N.Y. Research and Development Center.
For primary bibliographic entry see Field 07B.
W72-12500

AN IMPROVED HOLDER FOR THE DELVES MICROSAMPLING CUP,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 02K.
W72-12501

RESULTS OF THE ELEMENTAL PHOSPHOROUS MONITORING PROGRAM, LONG HARBOUR, NFLD. (JULY 1970-APRIL 1971),
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05B.
W72-12571

FIVE NEW SPECIES OF CHLAMYDOMONAS,
Wisconsin State Univ., La Crosse. Dept. of Biology.
J. M. King.
Journal of Phycology, Vol. 8, No. 1, p 120-126, March 1972. 23 fig, 24 ref.

Descriptors: *Systematics, *Chlamydomonas, Cultures, Chlorophyta, Protozoa, *Algae.
Identifiers: Chlamydomonas isabeliensis, Chlamydomonas pallidostigmatica, Chlamydomonas fottii, Chlamydomonas texensis, Chlamydomonas pseudomicrosphaera, Culture media, Culturing techniques, Morphology, Flagellates.

Five new species of Chlamydomonas, C. isabeliensis, C. pallidostigmatica, C. fottii, C. pseudomicrosphaera and C. texensis were isolated into axenic culture during an investigation of green microalgae. The axenic cultures were maintained on Boldo Basal Medium (BBM) solidified with 1.5 percent agar and the morphology of the organisms studied with wet mounts and hanging drop slides from isolates on BBM agar or BBM liquid medium. Experiments were performed in a controlled environment culture room with temperature at 22 C and incident light provided by fluorescent bulbs. Supplementary attributes of the algae may serve as possible taxonomic aids. Morphological descriptions and culturing characteristics are given for each of the new species. (Snyder-Battelle)
W72-12632

STUDIES ON THE BIOLOGY OF BROWN ALGAE ON THE ATLANTIC COAST OF VIRGINIA. I. PORTERINEMA FLUVIATILE (PORTER) WAERN,
Kent State Univ., Ohio. Dept. of Biological Sciences.
R. G. Rhodes.
Journal of Phycology, Vol. 8, No. 1, p 117-119, March 1972. 11 fig, 8 ref.

Descriptors: *Phaeophyta, *Tidal marshes, *Marine algae, Cultures, Salinity, Salt marshes, Systematics, *Virginia, *Atlantic Ocean, North America.
Identifiers: *Porterinema fluviatile, Culture media, Hummock Channel, Chloroplasts, Morphology, Epiphytes.

Porterinema fluviatile found as a microscopic filament on a culm of Spartina on the Atlantic Coast of Virginia, represents the first report of this marine alga in North America. The collection was made from a tidal marsh with water temperature of 19.5 C and salinity of adjacent water being 2.98 percent. Single filaments were isolated and placed into cultures containing modified Schreiber's solution. Cultures were maintained at 20 plus or minus 1 degree C with continuous illumination from fluorescent lamps. Photographs were taken with bright field illumination and chloroplast morphology and number were examined in light passing through a Wratten Filter No. 48 (Eastman Kodak). (Snyder-Battelle)
W72-12633

RADIOISOTOPIC STUDY OF CALCIFICATION IN THE ARTICULATED CORALLINE ALGA BOSSIELLA ORBIGNIANA,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
For primary bibliographic entry see Field 05C.
W72-12634

CONCENTRATION OF BROMIDE IONS IN SEAWATER BY ISOTOPIC EXCHANGE,
Naval Ordnance Lab., White Oak, Md.
For primary bibliographic entry see Field 05B.
W72-12638

THE DETERMINATION OF COPPER, LEAD, CADMIUM, NICKEL, ZINC AND COBALT IN NATURAL WATERS BY PULSE POLAROGRAPHY,
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, and L. G. Royle.
Analytica Chimica Acta, Vol. 58, No. 2, p 283-288, February 1972. 1 tab, 15 ref.

Descriptors: *Polarographic analysis, *Trace elements, *Pollutant identification, Chemical analysis, Copper, Lead, Cadmium, Nickel, Zinc, Cobalt, Water analysis, Separation techniques, Heavy metals, Aqueous solutions, Methodology, Chelation, Electrolytes, Electrochemistry, Calcium, Resins, Sea water, Freshwater, Calcium chloride, Ammonia, Water quality control.
Identifiers: *Pulse polarography, Sample preparation, Precision, Detection limits.

A pulse-polarographic method for determining Cu, Pb, Cd, Ni, Zn, and Co in water from a single aliquot of a sample involved preconcentrating the metals on chelating resins in its calcium form. The eluate from the resin contains sufficient calcium to act as a supporting electrolyte for the subsequent polarographic analysis. After preconcentration, a 2.5 ml aliquot of the solution was pulse-polarographed over the minus 0.2-minus 1.1 V range for Cu, Pb, and Cd analysis. Two-tenths ml of a previously prepared standard containing 10 micrograms/ml each of Cu, Pb, and Cd was then added and a second polarogram recorded. To the same solution in the cell a 2 M ammonia solution was added and a polarogram recorded from minus 0.8-minus 1.7 V for Ni and Zn, with a second polarogram being recorded after adding the Ni and Zn standard. Finally, 0.2 ml of a one percent alcoholic solution of dimethylglyoxime was added and polarographed between minus 1.1 and minus 1.5 V for cobalt and the Co standard was polarographed. The concentrations of the metals were calculated by measuring the peak heights and peak height increments after addition of the standards. Corrections were made for sample dilution caused by the addition of standards, ammonia, and dimethylglyoxime. Accuracy was evaluated by the analysis of spiked seawater samples which had been passed through the columns. Amounts detected and standard deviations seemed satisfactory for the routine analysis of trace metals in natural waters. (Mackan-Battelle)
W72-12640

A PRELIMINARY STUDY OF FRESH WATER FUNGI FROM ABACO ISLAND, THE BAHAMAS,
National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center.
P. A. Volz, and E. S. Beneke.
Mycopathologia et Mycologia Applicata, Vol. 46, No. 1, p 1-3, January 26, 1972. 7 ref.

Descriptors: *Aquatic fungi, *Systematics, Freshwater, Wells, Basins, Islands, Cultures, Water quality, Plant growth.
Identifiers: Zoospores, Aphanomyces, Pythium debaryanum, Achyla bisexualis, Saprolegnia parasitica, *Abaco Island (Bahamas).

Seventy-five freshwater samples were collected from different areas on Abaco Island, Bahamas and taken to the laboratory for fungal isolation. Morphologic classification was accomplished by identification of encysted and germinated zoospores on sterile hemp seed cotyledons which had been submerged or floated on the sampled water after collection. Species recognitions were made primarily by the development of sexual structures. Pythium, Achlya, Aphanomyces, and Saprolegr were genera isolated from wells, natural ro basins, and dredged areas. It was concluded th freshwater on a small marine island can supp fresh water fungi and that members of t Saprolegniales and Peronosporales can survive organic matter found floating or submerged shallow water. (Mackan-Battelle)
W72-12641

STUDY OF THE MICRODETERMINATION PHOSPHATE IN BIOLOGICAL PRODUCT (ETUDE DU MICRODOSAGE D PHOSPHATES DANS DES PRODUI BIOLOGIQUES),
Institutul de Medicina si Farmacia, Iasi (Rumani

Mikrochimica Acta, No. 1, p 68-73, 1972. 1 fig tab, 13 ref.

Descriptors: *Phosphates, *Colorimet Nutrients, Ultraviolet radiation, Uri Methodology, Spectrophotometry.
Identifiers: *Biological sampl Photocolorimetry, Blood, Phosphomolybdic ac Precision.

A study has been made of the methods for determination of phosphate in biological produ and a new method has been worked out that based on the formation of yellow/phosphomoly dic acid, which is subjected to photocolorimetry the ultraviolet region in a water-acetone medi The proposed procedure has been verified blood and urine, in the absence or presence of ditional phosphate. The error varies between 0 a 1 percent with a mean value of plus or minus 0 percent. (Mortland-Battelle)
W72-12642

THE DETERMINATION OF LEAD, CADMIU COPPER, THALLIUM, BISMUTH AND ZINC BLOOD SERUM BY THE METHOD ANODIC STRIPPING-POLAROGRAPHY, (E BESTIMMUNG VON BLEI, CADMIU KUPFER, THALLIUM, WISMUT UND ZINK BLUTSERUM IM WEGE DER A NOD--STRIPPING-POLAROGRAPHIE),
Kemijski Institut Boris Kidric, Ljubljana (goslavia).
I. Sinko, and S. Gomiscek.
Mikrochimica Acta, No. 2, p 163-172, 1972. 5 30 ref. English summary.

Descriptors: *Trace elements, *Polarograp analysis, Lead, Cadmium, Copper, Zinc, Poiso Heavy metals, Degradation (Decompositi Electrochemistry, Pollutant identification, Chei cal degradation.
Identifiers: *Anodic stripping polarograp *Biological samples, *Serum, Bismuth, Thalli Detection limits, Blood, Sample preparat Precision.

Sample preparation in the anodic-stripping pol graphic method for the analysis of blood serum Pb, Cd, Cu, Tl, Bi, and Zn involves decomposi a 0.5 ml blood serum sample with 0.5 ml nitric a perchloric acid (3:1) in a teflon autoclave. The detection limit is 0.01 microgram metal in 1 milli of blood serum. The analysis requires six hou if the depolarizer concentration is determined means of the standard addition method. The v tion coefficient amounted to 7.5 and 11 perc respectively, for copper and zinc for the bo serum specimen which contained 1.0 microgr copper, 0.7 microgram zinc, 0.016 microgram and less than 0.01 microgram cadmium, thal and bismuth per ml. (Mackan-Battelle)
W72-12646

SENSITIVITY OF THE C-1402 RADIOMETI METHOD FOR BACTERIAL DETECTION,
Johnston Labs., Inc., Cockeysville, Md.
J. R. Waters.

plied Microbiology, Vol. 23, No. 1, p 198-199, uary 1972. 1 fig, 4 ref.

scriptors: *Pollutant identification, *Radioacity techniques, *Pathogenic bacteria, Cultures, rbon radioisotopes, Carbon dioxide, E. coli, liforms, Enteric bacteria, Pseudomonas, Salnella, Streptococcus, Radiochemical analysis, diosensitivity.

ntifiers: *Sensitivity, C-14, Culture media, phylococcus aureus, Proteus vulgaris, Pseumonas aeruginosa, Staphylococcus epidermidis, terobacter cloacae, Streptococcus pyogenes, lmonella typhimurium, Detection limits.

rial dilutions of each of eight common bacterial ecies (E. coli, Staphylococcus aureus, Proteus lgaris, Streptococcus pyogenes, Pseudomonas uginosa, Staphylococcus epidermidis, Salnella typhimurium, Enterobacter cloacae) were pared by inoculating 1-ml samples into a vial of l tryptic soy broth with its dextrose replaced by microcuries of C-14-labeled glucose. After king, 1 ml was serially diluted for a total of 11 ls. From at least 3 vials 0.5 ml volumes were ur plated with 15 ml TSA, incubated 48 hr, and colonies counted. The vials were placed in the CTEC 225, stirred continuously, incubated at C, and gas samples (C-14-labelled CO2) autotically taken hourly to measure radioactive con-t. Detection corresponded to a release of less n 1 percent of the C-14 activity of the vial; i.e., Growth Index of 20 units. The detection time s considered to be the interval between inoculan and detection, the times being related to the ial inoculum, in colony-forming units (CFU), the colony counts. Plotted results show a linear ation between the logarithm of the initial inocun and the detection time. High sensitivity, down ne CFU, was demonstrated. (Mackan-Battelle) 2-12648

ROMATOGRAPHIC SEPARATION OF LYBDENUM USING AN ALIPHATIC PHA-HYDROXY OXIME,
va State Univ., Ames. Inst. for Atomic search; and Iowa State Univ., Ames. Dept. of emistry.
. Fritz, and D. R. Beuerman.
alytical Chemistry, Vol 44, No 4, p 692-694, ril 1972. 2 fig, 3 tab, 7 ref.

scriptors: *Molybdenum, *Separation niques, Ions, Organic compounds, Resins, n, Nickel, Cobalt, Zinc, Copper, Cadmiun, rcury, Aqueous solutions, Nuclear magnetic nance, Chelation, Heavy metals.
ntifiers: *Alpha-hydroxy oximes, Tin, Tungn, Thorium, Elution, Column extraction chroography, Aliphatic hydrocarbons, Metal ches, Infrared spectroscopy, Chemical recovery.

using either of two-alpha hydroxy oximes (10-roxyeicosan-9-one oxime (HEO) or 5,8-hyl-7-hydroxydodecan-6-one oxime (DHDO)) benе solution, it is possible to selectively ext molybdenum (IV) from acidic aqueous solu. Molybdenum was separated from each of 10 erent metal ions by elution through a roreticular resin bed impregnated with the oxs. The oxime solutions form complexes with ybdenum (IV) rather than the other ions, eby allowing its separation and characterizaby nuclear magnetic resonance and infrared troscopy. Elution through the column there- produces an oxime-molybdenum complex d to the resin and the separated metal in the te. Metals paired with Mo and chromatoged were Fe, Ni, Co, Zn, Cu, Sn, W, Cd, Hg, Th. Recoveries averaged 99.4 percent for Mo 99.8 percent for the other metals on HEO and percent Mo, 100.2 percent, for the ions on O columns. Thus it appears that hydroxy ox-. permit quantitative separation of Mo (IV) many other metal ions. (Mackan-Battelle) -12649

STREAM INSECTICIDE MONITORING STUDIES, BERRIEN COUNTY, MICHIGAN OCTOBER 1968 THRU JULY 1970,
Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
For primary bibliographic entry see Field 05B.
W72-12650

STUDIES ON THE PERSISTENCE OF SOME CARBAMATES INSECTICIDES IN THE AQUATIC ENVIRONMENT I: HYDROLYSIS OF SEVIN, BAYGON, PYROLAN AND DIMETILAN IN WATERS,
National Research Center, Cairo (Egypt). Water Pollution Dept.
For primary bibliographic entry see Field 05B.
W72-12651

A CONTINUOUS METHOD OF MONITORING WATER QUALITY BY CHLORINE CONSUMPTION UNDER ULTRAVIOLET RADIATION,
Government Chemical Industrial Research Inst., Tokyo (Japan).
T. Kobayashi, and T. Okuda.
Water Research, Vol 6, No 2, p 197-209, February 1972. 6 fig, 4 tab, 8 ref.

Descriptors: *Water quality, *Monitoring, *Ultraviolet radiation, *Chlorine, Aqueous solutions, Organic acids, Organic compounds, Chemical oxygen demand, Electrodes, Electrolysis, Instrumentation, Pollutant identification, Chemical reactions, Water pollution, Amino acids, Methodology, Volumetric analysis, Irradiation, Carbohydrates, Pollutants, Alcohols, Phenols, Ureas, Ammonia, Catalysts, Mercury, Lead, Salts, Automation, Equipment, Solvents, Water analysis, Acids.
Identifiers: *Coulometric titration, *Amperometry, *Consumption, Chemical interference, Aliphatic hydrocarbons, Ion selective electrodes, Organic solvents, Formic acid, Propionic acid, n-Butyric acid, Oxalic acid, Glutaric acid, Adipic acid, Fumaric acid, Glyconic acid, DL-Lactic acid, D-Tartaric acid.

A continuous coulometric titration apparatus in which water samples are titrated with electrolytically generated chlorine under irradiation with UV light has been constructed for the monitoring of polluted waters. Chlorine is continuously produced by electrolysis of 1 M HCl in an external generator cell, and the chlorine-HCl mixture and sample are fed at fixed rates to a stirred-tank reactor and mixed together under UV irradiation. The chlorine concentration in the chlorine-HCl sample water mixture is continuously detected amperometrically. Based on the samples examined, two kinds of electrode systems are utilized in the amperometric detection of chlorine: (1) rotating Pt microelectrode and Pt auxiliary electrode for compounds without amino groups; (2) gaseous-chlorine detector with Pt and Ag-AgCl electrodes separated by a KCl-agar bridge and 2 M-KCl-0.2 M-phosphate buffer of 6.1 for amino group-containing compounds and river water samples. Examinations have been made on aqueous solutions of 51 compounds and on raw waters at a water purification plant. Combination of chlorine and ultraviolet light permits far more rapid consumption of chlorine for various organic compounds than in the case of mere contact of chlorine and organic compounds in the dark. The proportionality and additivity of chlorine consumption data in mixed solutions were obtained only in low substrate concentrations. As the catalysts (or photosensitizers) in this method mercury (II) and lead (II) salts were found effective. (Holoman-Battelle)
W72-12652

THE SEDIMENT-INHABITING TESTATE AMOEBAE (RHIZOPODA, TESTACEA) FROM THE FINSTERTALER SEEN (TYROL/AUSTRIA), (SEDIMENTBEWOHNENDE SCHALENAMOBEN RHIZOPODA, TESTACEA) DER FINSTERTALER SEEN (TIROL)),
Biological Station, Lunz am See (Austria).
H. Laminger.
Archiv fur Hydrobiologie, Vol 69, No 1, p 106-140, August 1971. 17 fig, 8 tab, 18 ref.

Descriptors: *Systematics, *Protozoa, Sediments, Lakes, *Lake sediments, Invertebrates, Aquatic animals.
Identifiers: *Amoebae, *Austria, *Finstertaler Seen, Centropyxis spp, Cyphoderia ampulla, Difflugia spp, Euglypha aspera, Lesquereusia modesta, Microchlamys patella, Phryganella nidulus, Pontigulasia spectabilis, Sphenoderia lenta, Trinema enchelys, Trinema lineare.

Sixty species of testate amoebae were recovered from the sediment of an Austrian high-mountain lake (Finstertaler Seen). Forty-one species had not been previously identified in Austria, and six were new: Centropyxis adami, Centropyxis austriace, Centropyxis janetscheki, Diffugia finstertaliensis, Difflugia lebes var. bretschkoi, and Difflugia mammella. (Synder-Battelle)
W72-12653

THE POLAROGRAPHIC ESTIMATION OF BAYLUSCIDE,
National Research Centre, Cairo (Egypt).
T. M. H. Saber, and M. M Sidky.
J Chem U A R. Vol 13, No 3: p 369-373, 1970. Illus.
Identifiers: Pollutant identification, *Bayluscide, *Molluscicide, *Polarographic analysis.

Details of the conditions under which Bayluscide compound, a molluscicide, can be estimated polarographically are given.--Copyright 1972, Biological Abstracts, Inc.
W72-12664

AN ANNOTATED BIBLIOGRAPHY OF ATTEMPTS TO REAR THE LARVAE OF MARINE FISHES IN THE LABORATORY,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W72-12669

SUBLITTORAL ECOLOGY OF THE KELP BEDS OFF DEL MONTE BEACH, MONTEREY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
C. S. Minter, III.
Available from the National Technical Information Service as AD-738 875, $3.00 in paper copy, $0.95 in microfiche. Master's Thesis, September 1971. 181 p, 102 fig, 31 ref, 2 app.

Descriptors: *Baseline studies, *Kelps, *Biological communities, *California, Benthos, Ecosystems, Aquatic habitat, Food chains, Aquatic populations.
Identifiers: *Benthic ecology, *SCUBA, *Diving, *Marine ecology, Kelp beds, Marine benthos, Underwater studies, Harbor ecology, Monterey breakwater study.

Macroscopic organisms collected by SCUBA divers throughout a large portion of the kelp beds at Del Monte Beach, Monterey, California, were identified and a list of species present was compiled. More than 160 such species were found to exist. Collection methods and techniques utilized by divers were documented. Numerous underwater photographs were taken. A population census and mapping survey was made by divers of the benthic flora and fauna existing within two permanently marked bottom areas, one of which is to be eventually isolated from the open sea by erection of a breakwater. The areas were found to be of generally similar biological population, but of markedly different species distribution and relative abundance. (Katz-Washington)
W72-12670

MARINE FOULING ORGANISMS IN MONTEREY HARBOR, CALIFORNIA, JUNE THROUGH SEPTEMBER 1966,
Naval Postgraduate School, Monterey, Calif.
T. L. Miller.
Available from the National Technical Information Service as AD-805 628, $3.00 in paper copy, $0.95 in microfiche. M.S. Thesis, U.S. Naval Postgraduate School, 1966. 54 p, 14 fig, 3 tab, 17 ref, supp.

Descriptors: *Fouling, *Bottom fauna, *Pacific coast region, *Invertebrates, Marine animals, Animal grouping, On-site tests, Season, Annual succession, California, Worms.
Identifiers: *Marine fouling organisms, *Test panels, *Barnacles, Monterey Harbor (Calif), Bryozoans, Serpulids, Hydroids, Phoronid worms.

Marine fouling organisms occurring on test panels of various substances and at various locations and depths of the Monterey Harbor, California, were studied for identification and significance. Some panels were immersed for the entire length of the study--June 10 to September 16, 1966; others, mainly plywood, were immersed only for month-long periods throughout the study. Barnacles, bryozoans, and serpulids were the major fouling organisms in the inner harbor, while hydroids were most significant in the outer harbor. The barnacles reached maximum attachment in June and July, but were covered later by bryozoans. Phoronid worms were present in August and September on the shallow mud in the inner harbor. Fouling increased with depth and distance away from direct sunlight. Plywood, masonite and wood panels were the best collectors, and stainless steel was the worst. (Katz-Washington)
W72-12671

THE GROWTH AND SURVIVAL OF PLANTED CLAMS, MERCENARIA MERCENARIA, ON THE GEORGIA COAST,
Georgia Game and Fish Commission, Brunswick. Marine Fisheries Div.
W. F. Godwin.
Available from the National Technical Information Service as COM-72-10318, $3.00 in paper copy, $0.95 in microfiche. Georgia Game and Fish Comm., Marine Fisheries Division Contribution Series No. 9, September 1968. 16 p, 8 fig, 2 tab, 3 ref. Bur. of Commercial Fisheries 2-44-R.

Descriptors: *Marine fisheries, *Clams, *Growth, *Survival, *Aquiculture, Fisheries, Fishing, Aquatic animals, Mortality, Georgia, Atlantic Ocean, Commercial shellfish, Mollusks, Shellfish.
Identifiers: Planting (Clams), Quahog, Mercenaria spp.

Approximately 4,000 small laboratory-reared hard clams were artificially planted in six locations in St. Simonds Sound, a Georgia coast estuary. The excellent growth of planted clams suggests that protected areas of proper salinity and of proper bottom types could support planted clams in very high densities. Experiments showed the planted clams must be protected to reduce predation by the blue crab. The cost of providing wire screening was thought to be prohibitive. (Katz-Washington)
W72-12672

POLYCHLORINATED BIPHENYLS AND ORGANOCHLORINE PESTICIDES IN SOME FRESHWATER AND MARINE FISHES,
Fisheries Research Board of Canada, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 05C.
W72-12679

NATURAL ABUNDANCE OF THE STABLE ISOTOPES OF CARBON IN BIOLOGICAL SYSTEMS,
Texas Univ., Austin. Dept. of Botany.
For primary bibliographic entry see Field 05B.
W72-12709

LEAD IN A CONNECTICUT SALT MARSH,
Yale Univ., New Haven, Conn. School of Forestry.
For primary bibliographic entry see Field 05B.
W72-12710

PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 05B.
W72-12712

LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYVINYL CHLORIDE FORMULATIONS OF DURSBAN (TRADEMARK),
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05B.
W72-12713

LABORATORY RELEASE RATE STUDIES OF DIAZINON AND SUPRACIDE (TRADEMARK) FROM POLYVINYL CHLORIDE FORMULATIONS,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05B.
W72-12714

INTERPRETATION OF ISOPOTENTIAL POINTS: THE COMMON INTERSECTION IN FAMILIES OF CURRENT-POTENTIAL CURVES,
State Univ. of New York, Buffalo. Dept. of Chemistry.
D. F. Untereker, and S. Bruckenstein.
Analytical Chemistry, Vol 44, No 6, p 1009-1020, May 1972. 6 fig, 12 ref.

Descriptors: *Electrodes, *Oxidation-reduction potential, Instrumentation, *Spectrophotometry, Gold, Mathematical studies, *Electrochemistry, Copper, Oxidation, Chemical analysis, Adsorption, Metals, Chemical reactions, Electrical properties, Electric currents, Iodine, Ions, Sulfates, Iodides, Zeta potential.
Identifiers: *Isopotential points, Platinum electrode, Sulfites, Platinum, Current-potential curves, Data interpretation.

Studies of surface processes at solid electrodes show that it is possible to predict the occurrence of isopotential points in families of i-E curves obtained under potential scanning conditions. A common intersection point can occur if the the potential scanning program is the same for all curves. The electrode surface is partially covered with at least one adsorbed or deposited species whose initial amount is different for each curve, and the electrode surface behaves as two independent electrochemical regions, the sum of whose areas is constant at all times for all of the current-potential curves. These conclusions were reached from experiments of adsorbed SO2 on platinum, oxidation of thin copper films on platinum, and oxidation of a platinum electrode with both adsorbed SO2 and iodide. The isopotential point theory yields valuable information on the nature of an electrode surface. The occurrence and stoichiometry of surface reactions can be established using the disappearance of an isopotential point with increasing coverage of adsorbate. The existence of an unexpected intermediate adsorbate can also be established, and the presence of adsorable impurities can be verified. (Mortland-Battelle)
W72-12715

SELF-BALANCING BRIDGE FOR DIFFERENTIAL CAPACITANCE MEASUREMENTS,
Wayne State Univ., Detroit, Mich. Dept. Chemistry.
For primary bibliographic entry see Field 07B.
W72-12716

PULSED NUCLEAR MAGNETIC RESONANCE MEASUREMENT OF RELAXATION TIMES OF ION-EXCHANGE RESINS,
Wisconsin Univ., Madison. Dept. of Chemistry.
W. J. Blaedel, L. E. Brower, T. L. James, and J. Noggle.
Analytical Chemistry, Vol 44, No 6, p 982-9, May 1972. 4 fig.

Descriptors: *Ion exchange, *Resins, Molecular structure, Regression analysis, Measurement, Moisture content.
Identifiers: *Relaxation times, *Pulsed nuclear magnetic resonance, Protons, Cross linkages.

Pulsed NMR techniques have been applied to the measurement of longitudinal and transverse relaxation times (T sub 1 and T sub 2) in ion exchange resins of various water contents and cross linkages. Dowex 50-W ion exchange resin was used in all measurements, with 200-400 mesh size and various cross-linkings of 2, 4, 8, and 12 percent DVB. The moisture content ranged from fully swollen to less than one mole of water per exchange site. Relaxation time measurements were made at normal equilibrium probe temperatures for the instrument and at one observation frequency of 1500 4 K. The lowest relaxation time as calculated by linear regression analysis was around 0.1 msec. Cross-linking affects T sub 1 and T sub 2 for water protons only slightly. For water contents above 6 moles of water per exchange site, T sub 1 and T sub 2 became independent of water content, indicating a water-like environment for the water protons. Below 6 moles of water per exchange site, the relaxation times indicate that the water is structured. This work shows that the relaxation properties of ion exchange resins can be studied easily by pulsed NMR techniques, and that the relaxation times give information on the molecular structure of the resins. (Synder-Battelle)
W72-12717

USE OF ELECTRON SPIN RESONANCE TO CHARACTERIZE THE VANADIUM (IV) SULFUR SPECIES IN PETROLEUM,
Gulf Research and Development Co., Pittsburgh, Pa.
F. E. Dickson, C. J. Kunesh, E. L. McGinnis, and L. Petrakis.
Analytical Chemistry, Vol 44, No 6, p 978-1, May 1972. 2 fig, 4 tab, 18 ref.

Descriptors: Oil, Cations, *Sulfur, *Pollutant identification, Chemical analysis, Trace elements, *Oil pollution, Chromatography, Heavy metals, Isotropy, Resonance.
Identifiers: *Electron spin resonance spectrometry, *Oil characterization, *Vanadium, Porphyrins, Complexation, Asphaltenes, Petroleum, Petroleum residues.

A series of bis (dithiocarbamato) oxo-vanadium (IV) complexes have been prepared and analyzed for their electron spin resonance in a series of solvent, varying the dielectric constant and coordinating ability. Isotropic g sub o values and hyperfine coupling constants were examined for these environments and for several vanadium-sulfur complexes in order to characterize these species in spectrometric analysis. Data on fractions of petroleum residuals, separated chromatographically to concentrate polar and nonpolar materials have revealed that the difference in their SR parameters are valid and can be used for the identification of the complexes. The data also suggest an application of the method to the analy of

the nonporphyrin vanadium (IV) complexes in petroleum. (MackaniBattelle)
W72-12718

DETERMINATION OF TRACE AMOUNTS OF CHROMIUM (III) USING CHEMILUMINESCENCE ANALYSIS,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
W. R. Seitz, W. W. Suydam, and D. M. Hercules.
Analytical Chemistry, Vol 44, No 6, p 957-963, May 1972. 11 fig, 4 tab.

Descriptors: *Trace elements, *Chromium, *Pollutant identification, Heavy metals, Cations, Chemical reactions, Light intensity, Water analysis, Cobalt, Strontium, Chelation, Iron, Lead, Magnesium, Calcium, Zinc, Manganese, Aluminum, Nickel, Copper, Mercury, Cadmium, Oxidation, Chemical analysis.
Identifiers: *Chemiluminescence, Detection limits, Chemical interference, Luminol, EDTA, Tin, Vanadium, Hydrogen peroxide, 5-amino-2 3-dihydrophthalazine-1 4-dione, Complexation, Barium, Silver.

Since metal ions catalyze the oxidation of luminol (5-amino-2,3-dihydrophthalazine-1, 4-dione) by hydrogen peroxide basic aqueous solutions and the intensity of light emission is proportional to the metal catalyst concentration in the presence of excess reagents, the intrinsic sensitivity of this system can be used for trace metal analysis. The luminol system applied to Cr (III) detection employs the delivery of peroxide, the luminol base, and a volume of the sample into a special reaction cell into which nitrogen is bubbled to act as a mixer. The intensity of the resulting luminescent reaction is monitored and recorded. Light emission catalyzed by other metals is quenched by adding EDTA to form non-catalytic complexes. The Cr (III)-EDTA complex is slow to form and allows the chemiluminescent reaction to occur. This method was successively applied to several natural water samples with no sample pretreatment required. Analysis time was less than 30 min with a reported detection limit for Cr (III) of 0.5 picomoles (about 0.025 ppb). The minimum detectable quantity was 25 picograms with a linear response up to one micromole. Of the 18 cations checked for interference only 4 - Sn (IV), Co (II), Fe (II), Fe (III) - affect luminescence, and these can be compensated for by running a blank. (Mackan-Battelle)
W72-12719

IMPROVED PROCEDURES FOR THE DETERMINATION OF OXYTETRACYCLINE IN MILK, MILK PRODUCTS; CHICKEN MUSCLE, LIVER; AND EGGS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
S. E. Katz, and C. A. Fassbender.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 4, p 229-236, April 1972. 8 tab, 6 ref.

Descriptors: *Antibiotics (Pesticides), *Analytical techniques, *Evaluation, *Pollutant identification, *Milk, *Poultry, Organic pesticides, Methodology, Centrifugation, Bioassay, Pesticide residues, Methodology, Foods.
Identifiers: *Biological samples, *Oxytetracycline, Milk products, Tissues, Muscle, Liver, Eggs, Detection limits, Bioaccumulation, Recovery, Chlortetracyline.

The improved procedures for determining oxytetracycline in milk and dairy products, chicken muscle tissue and livers, and eggs are evaluated. The procedures used were based upon those developed for chlortetracycline in similar materials and are compared to the procedures listed in the FDA compendium of methods and protocols. The procedural improvements include pH adjustment, centrifugation, single agar layer, high temperature seeding and spreading of agar, and the use of a surfactant. A summary of the detection limits and analytical measurement for the individual procedures shows that the centrifuge modification, pH adjustment where applicable, and the use of surfactant when necessary have significantly improved the ability to measure residues of oxytetracycline in milk, eggs, and chicken tissue. (Holoman-Battelle)
W72-12721

MASS SPECTRAL PATTERN OF MIREX (DODECACHLOROOCTAHYDRO-1, 3, 4--METHENO-2H-CYCLOBUTA (CD) PENTALENE) AND OF KEPONE (DECACHLOROOCTAHYDRO-1,3,-4-METHENO-2H-CYCLOBUTA (CD)-PENTALEN-2-ONE) AND ITS APPLICATION IN RESIDUE ANALYSIS,
Georgia Univ., Athens. Dept. of Entomology.
S. Uk, C. M. Himel, and T. F. Dirks.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 4, p 207-215, April 1972. 4 fig, 1 tab, 8 ref.

Descriptors: *Pesticide residues, *Mass spectrometry, *Pollutant identification, Chemical analysis, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Chlorine radioisotopes, Ionization, Pesticide kinetics, Separation techniques, Gas chromatography, Heptachlor, Phenolic pesticides, Ions.
Identifiers: *Mirex, *Kepone, Chemical interference, *Mass spectra, Hexachloro-cyclopentadiene, Aroclor 1254, Aroclor 1260, Dodecachlorooctahydro-1 3 4-metheno-2H-cyclobuta (cd)pentalene, Decachlorooctahydro-1 3 4-metheno-2H-cyclobuta (cd)-pentalen-2-one, Heptachlor epoxide, Chlordane, Nonachlor, Chlordene, Cl-35, Cl-37.

Mass spectrometry can be used successfully to identify pesticide residues which produce overlapping late eluting gas chromatography peaks. The mass spectra of Mirex and Kepone were taken at ionization energies of 10 and 80 electron volts with a Bell-Howell model 21-490 mass spectrometer in a preliminary application of the method. It was difficult to distinguish true peaks from the background at m/e less than 100, but both insecticides yielded strong peaks at m/e 270 corresponding to the positively charged hexachloro-cyclopentadiene. At 10 eV, most peaks disappeared leaving the parent, m/e 270, and the m/e 235 peaks. The use of clusters of isotope peaks at m/e 270 and m/e 235 and the molecular ions (m/e 540 for Mirex and m/e 486 for Kepone) has been suggested as characteristics for identification. Kepone requires, in addition, the isotope clusters at m/e 216. The m/e 270 and m/e 235 fragments are not free from interference. The chlordane and heptachlor series of insecticides produce these two groups of ions. Nevertheless, their parent molecular ions are clear from overlapping with any fragment of Mirex or Kepone; chlordane, m/e 406; nonachlor, m/e 440; chlordene, m/e 336; heptachlor, m/e 370; heptachlor epoxide, m/e 386. (Holoman-Battelle)
W72-12723

SKEWED ALGAL DIVISION PATTERNS: EFFECTS OF AUTOSPORE YIELD ON COMPUTED SYNCHRONY INDICES,
Saint Louis Univ., Mo. Dept. of Biology.
D. W. Rooney.
Mathematical Biosciencies, Vol 12, No 3/4, p 367-373, December 1971. 2 fig, 3 ref.

Descriptors: *Mathematical studies, *Algae, Equations, Biological properties, Reproduction, Analytical techniques, Numerical analysis, Model studies, Computers, Cultures.
Identifiers: *Division patterns, *Autospores, *Synchronous cultures, Synchrony index.

Reported are algebraic and numerical analyses of the algal division synchrony index S sub T which reflects the degree of nonlinearity of plots of log cell number versus time. It has been found that for skewed distributions of division times, S sub T is affected by the number of autospores produced per division. A new algal division synchrony index S sub R is presented. For a culture of any given autospore yield, S sub R reflects the nonlinearity of a semilogarithmic plot versus time of cell number in a culture of identical division time pattern yielding two autospores per division. The index S sub R, independent of autospore yield for any division time distribution, assumes higher values for distributions skewed toward longer times than for oppositely skewed distributions. (Mackan-Battelle)
W72-12724

PHYTOPLANKTON PIGMENTS IN PORTO NOVO WATERS (INDIA),
Center of Advanced Study in Marine Biology, Porto Novo (India).
K. Krishnamurthy.
Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 2, p 273-282, 1971. 5 fig, 22 ref.

Descriptors: *Phytoplankton, *Pigments, *Chlorophyll, Salinity, Water temperature, Sampling, Turbidity, Analytical techniques, Spectrophotometry, Diatoms, Dinoflagellates, Seasonal, Filtration, Pyrrophyta, Cyanophyta, Euglena, Euglenophyta, Chrysophyta, Chlorophyta.
Identifiers: *Carotenoids, *Porto Novo (India), Chlorophyll a, Chlorophyll b, Chlorophyll c, Ceratium, Peridinium, Dinophysis, Gymnodinium, Noctiluca, Chaetoceros, Coscinodiscus, Cylindrotheca (Nitzschia), Rhizosolenia, Skeletonema, Pleurosigma, Eucampia, Thalassiothrix, Thalassionema, Triceratium, Biddulphia, Oscillatoria, Spirogyra, Peredinin, Fucoxanthin.

The concentration and seasonal cycle of phytoplankton pigments in backwater and in the water of adjoining mangrove forests in Porto Novo (India) were studied. Salinity and water temperature were also measured. For pigment estimation, oxoid membrane filters were used. Before filtration, 1 ml of 1 percent magnesium carbonate suspension was added to the filter and sucked dry in a Millipore filtration unit. Replicates were run and acetone extracts of pigments were prepared using a spectrophotometer. The pattern of seasonal events in the occurrence of pigments for the two regions was almost identical. However, chlorophyll a was higher in backwater, and chlorophylls b and c, and carotenoids were higher in the mangrove forest waters. During January to July, pigment values generally showed an upward trend with the primary peak of chlorophyll a occurring during July. The major carotenoids found were peridinin and fucoxanthin. (Mortland-Battelle)
W72-12725

MERCURY ACCUMULATION IN FOOD CHAINS,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 05B.
W72-12730

CULTIVATION AND GROWTH OF TWO PLANKTONIC OSCILLATORIA SPECIES,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
For primary bibliographic entry see Field 05C.
W72-12740

THE USE OF BLUEGILL BREATHING TO DETECT ZINC,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.

J. Cairns, Jr., and R. E. Sparks.
Copy available from GPO Sup Doc EP2.10:18050 EDQ 12/71, $0.55; microfiche from NTIS as PB-211 332, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 45 p, 1 fig, 14 tab, 15 ref. EPA Program 18050 EDQ 12/71.

Descriptors: *Zinc, *Bioindicators, *Water pollution effects, Sunfishes, Respiration, Toxicity, Lethal limit, Reproduction, Growth rates, Spawning, Monitoring, Industrial wastes, Bioassay, Sulfates, Fish physiology, Water pollution control, Water pollution sources, Heavy metals, Fishkill, Flow rates, Inhibitors.
Identifiers: *Bluegills, *Breathing, Biological samples, Zinc sulfate, Lepomis macrochirus.

The presence of zinc at concentrations of 8.7, 5.22, 4.16, and 2.55 mg/l in dechlorinated municipal tap water was detected by an increase in breathing rate or a change in breathing rate variance of bluegills. None of the fish exposed to the three lower concentrations died during the experiments. The criterion for detection was an arbitrary number of responses occurring at the same time. When the criterion was changed from a single response to three responses occurring at the same time, the number of false detections ('detections' occurring before zinc addition) decreased, but the lag between zinc addition and detection increased. Zinc concentrations of 0.025 and 0.075 mg/l (approximately 1/100 and 1/34 of 2.55 mg/l, respectively) did not appear to affect the reproduction and growth of bluegills in the laboratory, but 0.250 mg/l zinc (approximately 1/10 of 2.55 mg/l) inhibited spawning in ripe bluegills and killed newly-hatched fry. An in-plant system for the prevention of fishkills caused by spills could be developed by monitoring several biological functions of fish simultaneously to obtain informational redundancy and reduce error; by exposing test fish to higher waste concentrations than occur in the receiving stream as a safety factor; automating the collection and analysis of data to reduce lag time; and by choosing appropriate criteria for detection. (See also W72-12742) (Mortland-Battelle)
W72-12741

THE USE OF FISH MOVEMENT PATTERNS TO MONITOR ZINC,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 05C.
W72-12742

BIODEGRADATION OF NITROLOTRIACETIC ACID AND RELATED IMINO AND AMINO ACIDS IN RIVER WATER,
Monsanto Co., St. Louis, Mo.
For primary bibliographic entry see Field 05B.
W72-12743

DICHOTOMOSIPHON IN FLORIDA SPRINGS,
Florida Univ., Gainesville. Dept. of Botany.
J. S. Davis, and W. F. Gworek.
Journal of Phycology, Vol 8, No 1, p 130-131, March 1972. 6 ref.

Descriptors: *Chlorophyta, *Springs, Diatoms, Biota, Protozoa, *Amphipoda, *Florida, Streams, Isopods, Scenedesmus, Aquatic habitats, Classification, Aquatic algae.
Identifiers: *Dichotomosiphon tuberosus, *Epiphytes, Growth media, Cocconeis placentula, Closterium, Gomphonema longiceps, Cymbella, Vaucheria.

Dichotomosiphon and its associated biota were obtained from several Florida springs. Collections were made several times by diving with scuba equipment and wading. To aid in identification, pieces of the Dichotomosiphon mat were placed in 3 different growth media: soil and water, spring water, and a defined mineral medium. They were incubated at 70F under florescent light (350 ft-C intensity with a 16 hr-light, 8 hr-dark cycle). After 12-15 days, the tubes in spring water produced highly characteristic sex organs and akinetes. In its natural habitat this tubular alga produces extensive bright green mats which harbor epiphytes (Cocconeis placentula, Gomphonema longiceps), unicellular algae (Closterium, Scenedesmus, and Cymbella), ciliates, and amphipods. (Snyder-Battelle)
W72-12744

ABSENCE OF CHLORINATED DIBENZODIOXINS AND DIBENZOFURANS FROM AQUATIC ANIMALS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
V. Zitko.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 2/3, p 105-110, February 1972. 2 tab, 15 ref.

Descriptors: *Pesticides residues, *Aquatic animals, *Chlorinated hydrocarbon pesticides, Toxicity, Sharks, Eels, Gulls, Bioassay, Polychlorinated biphenyls, Aroclors, Bird eggs, Food chains, DDD, DDE, DDT, Gas chromatography.
Identifiers: *Chlorodibenzodioxin, *Chlorodibenzofuran, Biological samples, Tissue, Metabolites, Carcharodon carcharias, Phalacrocorax auritus, Larus argentatus, Anguilla rostrata, Esox niger, Cormorants, Muscle, Liver, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1268, Phenoclor DP-6, Chemical interference, Detection limits, p p' DDE, p p' DDD, p p' DDT.

Samples of eel and chain pickerel muscle, muscle and liver of white shark, eggs of cormorants and herring gulls, and samples of herring oil and fishmeal were analyzed by gas chromatography for the presence of chlorinated dibenzodioxin and dibenzofuran residues. Interference by PCB's was tested by using Aroclors 1221, 1232, 1242, 1248, 1254, 1260, and 1268, and Phenoclor DP-6. The residues were not detectable at limits of 0.04, 0.02, 0.02, 0.01, and 0.01 micrograms/g on tissue wet weight basis, for 2,3,7,8-tetrachlorodibenzodioxin (TCDD), a mixture of di-, tri-, and tetrachlorodibenzofuran (CDF), two isomeric hexachlorodibenzodioxins (HCDD), octachlorodibenzodioxin (OCDD), and octachlorodibenzofuran (OCDF), respectively, in the shark, eggs of double-crested cormorants and herring gulls, eel and chain pickerel, and in commercial herring oil and fishmeal. In some cases PCB's were completely removed and sometimes retention times relative to peaks of p,p'-DDE were obtained in the samples analyzed. The results indicate that there is no detectable contamination of food chains by chlorinated dibenzodioxins and dibenzofurans. (Holoman-Battelle)
W72-12745

A QUALITATIVE AND QUANTITATIVE STUDY OF PLASTOQUINONE A IN TWO THERMOPHILIC BLUE-GREEN ALGAE,
Montana Univ., Missoula. Dept. of Botany.
R. P. Sheridan.
Journal of Phycology, Vol 8, No 1, p 47-50, March 1972. 2 fig, 2 tab, 30 ref.

Descriptors: *Cyanophyta, Separation techniques, Photosynthesis, Chemical analysis, *Solvent extractions, Ultraviolet radiation.
Identifiers: *Chlorophyll a, *Plastoquinones, *Thermophilic algae, *Synechococcus lividis, Ultraviolet absorption spectra, Thin layer chromatography, *Plectonema.

Two thermophilic blue-green algae (Synechoccus lividus and Plectonema sp.) were examined for the presence of plastoquinones by extracting a mixture of logarithmic growth phase cells containing 250-ml portions of cells in distilled water, heptane, and n-propanol. After repeated extractions to insure separation of any possible quinones in the lipid epiphases from the hypophase, the dried epiphase material in heptane was thin-layer chromatographed on silica gel. The PQ types A, B, and C from the Synechococcus strain Y52 were also tested by ultraviolet absorption spectral analysis and showed characteristics identical to photosynthetic quinones isolated from spinach chloroplasts and maple leaves. Plactonema sp. at the surface of its gelatinous mat contained less PQA/chlorophyll a than filaments collected 0.5 cm beneath the mat surface. There are seasonal changes in the PQA/chlorophyll a ratio. The ratio changes observed for Plectonema sp. under field conditions are assumed to be largely influenced by changes in pigment content in response to seasonal changes in light intensity. It is suggested from the data that either the thermal algae are as advanced phylogenetically as the mesophilic Cyanophyta, or that the photosynthetic quinones are essentially identical in all chlorophyll a-containing plants and therefore cannot be used in phylogenetic interpretation. The values of PQA per cell and chlorophyll a per cell are presented with the changes in the ratio of PQA to chlorophyll a for cells grown at different light intensities. (Mackan-Battelle)
W72-12748

RETENTION OF DISSOLVED COMPOUNDS BY MEMBRANE FILTERS AS AN ERROR IN THE C-14 METHOD OF PRIMARY PRODUCTION MEASUREMENT,
Toronto Univ. (Ontario). Div. of Life Sciences.
C. Nalewajko, and D. R. S. Lean.
Journal of Phycology, Vol 8, No 1, p 37-43, March 1972. 3 fig, 6 tab, 14 ref.

Descriptors: *Primary productivity, *Measurement, Separation techniques, Water analysis, Radioactivity techniques, Carbon radioisotopes, Tracers, Organic compounds, Chlorella, Cultures, Retention, Filtration, Radioactivity.
Identifiers: *Errors, *Chlorella pyrenoidosa, *Cryptomonas ovata, C-14, *Membrane filters, Membrane filtration.

A source of error in measuring primary production by the C-14 method was the retention of C-14-labeled bicarbonate and glycollate, and other C-14-labeled substances from filtrates of algal cultures and lake water on membrane filters. Carbon-14-labeled sodium bicarbonate was added to axenic cultures of Chlorella pyrenoidosa and Cryptomonas ovata. After incubation, different volumes were filtered using 25 mm, 0.45 micron Millipore membrane filters and dried in a dessicator. The radioactivity of the algae on the membrane filters was measured as well as the radioactivity of any organic C-14-labeled compounds in the filtrate. Data indicate that under certain conditions, the retention of radioactivity by MF type, 0.45 micron Millipore filters from filtrates of algal cultures and lake water may represent a significant addition to the radioactivity in particulate matter retained by the filters and that the C-14-labeled material retained was not proportional to the volume but showed a saturation effect with increasing volume filtered. When the radioactivity retained by a filter is divided by the volume filtered, decreasing values are obtained with increased volume filtered which results in a similar type curve when different volumes of lake water or cultures are filtered. Radioactivity values per milliliter were constant using Chlorella in Chu 10 medium. However, the curve could be obtained by increasing pH and bicarbonate concentrations in the medium and on resuspending the algae in Lake Ontario (winter) filtrate. The values of cpm/ml retained from filtrates were low in Cryptomonas cultures. (Mackan-Battelle)
W72-12749

'RECIPITATION SCAVENGING (1970).
For primary bibliographic entry see Field 05B.
W72-12752

N-CLOUD SCAVENGING ANALYSIS FROM COSMOGENIC RADIONUCLIDE MEASUREMENTS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-12757

TABLE ELEMENTS OF THE ATMOSPHERE AS TRACERS OF PRECIPITATION SCAVENGING,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-12758

CONCENTRATION VARIATION OF SOME TRACE METALS IN PRECIPITATION FROM GREAT PLAINS THUNDERSTORMS,
Thadron Atmospheric Research Inst., Nebr.
For primary bibliographic entry see Field 05B.
W72-12759

CAVENGING BY SNOW AND ICE CRYSTALS,
Illinois Inst. of Tech., Chicago.
For primary bibliographic entry see Field 05B.
W72-12760

EUROPEAN INTEREST IN ACIDIC PRECIPITATION: A REVIEW,
Battelle Memorial Inst., Seattle, Wash. Research Center.
For primary bibliographic entry see Field 05B.
W72-12773

MECHANISMS OF IODINE INJECTION FROM THE SEA SURFACE,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-12776

MODEL FOR VARIATIONS WITH PARTICLE SIZE OF HALOGEN-ION RATIOS IN MARINE AEROSOLS,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 05B.
W72-12777

THE DETERMINATION OF TRACE METALS IN SALINE WATERS AND BIOLOGICAL TISSUES USING THE HEATED GRAPHITE ATOMIZER,
Miami Univ., Fla.
D. A. Segar.
American Institute of Aeronautics and Astronautics, Paper No. 71-1051, 1971. Presented a Joint Conference on Sensing of Environmental Pollutants, Palo Alto, California, November 8-10, 1971. 1 p, 3 fig, 5 tab, 22 ref.

Descriptors: *Methodology, *Analytical techniques, *Spectrophotometry, Trace elements, Sea water, Water chemistry, Metals, Iron, Copper, Nickel, Cobalt, Zinc, Lead, Chromium, Manganese, Silver, Cadmium, Solvent extractions.
Identifiers: *Atomic absorption spectrophotometry, *Graphite atomizer, Vanadium, Transition elements, Tissue analysis, Ammonium pyrolidine dithiocarbamate, Methyl iso-butyl ketone, Marine biological tissues.

A selective, volatilization technique utilizing the heated graphite atomizer atomic absorption technique was developed for the analysis of iron in seawater. A similar technique may be used to determine vanadium, copper, nickel, and cobalt in saline waters when their concentrations are higher than those normally encountered in unpolluted seawaters. A preliminary solvent extraction using ammonium pyrolidine dithiocarbamate and methyl iso-butyl ketone permits the determination of a number of elements including iron, copper, zinc, nickel, cobalt and lead in seawater. The heated graphite atomizer technique was applied to the determination of trace transition elements in marine plant and animal tissues. (Svensson-Washington)
W72-12789

TEMPERATURE ACCLIMATION IN THE NERVOUS SYSTEM OF THE BROWN BULLHEAD (ICTALURUS NEBULOSUS),
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-12791

WATER RESOURCES DATA FOR NEW YORK, 1970: PART 2. WATER QUALITY RECORDS.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 07C.
W72-12862

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1970 WATER YEAR,
Geological Survey, Austin, Tex.
A. J. Dupuy, and J. A. Schulze.
Texas Water Development Board Report 149, June 1972. 211 p, 1 fig, 4 tab, 9 ref.

Descriptors: *Water quality, *Surface waters, *Basic data collections, *Water analysis, *Texas, Chemical analysis, Sediments, Biochemical oxygen demand, Dissolved oxygen, Nutrients, Pesticides, Trace elements, Discharge measurement, Water temperature.

Basic data for the special periodic network in Texas for the 1970 water year include selected chemical and biochemical records of surface waters, records of minor elements in surface waters, records of pesticides in surface waters, and records of pesticides in bottom deposits in streams. Pesticides include insecticides and herbicides. Most of the sites are at stream-gaging stations; at other sites, the water discharge was usually measured when the samples were collected so that the water quality could be considered in relation to the discharge. (Woodard-USGS)
W72-12870

MULTIELEMENT NEUTRON ACTIVATION ANALYSIS OF BIOLOGICAL MATERIAL USING CHEMICAL GROUP SEPARATIONS AND HIGH RESOLUTION GAMMA SPECTROMETRY,
Cornell Univ. Ithaca, N.Y. Dept. of Chemistry.
G. H. Morrison, and N. M. Potter.
Analytical Chemistry, Vol. 44, No. 4, p 839-842, April 1972. 1 fig, 3 tab, 12 ref.

Descriptors: *Neutron activation analysis, *Radiochemical analysis, Iron, Aluminum, Chlorine, Magnesium, Manganese, Strontium, Bromine, Sodium, Cobalt, Molybdenum, Copper, Gold, Cadmium, Zinc, Potassium, Chromium, Cesium, Calcium, Separation techniques, Radioisotopes, Radioactivity techniques, Arsenic radioisotopes, Cadmium radioisotopes, Chlorine radioisotopes, Cobalt radioisotopes, Gold radioisotopes, Potassium radioisotopes, Zinc radioisotopes, Strontium radioisotopes, *Trace elements, Halogens, Alkali metals, Alkaline earth metals, Heavy metals, Irradiation.
Identifiers: *Biological samples, *Gamma spectrometry, Orchard leaves, Kidney, Heart, Tissue, Vanadium, Arsenic, Antimony, Selenium, Samarium, Europium, Indium, Barium, Technetium, Gallium, Tungsten, Lanthanum, Scandium, Cerium, Rubidium, Counting.

Quantitative and qualitative information were obtained on 31 elements by chemical group separation and gamma spectrometric analysis of freeze dried samples of kidney, heart, and NBS Standard Reference Material 1571, orchard leaves. One gram samples were destructively irradiated for 8 hrs prior to chemical separation. Four sets on non-destructive irradiations were carried out on samples for various periods of time, permitting analysis of eight elements not determined in the chemically processed groups (Al, Cl, Mg, Mn, V, Sr, As, Sb, Se). After irradiation the samples were digested in a sulfuric acid-nitric acid mixture and Br-82 was determined in the volatile phase by gamma counting. The residue phase was dissolved in HCl, passed through a hydrated antimony pentoxide mesh column extraction system, and Na-24 was determined as above. Effluent from the extraction was passed through a column of Dowex 1-X8 and the collected solution saved for further analysis. The resin was eluted with HCl and the eluate and resin counted separately. The eluate yielded Fe-59, Co-60, Mo-99, Ga-72, Tc-99m, Cu-64 and W-187 while the resin yielded Au-198, Cd-115, In-115m, Zn-69m, Zn-65 and As-76. The previously collected solution was evaporated, the residue dissolved in HCl and passed through a column of Bio-Rad Ag 50W-X12. The resin group yielded counts for Sc-47, La-140, Ce-141, Ba-131, Sm-153, Eu-152m, the eluate group contained K-42, Cr-51, Rb-86, Cs-134, and Sc-46. Tabulated abundances correlate well with the NBS certified values. (Mackan-Battelle)
W72-12924

ATOMIC ABSORPTION AND FLUORESCENCE SPECTROPHOTOMETRY WITH A CARBON FILAMENT ATOM RESERVOIR PART IX. THE DIRECT DETERMINATION OF SILVER AND COPPER IN LUBRICATING OILS,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
J. F. Alder, and T. S. West.
Analytica Chimica Acta, Vol 58, No 2, p 331-337, February 1972. 4 fig, 5 tab, 5 ref.

Descriptors: *Copper, *Oil, *Heavy metals, Lubricants, Calcium, Chromium, Iron, Lead, Zinc, Phosphorus, Sulfur, Pollutant identification, Chemical analysis, Absorption, Aqueous solutions, Organic compounds, Fluorescence, Trace elements.
Identifiers: *Atomic absorption spectrophotometry, *Fluorescence spectrophotometry, *Silver, Barium, Detection limits, Sensitivity, Carbon filament, Atom reservoir, Chemical interference.

A method for the direct determination of silver and copper in clean and used lubricating oils utilizes atomic absorption and fluorescence spectrophotometry with a carbon filament atom reservoir. The oil sample is pipetted onto the carbon filament and the volatile fractions are evaporated off at various low temperature levels. The metal is then atomozed by increasing the filament temperature to 2500-2700 C and the free, transitory atoms produced above the surface of the filament are measured by an atomic absorption technique utilizing a slightly modified conventional atomic absorption spectrophotometer in conjunction with hollow-cathode lamps as line sources. Due to the considerable amount of noise on the atomic absorption signal, detection limits were poor but the sensitivities were good; absolute sensitivities of 0.13 and 0.22 picograms were obtained for copper and silver. A ready determination of silver and copper in both clean and used lubricating oils can be obtained through the use of this method. The

only serious interferences from elements normally present in lubricating oils are calcium on copper and barium on silver. The fact that the nominal 2400 ppm calcium content in the engine oils did not noticeably affect the copper determinations compared to the spectrographic analyses indicated that the form in which the calcium was present could be of significance or that the spectrographic method is equally affected by the presence of calcium. (Byrd-Battelle)
W72-12931

SIMULTANEOUS MICRODETERMINATION OF NITRATES AND NITRITES BY DIFFERENTIAL GASOMETRIC REACTION,
Ain Shams Univ., Cairo (Egypt). Dept. of Chemistry.
S. S. M. Hassan.
Analytica Chimica Acta, Vol 58, No 2, p 480-483, February 1972. 2 tab, 11 ref.

Descriptors: *Nitrates, *Nitrites, *Chemical analysis, Ureas, Nitrogen, Chemical reactions, Reduction (Chemical), Nitrogen compounds, *Aqueous solutions, Water analysis.
Identifiers: Precision, Sulphamic acid, Nitrous oxide, Recovery.

A method for the simultaneous microdetermination of nitrites and nitrates in various binary mixtures utilizes an apparatus consisting of a reaction vessel connected to a Dewa flask containing solid carbon dioxide and to a micronitrometer containing fresh 50 percent KOH solution. Samples containing nitrite and nitrate (3-8 mg of each) are weighed into the reaction vessel and purged with carbon dioxide (100 bubbles/min). A saturated aqueous solution of sulphamic acid or urea is added and the liberated nitrogen gas collected until the reaction is completed. The percent nitrite present is based on the assumption that one mole of nitrogen is equivalent to one mole of nitrite. Once the nitrogen gas is removed, the system is purged with CO2 for 2 min and HCl is added. The reaction vessel is heated to boiling until the reaction is completed. The volume of nitrous oxide gas collected indicates the amount of nitrate present; one mole of nitrous oxide is equivalent to one mole of nitrate. Various mixtures of different nitrate samples with potassium nitrite were analyzed with sulphamic acid and urea. With sulphamic acid, the average recovery was 99.2 and 99.1 percent, respectively, for nitrates and nitrites; and 99.6 and 99.9 percent, respectively, using urea. Reduction with sulphamic acid is recommended since the reaction proceeds more smoothly and rapidly than with urea. (Snyder-Battelle)
W72-12932

INTERFERENCE OF FATS IN THE DETERMINATION OF MERCURY RESIDUES IN FISH BY ATOMIC ABSORPTION SPECTROMETRY,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
J. G. Saha, and Y. W. Lee.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 5, p 301-304, May 1972. 2 tab, 3 ref.

Descriptors: *Lipids, *Mercury, *Fish, Heavy metals, Chemical analysis, Methodology, Organic compounds, Organic matter, Solvent extractions, Ions.
Identifiers: *Chemical interference, *Atomic absorption spectrometry, Biological samples, Tissue, Lard, Corn oil, Cod liver oil.

Two atomic absorption spectrometric methods for determining mercury residues in fish are compared and an assessment made of the effect of the presence of fat on mercury determinations by these methods. About 5 or 10 mg of fat (lard, corn oil or cod liver oil) were added to the reagent blanks in both methods and the apparent mercury content determined. Mercury content of the reagent blanks (without the addition of fat or fish tissue) in both the methods was determined and the results corrected accordingly. The method of Wobeser et al. gave consistently higher values than that of Saha et al. for the mercury content of the fish examined. With the former method, the addition of fat to the reagent blank gave an apparent 'mercury' peak in the AA spectrometer whereas the Saha et al. method gave no 'apparent mercury' because the fats are removed with chloroform before extraction of mercuric ions with dithizone. These results indicate that in the wet oxidation methods of determining mercury in fish tissue any fat remaining in the digests can interfere in the estimation of mercury by atomic absorption spectrometry and give high values. This interference can, however, be easily removed by extraction of the digests with chloroform prior to the recovery of mercuric ions with dithizone. (Holoman-Battelle)
W72-12933

DDT-DEHYDROCHLORINASE FOR IDENTIFICATION OF DDT IN SOIL,
Alberta Univ., Edmonton. Dept. of Entomology.
R. H. Gooding, and H. G. Philip.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 5, p 288-291, May 1972. 3 tab, 3 ref.

Descriptors: *Soil analysis, *DDT, *DDE, *Chemical reactions, Chemical analysis, Enzymes, Pollutant identification, Soils, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Metabolism, Gas chromatography, Solvent extrations, Separation techniques, Aroclors.
Identifiers: *DDT-dehydrochlorinase, Chemical interference, Sample preparation, Aroclor 1221, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, Metabolites.

DDT-dehydrochlorinase extracted from DDT-resistant houseflies was used to confirm the identification of DDT by enzymatically converting DDT to DDE. Samples containing 0.001-10.0 micrograms of DDT were evaporated to dryness after which the residue was dissolved in dimethyl sulfoxide, combined with a DDT-dehydrochlorinase solution, gased with nitrogen, incubated, and extracted into an organic layer with saturated sodium sulfate followed by 2:1 cyclohexane: 2-propanol mixture. The organic layer was injected into a gas chromatograph equipped with a Pyrex column and a tritium foil detector. In the application of this method to soil analysis, samples were extracted in acetone-acetonitrile followed by a clean-up through petroleum ether and an activated florisil column. All the samples analyzed contained significant amounts of material identified as DDT but not metabolizable by DDT-dehydrochlorinase. Aliquots of the above samples were checked to determine if there were materials extracted from the soil which interfered with the complete metabolism of the DDT present. No enzymatic inhibitions by contaminants in the extracts were detected. Most of the contaminants were PCB's. Further testing with several PCB's (Aroclors) revealed that they do not interfere with the enzymatic confirmation of DDT. (Holoman-Battelle)
W72-12934

THE MICRODETERMINATION OF CALCIUM BY THE USE OF AMBERLITE IRC-50 RESIN AND GLYOXAL BIS (2-HYDROXYANIL),
Medical Research Council, Oxford (England).
G. Hunter.
Analyst, Vol 97, No 1152, p 233-237, March 1972. 1 tab, 6 ref.

Descriptors: *Calcium, *Colorimetry, Phosphates, Silicates, Aqueous solutions, Resins, Ions, Ion exchange, Water analysis, Methodology, Color reactions, Indicators, Inhibitors, Chemical reactions, Carbonates.
Identifiers: *Glyoxal bis (2-hydroxyanil), *Amberlite IRC-50 resin, *Microanalysis, Distilled water, Chemical interference, Absorbance, Citric acid, Sample preparation.

Conditions have been described for the use of Amberlite IRC-50 resin and glyoxal bis (2-hydroxyanil), GBHA, in the microdetermination of calcium in solutions containing phosphate. Determinations of calcium in deionized distilled water are made colorimetrically by placing a neutral or slightly acidic solution containing less than 5 micrograms of calcium into a colorimeter tube and adding water for a total volume of 1.4 ml. Two ml of methanol and 0.2 ml of GBHA solution are added plus 0.33 ml of 0.10 N sodium hydroxide solution. The solution will develop a clean red color which should be read within 3 minutes. Readings are recorded against a blank of 1.4 ml of water, and under the conditions described, 1 microgram of calcium will read between 10 and 12 on the colorimeter scale. For acidic solutions, additional sodium hydroxide is needed, and a procedure for its addition is described. The effects of various ions on this reaction are described and procedures given for the use of Amberlite IRC-50 resin with GBHA as an indicator in determining trace amounts of calcium in the presence of phosphate. Simple procedures for the determination of phosphate and silicate are also given. (Mortland-Battelle)
W72-12937

THE USE OF A MIXED-SOLVENT SYSTEM FOR THE DETERMINATION OF CALCIUM AND ZINC IN PETROLEUM PRODUCTS BY ATOMIC-ABSORPTION SPECTROSCOPY,
Shell Research Ltd., Chester (England). Thornton Research Centre.
S. T. Holding, and P. H. D. Matthews.
Analyst, Vol 97, No 1152, p 189-194, March 1972. 2 tab, 1 ref.

Descriptors: *Calcium, *Zinc, Oil, Spectroscopy, Oil industry, Metals, Inorganic compounds, Solvent extractions, Separation techniques.
Identifiers: *Oil characterization, *Atomic absorption spectroscopy, Transmission fluids, Hydrochloric acid, Organic solvents, Sample preparation, Precision, Absorbance, Petroleum products.

A mixed-solvent system that permits the use of inorganic compounds as standards has been applied to the determination of calcium and zinc in unused lubricating oils and automatic transmission fluids by atomic-absorption spectroscopy. By the incorporation of hydrochloric acid into the solvent system, it has been possible to eliminate the systematic errors that may occur when an air - acetylene flame is used in the determination of calcium. A sample containing about 0.5 mg calcium is weighed into a 50 ml beaker to which is added ten ml of mixed solvent (cyclohexanone, alcohol, industrial methylated spirit-50:30:20) and 5 ml concentrated hydrochloric acid. The mixture is shaken, heated to 40 C and transferred to a 100-ml calibrated flask by use of about 60 ml of mixed solvent and 5 ml water. For zinc, oil containing about 0.1 mg zinc is weighed directly into a 100 ml calibrated flask and 60 ml of the mixed solvent and 5 ml of hydrochloric acid are added. After shaking, 5 ml of water are added. In both cases, after further shaking the mixed solvent is added to bring the solution up to the calibration makr. A fuel-lean air - acetylene flame is used for the determination to give good precision. Results have been obtained for a wide range of unused lubricating oils and automatic transmission fluids and there is good agreement with those obtained by X-ray fluorescence and established Institute of Petroleum, chemical procedures (I.P. 111/49T Method B and I.P. 117/66T Method B). (Mortland-Battelle)
W72-12939

INTERDISCIPLINARY MONITORING OF THE NEW YORK BIGHT,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
W. G. Egan, J. M. Cassin, and M. E. Hair.
Available from the National Technical Information Service as AD-737 506, $3.00 in paper copy, $0.95 in microfiche. Grumman Research Department Memorandum No RM-534J, January 1972. 15 p, 5 fig, 7 ref.

Descriptors: *Instrumentation, *Monitoring, *Water properties, *On-site data collections, New York, Bioluminescence, Biological properties, Chlorophyll, Turbidity, Sampling, Mathematical models, Estuarine environment, Salinity, Chemical analysis, Biomass, Dissolved oxygen, Thermocline, Hydrogen ion concentration, Flow, Chemical properties, Physical properties, Hudson River, Depth, Water temperature, Nutrients, Algae, Nitrogen, Phosphorus, Dinoflagellates, Laboratory tests, Water quality control, On-site investigations, Physiochemical properties, Water quality.
Identifiers: *New York Bight, Collaborative studies.

Interdisciplinary physical, chemical, and biological measurements were made in the New York Bight during 1969-70 using new in situ electronic instrumentation, with associated monitoring by conventional procedures to check the performance. This new equipment was partly an original design and partly modified commercial instrumentation and included photometric sensors and a modified Beckman conductivity cell, photovolt flow type electrode sensor, and Delta Scientific oxygen probe. This equipment was found to be feasible for the measurement of chlorophyll (and the related biomass), bioluminescence, Gelbstoff, pH, dissolved O2, salinity, and the location of the thermocline. It appears that the in situ instrumentation may be adapted to continuous synoptic monitoring of the estuarine and oceanographic parameters necessary for mathematical modeling. (Snyder-Battelle)
W72-12941

SPECTROPHOTOMETRIC DETERMINATION OF ARSENITE, ARSENATE, AND PHOSPHATE IN NATURAL WATERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. L. Johnson, and M. E. Q. Pilson.
Analytica Chimica Acta, Vol 58, No 2, p 289-299, February 1972. 5 fig, 3 tab, 19 ref.

Descriptors: *Spectrophotometry, *Phosphates, Chemical reactions, Arsenic compounds, Chemical analysis, Metals, Molybdenum, Oxidation, Methodology, Reduction (Chemical), Color reactions, Water pollution sources, Water analysis, Pollutant identification.
Identifiers: *Arsenate, *Arsenite, Arsenic, Precision, Dection limits, Absorbance.

A relatively simple method, based on the work of Johnson (1971), has been developed for the routine analysis of arsenite, arsenate, and phosphate by spectrophotometric measurement of the arsenic and phosphate molybdenum blue complexes. A reducing agent is used to lower the oxidation state of the arsenic present in the samples chosen to a plus 3, eliminating any absorbance caused by molybdoarsenate since arsenite will not form the molybdenum complex. This, in effect, results in measurement of an absorbance value for phosphate alone. A mixed (color) reagent added to 'untreated' samples produces color from both molybdophosphate and molybdoarsenate, and the difference between the 2 absorbances is therefore proportional to the arsenate concentration. An oxidizing agent, iodate, is added to samples chosen for oxidation to convert arsenite to arsenate. The experimental conditions are such that the absorbance difference between an 'oxidized' and a 'reduced' sample is the absorbance arising from total inorganic arsenic. The arsenite concentration is then calculated as the difference between total-As and arsenate-As. The method has been shown to be applicable to fresh and salt water samples where the total concentration of arsenic is less than about 3 micromoles. Recovery experiments for various quantities of phosphate, arsenate, and arsenite added to Sargasso Sea water were accurate within plus or minus 0.017 and 0.012 for arsenate or arsenite and phosphate, respectively. (Mackan-Battelle)
W72-12942

SIMULTANEOUS ASSAY OF CALCIUM-45 AND STRONTIUM-89 IN DOUBLE-ISOTOPE BIOLOGICAL SAMPLES BY LIQUID SCINTILLATION COUNTING,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
J. E. Hardcastle, W. H. Fuller, and R. J. Hannapel.
Analytical Biochemistry, Vol 46, No 2, p 534-547, April 1972. 3 fig, 6 tab, 8 ref.

Descriptors: *Radiochemical analysis, Calcium, Strontium radioisotopes, Bioassay, Soil analysis, Cations, Anions, Spectrometers, Aqueous solutions, Vegetation, Barley, Ammonium salts, Salts, Iron, Potassium, Sodium, Radioactivity techniques.
Identifiers: *Ca-45, *Sr-89, *Biological samples, *Liquid scintillation spectrometry, Barium, Chemical interference, Precision, Sample preparation, Wet ashing.

The method for simultaneously counting Ca-45 and Sr-89 in samples from radiotracer experiments involves (1) drying aqueous samples containing the radionuclides (and salt carrier), (2) dissolving the salt residues in the alkyl phosphate/toluene/fluor (scintillation) solution, and (3) analyzing the double-isotope samples in a liquid scintillation spectrometer. Prior to assay, biological samples must be digested and converted to chloride salts. A standard nitric acid-hydrogen peroxide wet ashing technique is used to digest plant samples and concentrated HCl added to convert the residues to chloride salt. Soil samples are treated with sodium acetate to extract Ca-45 and Sr-89 and wet-ashed as above to remove organic material and convert the radioisotopes to chloride salt. Based on expected and experimentally determined standard deviations, a precision better than one percent is possible for samples with rates of 10,000 cpm; low counting rates reduce precision to 3-4 percent. Maximum counting efficiencies of 87 and 65 percent were obtained for standards of Ca-45 and Sr-89, respectively. The digestion technique using barley straw showed recoveries of over 90 percent and about 5 percent precision for both isotopes. Large amounts of the insoluble ferric, Ba, K, Na, and ammonium salts and other cations were found to cause serious counting problems. (Holoman-Battelle)
W72-12943

THE DETERMINATION OF MERCURY BY ATOMIC-ABSORPTION SPECTROPHOTOMETRY WITH THE 'DELVES SAMPLING CUP' TECHNIQUE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
D. Clark, R. M. Dagnall, and T. S. West.
Analytica Chimica Acta, Vol 58, No 2, p 339-346, February 1972. 3 fig, 1 tab, 18 ref.

Descriptors: *Mercury, *Spectrophotometry, Chemical analysis, Ions, Calibrations, Aqueous solution.
Identifiers: *Delves cup method, *Atomic absorption spectrophotometry, Chemical interference, Detection limits, Flame atomization, Absorbance.

An extension of the Delves cup method was used in the determination of mercury by atomic absorption spectrophotometry. A microsampling apparatus involving a nickel absorption tube and nickel foil crucible (Delves Sample Cup) was constructed and the whole assembly designed so that the crucible could be precisely moved in and out of the flame, with the nickel crucible fitted directly below the aperature in the underside of the absorption tube when in the atomization position. Absorbance measurements were made at 253.65 nm on standard Hg solutions prepared by diluting a stock solution (1 mg Hg/ml) of Hg (II)chloride dissolved in 1M HCl. Calibration curves were constructed by plotting peak height versus mercury concentration. A double absorption peak was obtained and a detection limit of 0.17 ng Hg was achieved using a 5-microliter sample and a triple-row capillary hydrogen diffusion flame. The optimal flame type and absorption tube temperature were considered in relation to the sensitivity and degree of interference from extraneous ions. The interferences observed in the described method of atomization was not deemed to be common to the conventional techniques. (Mackan-Battelle)
W72-12944

MICROTURBELLARIANS FROM FRANCONIA: A CONTRIBUTION TO THE KNOWLEDGE OF SYSTEMATICS AND ECOLOGY OF TURBELLARIA EXCL. TRICLADIDA IN SOUTHERN GERMANY, (DIE KLEINTURBELLARIEN FRANKENS EIN BEITRAG ZUR SYSTEMATIK UND OKLOGIE DER TURBELLARIA EXCL. TRICLADIDA IN SUDDEUTSCHLAND),
Erlangen-Nuremberg Univ. (West Germany). Zoologisches Institut.
J. Bauchhenss.
Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 4, p 609-666, 1971. 21 fig, 1 tab, 121 ref.

Descriptors: *Systematics, *Ecology, Aquatic animals, Invertebrates, Seasonal, Phenology, Distribution patterns.
Identifiers: *Turbellaria, Flatworms, Periodicity, Taxocenes, Oligochoerus limnophilus, Catenula lemnae, Catenula macrura, Suomina turgida, Stenostomum spp., Rhynchoscolex simplex, Microstomum spp., Prorhynchus stagnalis, Geocentrophora sphyrocephala, Plagiostomum lemani, Bothrioplana semperi, Microdalyellia spp., Gieysztoria spp., Castrella truncata, Microdalyellia rossi, Castrella vernalis, Typholplana viridata, Typhloplana halleziana, Styloplanella strongylostomoides, Castrada spp., Strongylostoma radiatum, Dochmiotrema limnicola, Rhynchomesostoma rostratum, Olishtanella truncula, Olisthanella obtusa, Krumbachia styriaca, Mesostoma spp., Bothromesostoma personatum, Phaenocora spp., Opistomum pallidum, Gyratrix hermaphroditus, Opisthocystis goettei.

Sixty-one microturbellarian species exclusive of the Order Tricladida were collected from freshwater habitats of Franconia (Southern Germany) and their taxonomy, ecological needs, and seasonal occurrence studied. Species found for the first time in Germany were: Catenula macrura, Stenostomum grabbskogense, Stenostomum arevaloi franconia, Macrostomum obtusum, Macrostomum orthostylum, Microdalyellia microphthalma, Microdalyellia brevispina, Castrella vernalis, Styloplanella strongylostomoides, Castrada perspicua, Krumbachia styriaca. Stenostomum arevaloi franconia n. ssp. was separated from Stenostomum arevaloi. Its refractile bodies are all of the same diameter. This subspecies is exclusively found in Franconia. Phenological groups were established according to the seasonal occurrence of species in Franconia. The curve of seasonal distribution of the species shows two peaks during the year (June, August) and the great number of eurychrone species is very conspicuous. According to the biotic and abotic features, the microturbellarian taxocenes described were associated with 12 definite types of habitats. These taxocenes are characterized by

characteristic species, a special combination of species, or by the absence of certain species. (Holoman-Battelle)
W72-12945

ANALYSIS OF TOXIC METALS IN TRADE EFFLUENTS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
P. J. Belling.
Effluent and Water Treatment Journal, Vol 9, No 6, June 1969, p 314-318, 332, 5 tab.

Descriptors: *Analytical techniques, *Spectrophotometry, *Metals, *Industrial wastes, Chromium, Copper, Manganese, Iron, Sodium, Sulfates, Phosphates, Zinc, Pollutant identification.
Identifiers: *Atomic absorption spectrophotometry, *Electroplating industry, Interference effects, Nickel, Interference suppression agent, Strontium chloride, Hydrochloric acid, Toxic metals.

Atomic absorption spectrophotometry has been utilized in the determination of the more important toxic metals, i.e., chromium, copper, nickel, zinc, and manganese found in effluents from the electroplating industry. The interference effects produced by iron, sodium, phosphate and sulfate on the determination of chromium, copper, manganese, nickel and zinc were investigated. The mutual interaction of chromium and nickel was also examined. The absorption of chromium was depressed by iron and nickel, and the absorption of nickel was enhanced by iron, chromium, and sodium. Interference with the determination of copper, manganese and zinc was insignificant at iron/metal ratios of up to 200:1. The only interference effect noticed for phosphate and sulfate was the depressed absorption of nickel by phosphate. The use of 1% W/V of strontium chloride and 5% V/V of hydrochloric acid as an interference suppression agent resulted in satisfactory recovery of the added toxic metal at levels likely to be found in trade effluents. (Galwardi-Texas)
W72-12963

THE VALUE OF THE SEED GERMINATION TEST FOR EVALUATING THE TOXIC ACTION OF POLLUTED WATER,
Leipzig Univ. (East Germany). Hygiene-Institut.
G. Vogler.
Z Gesamte Hyg Grenzgeb. Vol 17, No 8: p 582-585. 1971.
Identifiers: *Pollutant identification, Chlorination, *Germination, Seeds, Sinapis alba D, Testing, Toxicity.

In the seed germination test, seeds of Sinapis alba are placed on filter paper in sterilized Petri dishes in part contact with water to be tested for suitability for agricultural irrigation. After 2 or 3 days in the dark, the hypocotyl or root length is measured in comparison with root length of control seed in unchlorinated drinking water. Reduced root growth is evidence of pollution and perhaps cause for rejection of the water. This test was studied and found wanting on 2 counts: seed germinating conditions are physiologically different from those in ordinary growing photosynthesizing plants, and Sinapis alba seeds are not a suitable test object.--Copyright 1972, Biological Abstracts, Inc.
W72-13010

5B. Sources of Pollution

LIQUID-WASTE DISPOSAL AT THE LINFIELD DISPOSAL SITE, DALLAS, TEXAS,
Geological Survey, Austin, Tex.
E. R. Leggat, J. F. Blakey, and B. Massey.
Geological Survey Report, May 1972. 28 p, 4 fig, 3 tab, 2 ref.

Descriptors: *Water pollution sources, *Liquid wastes, *Waste disposal, *Texas, Seepage, Infiltration, Groundwater, Streams, Water analysis, Chemical analysis, Water chemistry.
Identifiers: *Dallas, *Unlined pits.

The disposal of liquid wastes in unlined pits at the Linfield disposal site in south Dallas, Texas, has resulted in percolation of the waste materials into the underlying groundwater reservoir. In effect, the pits are point sources of recharge and pollution, not only to the groundwater body, but to the Trinity River, which is the ultimate point of natural discharge of the groundwater. Continued use of the pits can result only in further degradation of the quality of the groundwater. Water level measurements were used to construct a water-table map which shows a radial outflow from the recharge mound developed in the immediate vicinity of the pits. Upon reaching the water table, which is no more than 2 or 3 feet below the bottom of the pits, the effluent mixes with the groundwater and moves down the hydraulic gradient, eventually to be discharged to the river. The heterogeneous groundwater quality observed in the test wells results from the different types and volumes of liquids being placed in the pits and from the random cycle followed in filling the pits. Although values for most water-quality parameters varied greatly both in time and place, the waters from all test wells were highly mineralized. (Woodard-USGS)
W72-12414

HEAVY METAL CONTENT OF SOME RIVERS AND LAKES IN WALES,
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, and L. G. Royle.
Nature, Vol 238, No 5363, p 329-330, August 11, 1972. 1 fig, 11 ref.

Descriptors: *Heavy metals, *Trace elements, *Water pollution sources, Manganese, Copper, Lead, Iron, Cadmium, Nickel, Zinc, Path of pollutants, Water quality, Data collections.
Identifiers: *Wales.

Welsh rivers and lakes are remarkably free from domestic and industrial pollutants, but because of the presence of mineral deposits and the remains of mining activities, they are likely to have small but significant concentrations of heavy metals that may cause severe deterioration of the water quality. For example, the presence of lead, zinc and copper in some Welsh streams causes a high mortality rate in fish and other living populations of these streams, and the heavy metals carried to the sea by Welsh rivers are the primary source of these metals in Cardigan Bay. But since the cessation of mining activities in the early part of this century, some rivers have shown some recovery from the effects of lead pollution. Different metals occur at high concentrations in the various rivers. The River Ystwyth, reported in 1936 to be lead and zinc polluted, and more recently to be recovering, contains moderately high zinc and lead ranging between 200-270 micrograms Zn/liter and 2-6 micrograms Pb/liter. Manganese and cadmium are moderate (7-15 and 1.1-1.3 micrograms/liter respectively), The River Rheidol is found to be rich in manganese (9-28 micrograms/l) and zinc, cadmium and lead levels are moderately high. The largest total amount of metals is found in the River Twymyn, where the zinc, copper, lead, cadmium, manganese and nickel levels are high. The River Mawddach shows a high copper content whereas its zinc content is only just above the value for average clean water. The unusually high average manganese concentrations found at the head of the Mawddach, Dwyryd and Dysynii estuaries are possibly caused by the occasional interaction between saline water and the suspended hydrated manganese oxide carried down by the stream. (Knapp-USGS)
W72-12425

OIL SLICKS AND FILMS.
Defense Documentation Center, Alexandria, Va.

Available from NTIS, Springfield, Va. 22151 as AD-738 500, Price $3.00 paper copy; 95 cents microfiche. Defense Documentation Center Bibliographic Report DDC-TAS-71-64, March 1972. 74 p, (DDC Bibliography for the period September 1961-March 1971).

Descriptors: *Bibliographies, *Oil spills, *Water pollution sources, *Oil pollution, *Documentation, Oceans, Seashores, Beaches, Estuaries, Ecology, Cleaning, Methodology, Environmental effects, Information retrieval.

This unclassified bibliography on oil pollution was compiled from the entire Defense Documentation Center's data bank (January 1953 - November 1971). References pertain to the cleaning and removal of oil slicks, oil films, and related films from water surfaces. Included are Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes. (Woodard-USGS)
W72-12426

ADVANCED NONTHERMALLY POLLUTING GAS TURBINES IN UTILITY APPLICATIONS.
United Aircraft Research Labs., East Hartford, Conn.

Copy available from GPO Sup Doc EPA 16130 DNE 03/71, $2.00; microfiche from NTIS as PB-211 283, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1971. 264 p, 82 fig, 31 tab, 142 ref. EPA Program 16130 DNE 03/71.

Descriptors: *Thermal powerplants, *Thermal pollution, Economics, Comparative costs, Steam turbines, *Water cooling, *Electric power, *Utilities.
Identifiers: *Gas turbines.

Performance, size and cost for advanced simple-regenerative-, and compound-cycle gas turbine engines were reviewed. For various regions of the U.S., comparisons were made of installed costs and total busbar power costs of a 1000-MW power station using gas turbines versus one using steam turbines. It is shown that the gas turbines in the 1970 decade could produce electric power at lower costs than steam turbines in the South Central U.S. where natural gas is readily available. Elsewhere in the U.S. the gas turbines would be economically competitive if moderately priced clean fuels were available. Advanced gas turbines are expected to become more competitive in the 1980's as anticipated increases in turbine inlet temperature, component efficiencies and larger engine designs lead to more efficient and lower cost engines. Although the development costs for large advanced gas turbines would approach 100 to 200 million dollars, the total amount that utilities are expected to expend for cooling devices to combat thermal pollution over the next two decades is more than ten times this amount. (Eagle-Vanderbilt)
W72-12450

HEATED SURFACE JET DISCHARGED INTO A FLOWING AMBIENT STREAM,
National Center for Research and Training in the Hydrologic and Hydraulic Aspects of Water Pollution Control, Nashville, Tenn.
L. H. Motz, and B. A. Benedict.
Copy available from GPO Sup Doc EPA 16130 FDQ 03/71, $1.75; microfiche from NTIS as PB 211 284, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1971. 207 p, 75 fig, 16 tab, 48 ref. EPA Program 16130 FDQ 03/71.

Descriptors: *Cooling water, *Thermal pollution, *Jets, *Turbulent flow, *Thermal powerplant, Heated water, Thermal stratification, Diffusion

/ater temperature, Heat exchange, Temperature, ensity stratification, On-site investigations.
lentifiers: *Heat discharge, Buoyant jets, Am- ent fluids, Temperature profiles.

he temperature distribution in the water body ıe to a discharge of waste heat from a thermal- ectrical plant is a function of the hydrodynamic ariables of the discharge and the receiving water ody. The temperature distribution can be escribed in terms of a surface jet discharging at me initial angle to the ambient flow and being eflected downstream by the momentum of the nbient velocity. It is assumed that in the vicinity the surface jet, heat loss to the atmosphere is egligible. It is concluded that the application of e two dimensional surface jet model is depen- nt on the velocity ratio and the initial angle of scharge, and the value of the initial Richardson mber, as low as 0.22. Both laboratory and field ta are used for verification of the model which ıs been developed. Laboratory data is used to aluate the two needed coefficients, a drag coef- ient and an entrainment coefficient, as well as e length of the zone of flow establishment and e angle at the end of that zone. (Eagle-Van- rbilt)
72-12451

JRFACE DISCHARGE OF HEATED WATER,
innesota Univ., Minneapolis. St. Anthony Falls ydraulic Lab.
. Stefan, N. Hayakawa, and F. R. Schiebe.
opy available from GPO Sup Doc EPA 16130 SU 12/71, $2.00; microfiche from NTIS as PB- 1 285, $0.95. Environmental Protection Agency, ater Pollution Control Research Series, ecember 1971. 256 p, 86 fig, 4 tab, 66 ref. EPA ogram 16130 FSU 12/71.

escriptors: *Outlets, *Thermal pollution, Mathematical models, Jets, Flow, Mixing, akes, Entrainment, *Model studies, *Heated ater, *Discharge (Water).
entifiers: Thermal plume data, *Surface scharge.

comprehensive analytical model has been veloped to describe the flow of heated water om a channel onto the surface of a lake or reser- ir. This analytical tool can be used to predict pth, width, temperature, and flow velocity in a ated water surface jet. Weak cross-currents and nds are included. The model also predicts the tal amount of heat actually lost to the at- osphere and the amount of ambient water en- ined. As presented, the analytical method is mple and inexpensive to apply. It assumes fully tablished buoyant jet flow into a homogeneous vironment. It can be extended to include, for ex- mple, an outlet zone (zone of flow establishment) stratification in the ambient water. Criteria for e existence of the two-dimensional mixing inter- l hydraulic jump and the rates of entrainment hich it may produce have been established eoretically and verified with a limited number of perimental data. The results of two field surveys a thermal plume are presented. Comparisons th laboratory data illustrate the outstanding sig- ficance of the densimetric Froude number and e relative insignificance of the Reynolds number modeling parameters. (Eagle-Vanderbilt)
72-12452

TEST SIMULATION OF THE TEMPERA- JRE OF THE ILLINOIS RIVER AND A PRE- CTION OF THE EFFECTS OF DRESDEN II ND DRESDEN III REACTORS,
ttelle Memorial Inst., Richland, Wash. Pacific rthwest Lab.
T. Jaske.
vailable from the National Technical Informa- n Service as BNWL-728, $3.00 in paper copy, .95 in microfiche. AEC Research and Develop- nt Report No. BNWL-728, UC-2, April 1968. 35 18 fig, 4 tab, 9 ref. AEC AT (45-1) - 1830.

Descriptors: *Temperature, *Forecasting, *Thermal pollution, Weather data, Froude number, Stratified flow, *Water temperature.
Identifiers: *Colheat simulation system, *Illinois River, Advected heat, Flow records, Thermal regime.

Two test simulations that involve application of the digital simulation system were performed. Actual data collected at two widely differing drainage basins were used. The results of the Illinois River simulation and the prediction of the effects of the thermal loading to be imposed by the operation of Dresden 2 and 3 reactors are summarized. It is concluded that the Colheat simulation system is generally adequate to represent the water temperature of the Illinois River within the accuracy of the available data record. The study forecasts significant alteration of the present thermal regime of the Illinois River 39 miles down stream at Ottawa. On a yearly average basis, about 70 percent of the heat of the present Dresden plant is dissipated to the atmosphere before reaching that point. This is expected to decrease to about 60 percent for the combination of Dresden 1 and 2, and to about 50 percent for the three plants. The field data support the validity of Debler's use of the densimetric Froude number as an index of the stratifying tendency of rivers and reservoirs. (Upadhyaya-Vanderbilt)
W72-12454

A PROGRAM TO ASSESS THE THERMAL DISCHARGE FROM A PLANNED NUCLEAR POWER PLANT ON CAYUGA LAKE,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
G. J. Neumaier.
In: Proceedings 12th Conference on Great Lakes Research, University of Michigan, Ann Arbor, May 5-7, 1969, p 664-673. 7 fig, 2 tab, 4 ref.

Descriptors: *Currents (Water), *Remote sensing, *Water temperature, Nuclear powerplants, Mixing, Meteorological data, Instrumentation, Model studies, Infrared radiation, *New York.
Identifiers: *Cayuga Lake (NY).

Cayuga Lake, one of the Finger Lakes in New York State, is the site of an operating fossil-fuel plant and the proposed site of a nuclear power installation. Cornell Aeronautical Laboratory has conducted a program to determine the physical changes that would occur in the lake when the proposed 830 megawatt nuclear power plant goes into operation. The approach taken is described and some samples of the experimental data obtained in the program are presented. Infrared aerial surveys have been taken over the site under a variety of meteorological, seasonal and lake conditions to collect lake surface temperature data for thermal plumes of interest. Four buoys have been placed in the site area. Temperature measurements recorded from a set of 48 thermistors spaced at various depths provide an accurate and nearly continuous picture of the thermocline at those four buoy locations. In addition, lake current and meteorological measurements are being made and used through an extensive modeling program in predicting the thermal changes in the Lake which would result from construction of the nuclear power plant. (Upadhyaya-Vanderbilt)
W72-12456

SIMULATED THERMAL EFFLUENT INTO LAKE ONTARIO,
Toronto Div. of Sanitary Engineering (Ontario). Water Quality Surveys Branch.
M. D. Palmer.
In: Proceedings 12th Conference on Great Lakes Research, University of Michigan, Ann Arbor, May 5-7, 1969, p 674-685. 9 fig, 4 tab, 12 ref.

Descriptors: *Water temperature, *Mathematical models, Forecasting, Winds, Dye releases, Heated water, Dispersion, *Lake Ontario, Model studies, *Simulation analysis, *Thermal pollution.
Identifiers: *Thermal effluent, Variance, Plume.

The dispersion pattern of Duffin Creek water into Lake Ontario was determined under two different wind conditions in the spring time when the flow was 180 cfs and 5F warmer than the lake water. Continuous Rhodamine B dye injection was used to trace the plume. In both studies, the maximum concentration of dye remained very near to the shoreline. Based upon experimental results, a model was developed which predicts maximum concentration within 25 percent for distances up to 4000 ft from the source. The relationship between dye concentration and distance was found. The model applied to an existing thermal generating station at Lakeview was capable of predicting maximum temperatures within 25 percent of measured values. (Upadhyaya-Vanderbilt)
W72-12457

SATELLITE MEASUREMENT OF LAKE-SURFACE TEMPERATURES,
Allied Research Associates, Inc., Concord, Mass.
For primary bibliographic entry see Field 02H.
W72-12460

THE APPLICATION OF AN EMPIRICAL MODEL FOR THE DETERMINATION OF WATER TEMPERATURE IN A THERMALLY POLLUTED IMPOUNDED RIVER (ZASTOSOWANIE MODELU EMPIRYCZNEGO DO WYZNACZANIA TEMPERATURY RZEKI SPIETRZONEJ,OBCIAZONEJZRZUTAMI P ODGRZANYCH WOD),
State Inst. of Hydrology and Meteorology, Warsaw (Poland).
J. Jaworski.
Przeglad Geofizyczny, No. 1-2, p 27-38, 1971. 6 fig, 9 ref.

Descriptors: *Heat balance, *Water temperature, *Forecasting, Hydraulics, *Thermal pollution, Heated water, Model studies.
Identifiers: *Empirical models, *Vistula River.

Starting from a general heat balance equation, a method has been developed which enables the determination of temperature changes in a section of an impounded river that had been thermally polluted. The model can predict the temperature in any profile of the impounded river within an error of 0.3C. Attempts to verify this model under the conditions of a free-flowing river (Narew) under different hydraulic and morphometric conditions were satisfactory and the calculations showed a considerable coincidence with measurements. The empirical model is valid for conditions prevailing in the Vistula River near Nowa Huta. Since the verification of the model was carried out under conditions differing essentially from the experimental conditions, one may expect that the suggested model may be used for other rivers featuring similar hydraulic and morphometric conditions. (Upadhyaya-Vanderbilt)
W72-12463

TRANSACTIONS OF THE THERMAL EFFLUENT INFORMATION MEETING.
For primary bibliographic entry see Field 05D.
W72-12466

THERMAL EFFLUENT-WHAT IT IS, WHERE IT COMES FROM AND WHERE IT GOES,
Idaho State Univ., Pocatello. Dept. of Nuclear Science and Engineering.
A. E. Wilson.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970, Idaho Nuclear Energy Commission, Idaho Falls, Idaho, (1970), p 7-17.

Descriptors: *Thermal pollution, *Heat balance, *Energy loss, Energy conversion, Thermal powerplants, Evaporation, Heat transfer, Temperature, *Path of pollutants.

The relationship between heat energy and temperature is explained. Thermal effluents are present in large numbers of energy conversions, but the ones of concern are those which produce a concentrated effluent source. At the present thermal electric generating capacity and assuming an average efficiency of 35%, there must be nearly 600 million kilowatts of waste heat somewhere in the country. The amount of waste heat continues to increase. Waste heat is dumped either directly or indirectly into the air, water, or the earth or it evaporates water. At the present rate of increase of energy use, in 100 years the mean surface temperature of the earth will have risen about 2.5 degrees F. It is not certain what the effect would be but a rise of 5 degrees is estimated to be enough to melt the polar ice caps. (See also W72-12466) (Eagle-Vanderbilt)
W72-12467

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT JULY-DECEMBER 1970,
Battelle Pacific Northwest Labs., Richland, Wash.
T. H. Essig.
Available from the National Technical Information Service as BNWL-1613, $3.00 in paper copy, $0.95 in microfiche. Report No BNWL-1613, September 1971, 20 p, 3 fig, 5 tab, 5 ref.

Descriptors: *Nuclear wastes, *Groundwater, *Radioisotopes, *Monitoring, Nitrates, Tritium, Tracers, Strontium radioisotopes, Potable water, Water pollution effects, Radioactive Wastes, Sediments, Ions, Water pollution sources, Evaluation, Radioactive waste disposal.
Identifiers: Rubidium radioisotopes, Uranium, Cesium radioisotopes, Rhodium.

The status of groundwater contamination resulting from disposal of Hanford plant effluents is evaluated. It is assumed that the radionuclides Ru-106 and tritium, and the nitrate ion move at essentially the same rate as groundwater. In addition, they can be detected in groundwater at low concentrations relative to their respective drinking water standards. Therefore, they are used to trace the groundwater flow pathes away from the major disposal sites. The Ru-106-Rh and tritium concentrations measured in the unconfined groundwater during the second half of 1970 show that the zones of detectable contamination extend in an easterly to southeasterly direction from 200-E Area (chemical processing areas) as observed in the past. For the first time, concentrations were measured over a geographically extensive area in the vicinity of the 100 Areas (production reactor areas). The few locations for which average groundwater concentrations exceeded the Concentration Guide for Ru-106 were all within either 200-E or 200-W Areas. Gross beta activity concentrations in the groundwater beneath the 100 Areas decreased such that the only samples showing detectable beta activity were from wells located at 100-N Area. Concentrations of uranium, the principal radionuclide observed in 300 Area (fuel fabrication and laboratory area) groundwater, averaged less than 0.5 pCi/ml. Water samples from several wells with piezometer tubes extending to deep aquifers were obtained and analyzed; all such samples had gross beta concentrations less than the analytical limit (0.2 pCi/ml). Nitrate ion concentrations greater than 10 percent of the Public Health Service recommended drinking water standard of 45 ppm were observed in most groundwater samples from wells within and surrounding the 200 and 300 Areas. However, groundwater from these zones is not consumed by humans or animals. (Mortland-Battelle)
W72-12481

INTERVAL SCANNING PHOTOMICROGRAPHY OF MICROBIAL CELL POPULATIONS,
Pennsylvania State Univ., University Park, Dept. of Microbiology.
L. E. Casida, Jr.
Applied Microbiology, Vol 23, No 1, p 190-192, January 1972. 1 fig, 4 ref.

Descriptors: *Population, *Monitoring, *Microorganisms, Surveys, Bacteria, Growth chambers, Fungi, Growth rates, Cultures.
Identifiers: *Scanning photomicrography, Agromyces ramosus, Photomicrography.

A procedure is presented for photographically recording growth and other changes occurring within microbial populations over periods of time. The technique involves photographically scanning a prepared microculture chamber at intervals during incubation in a fixed focal plane. The microculture chamber is prepared by drilling a 1.9 m hole in a glass slide, filling the hole with agar and placing a Teflon sheet on one side and a culture smeared cover slip with a scribed 'x' overlying the agar-filled hole on the other side of the slide. Scanning photography was accomplished with a phase-contrast microscope using the quadrants of the 'x' as reference areas. This technique has been used to study the growth, in the presence or absence of the stimulant catalase, of the catalase-negative fungus Agromyces ramosus. (Mackan-Battelle)
W72-12483

MICROBIAL DEGRADATION OF DDT METABOLITES TO CARBON DIOXIDE, WATER, AND CHLORIDE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
D. D. Focht.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 1, p 52-56, January 1972. 1 fig, 3 tab, 5 ref.

Descriptors: *Metabolism, *Microbial degradation, *DDT, Growth rates, Cultures, Sewage effluents, Chlorides, Pesticide kinetics, Soil fungi, Carbon dioxide, Water, Soil bacteria, Degradation (Decomposition).
Identifiers: *Hydrogenomonas, Culture media, Plate counts, DDM, p-chlorophenylacetic acid, Fusarium, Hydrogen chloride, Metabolites, Substrate utilization, Reaction products, Selective media.

A hyaline Moniliaceae fungus was shown to be capable of converting chlorinated bacterial degradation products of DDT metabolites to water, carbon dioxide, and hydrogen chloride. The fungal isolate was obtained from sewage effluent by selective culture with 3-chloro-cis-crotonic acid as the sole carbon source in a mineral salts medium. Fungal and bacterial growth were determined turbidmetrically and by viable plate counts. Fungal growth was evident within 5 days and both fungal supernatant liquids were positive for chloride; uninoculated controls were negative. The fact that the fungus was able to grow on both ring fission products clearly established the breakdown of DDM, a DDT metabolite, to carbon dioxide, water, and chloride. It was shown that fungal growth in this system is totally dependent on degradation products excreted by the bacterium. Although an exogenous energy source is needed, if the source is too great, bacterial growth 'swamps out' fungal growth. When conditions approaching optimum are met, the degradation of DDM can proceed. (Mortland-Battelle)
W72-12484

INITIAL STUDIES ON THE MICROBIAL BREAKDOWN OF TRIALLATE,
Saskatchewan Univ., S, Regina, Dept. of Biology.
D. R. Cullimore, and A. E. Smith.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 1, p 36-42, January 1972. 2 fig, 8 ref.

Descriptors: *Microbial degradation, *Thiocarbamate pesticides, Absorption, Cultures, Separation techniques, Gas chromatography, Molds, Soil bacteria, *Soil microorganisms, Metabolism, Persistence, *Pesticide kinetics, Path of pollutants, Soil fungi, Yeasts, Solvent extractions, Loam, Pseudomonas, Soil microbiology, Soil dynamics.
Identifiers: *Triallate, *Substrate utilization, Bioaccumulation, Culture media, Electron capture gas chromatography, Penicillium, Chladosporium, Rhodotorula, Pseudomonas fluorescens, Aerobacter cloacae, Aerobacter aerogenes, Serratia, Chromobacterium viscosum, Proteus vulgaris, Propionibacterium jensenii, Pseudomonas aeruginosa, Aerogenes hydrophilia, Xanthomonas campestris, Eriwina amylovora, Achromobacterium parvulus, Disk method.

Two methods were utilized for studying the interaction of the herbicide Triallate (S-2,3,3 trichloroallyl N, N diisopropylthiolcarbamate with microorganisms isolated from soil and stock solutions. The objective was to determine microbial activity caused breakdown of the Triallate. The first method, the 'Disk' method, involves the preparation of basal agar plates seeded with the culture under test. The second method utilizes a basal broth to which 3 ppm Triallate had been added. Some of the soil bacteria were more sensitive to inhibition by Triallate than others. Triallate is absorbed by strains of Penicillium during rapid mycelial growth and is retained while the mold remains viable. This results in poor extraction of Triallate by benzene but it is extractable by a mixture of benzene and isopropanol. The persistence of Triallate in soil may be in part due to its absorbance onto microbial cells. It appears probable that after application to the soil, some Triallate becomes adsorbed onto growing mold mycelia where it remains during the life of the mold. Upon death, the chemical is presumably released and either readsorbed, degraded, or lost by volatilization. (Mortland-Battelle)
W72-12485

LIGHT-SCATTERING PROFILES IN THE STRAITS OF FLORIDA,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.; and Miami Univ., Coral Gables, Fla. Optical Physics Lab.
H. R. Gordon, and J. M. Smith.
Bulletin of Marine Science, Vol 22, No 1, p 1-14 March 1972. 4 fig, 1 tab, 8 ref.

Descriptors: *Equipment, Light penetration, *Measurement, Florida, Straits, Bottom-reflected light, Data collections, Sampling, Instrumentation, Physical properties, Optical properties, Particle size, Suspended load, Water currents, Stratification, Bottom sediments, Depth, Depth-area curves, Organic matter.
Identifiers: *Light scattering, *Profiles, Particulate matter, Light-scattering meter.

A simple, in situ 45 degree angle, light-scattering meter, used to obtain scattering profiles in the Florida Current, is described. The instrument consists of a nearly collimated light source from a bulb which is powered by a rechargeable 6-volt alkaline battery. The scattered light is received by a photomultiplier tube which is energized by a low-voltage power supply and the scattering meter is attached to a seven-conductor supporting cable about 3 above a commercial STD unit which utilizes two of the conductors. Relative calibration of the instrument is achieved by measuring the signal when the instrument is 10 meters below the surface, with a ground-glass plate 10 sq mm in area inserted in the beam and field of view of the photomultiplier. The depth is obtained by placing the signal from the STD's depth channel directly on the second channel of a two-channel recorder. The light scattering profiles obtained east of the current axis demonstrate the existence of high concentrations of particulate matter close to the bottom. Near the axis of the current, an anomalously high scattering coefficient was observed as well as a scattering maximum near the depth of largest vertical shear. Rapid fluctuations in scattering, observed at

depths on each station, are attributed to statistical fluctuations of the concentration of large particles in the scattering volume. (Snyder-Battelle)
W72-12488

DEGRADATION OF N-ALKANE-1-SULFONATES BY PSEUDOMONAS,
Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).
G. J. E. Thysse, and T. H. Wanders.
Antonie van Leeuwenhoek, Vol. 38, No 1, p 53-63, 1972. 4 fig, 4 tab, 15 ref.

Descriptors: *Microbial degradation, *Linear alkylate sulfonates, *Sulfonates, *Pseudomonas, Soil bacteria, Aquatic bacteria, Pathogenic bacteria, Biodegradation, Water pollution sources, Loam, Sea water, Pollutant identification, Detergents, Degradation (Decomposition), Metabolism, Spectrometers, Chemical reactions.
Identifiers: *Substrate utilization, *Alkane sulfonate, Aliphatic hydrocarbons, Dissimilation, Electron capture gas chromatography, Scintillation counting, Alkanes, Gas liquid chromatography, Liquid scintillation, Pseudomonas aeruginosa.

A study was conducted to: (1) obtain conclusive evidence for the pathway of n-alkane sulfonate dissimilation in pseudomonads; (2) prove or disprove the presence of additional minor pathways and/or side reactions; and (3) obtain information on the enzyme which catalyzes the attack on the alkane sulfonate molecule. The microorganisms used were accumulated by the elective-culture method and two pure cultures, AJ1 and AJ2, isolated for further study. The capability of the microbe to utilize a compound was determined by inoculating mineral agars containing the compound and incubating for 76 hr at 30 C. Cultures containing C-14-labeled and unlabeled pentane sulfonate were analyzed by liquid scintillation counting and GLC, respectively, to determine if there were any accumulation of propionate and valerate; accumulation of corresponding fatty acids from the C8-C12 alkane sulfonates was also confirmed by electron capture GLC. AJ1 grew well on the low-molecular-weight alkane sulfonates, but not on higher ones; AJ2 accepted only the high-molecular-weight sulfonates. The sulfonate oxidizers AJ1 and AJ2 did not grow at the expense of a n-paraffin, and the paraffin oxidizer did not grow on the sulfonate media. The alkane sulfonates were dissimilated by AJ1 and AJ2, ultimately to yield carbon dioxide, water, and sulfate. In the primary oxidation reaction (s) the corresponding fatty acid and sulfate were formed. The fatty acid was subsequently degraded by beta-oxidation. (Byrd-Battelle)
W72-12490

CATIONIC UPTAKE AND EXCHANGE IN SALMONELLA ENTERITIDIS,
Georgia Univ., Experiment. Div. of Food Science.
J. R. Chipley, and H. M. Edwards, Jr.
Canadian Journal of Microbiology, Vol. 18, No. 4, p 509-513, April 1972. 7 tab, 17 ref.

Descriptors: *Cation exchange, *Absorption, Zinc radioisotopes, Zinc, Manganese, Sodium, Iron, Calcium, Environmental effects, Radioactivity techniques, Ion transport, Salmonella, Enteric bacteria, Aerobic bacteria, Cytological studies, Path of pollutants, Stable isotopes, Membrane processes, Pathogenic bacteria.
Identifiers: *Salmonella enteritidis, Manganese radioisotopes, Calcium radioisotopes, Iron radioisotopes, Sodium radioisotopes, Sample preparation, Chemical interference.

The uptake and use of inorganic radioactive cations (Zn-65, Ca-47, Mn-54, Na-22 and Fe-59) in cells and cell walls of Salmonella enteritidis was investigated by suspending the cells in a flask of 500 ml sterilized, chemically defined growth media and incubating them on a rotary shaker at 37 C for 4-6 hr. After this, the cation was added as its chloride salt and the cultures allowed to grow for 24-26 hr. The suspensions were centrifuged and the resulting pellets resuspended 3 times in distilled water. Aliquots of all washing solutions were measured for amounts of radioisotope lost in the procedures. Cell walls were prepared by sonification and chemical treatment and then treated as above. The loss of radioactivity was measured after all samples were resuspended in salt solutions by use of a spectrometric and liquid scintillation system. The effects of pH, temperature, time and ionic interference (K vs Na-22 ion) were determined by similar tests. Both the uptake and exchange of radioactive cations were energy-dependent and influenced by pH, dialysis time and temperature, and by the ionic content of the surrounding medium. Cell walls bound Ca-47 to the greatest extent, followed in order by Zn-65, Mn-54, and Fe-59. Another determining factor for cationic exchange was valency, with divalent cations exchanging to the greatest extent, followed by trivalent and monovalent cations, respectively. The greatest amount of exchange occurred between a radioisotope and a stable isotope of the same species. All losses of radioactivity were dialyzable indicating that this exchange involves very small moieties, perhaps the cation alone. Both 2,4-dinitrophenol (DNP) and N,N'-dicyclohexylcarbodiimide (DCCD) significantly decreased autologous exchange, cationic exchange, and cationic uptake in either cell or cell walls. (Mackan-Battelle)
W72-12491

BACTERIAL CELL PRODUCTION FROM HEXADECANE AT HIGH TEMPERATURES,
Wisconsin Univ., Madison. Dept. of Biochemistry.
D. A. Sukatsch, and M. J. Johnson.
Applied Microbiology, Vol 23, No 3, p 543-546, March 1972. 3 tab, 12 ref.

Descriptors: *Bacteria, *Cultures, *Growth rates, *Temperature, Organic compounds, Fermentation, Analytical techniques, Nitrogen, Absorption, Centrifugation, Carbon, Hydrogen, Ammonia, Incubation, Cytological studies, Resistance.
Identifiers: *Hexadecane, Culture media, Octadecane, Aliphatic hydrocarbons, Enrichment, Ammonium ions, Substrate utilization.

An investigation was conducted to determine whether bacterial cell yields could be obtained above 45 C that were equal to those obtainable at lower temperatures. A medium containing hexadecane was used for fermentation and a similar medium for enrichment. A mineral agar plating was made by adding 1.8 percent Ionagar No. 2 to the fermentation medium. Soil was used to inoculate 100 ml of enrichment medium in 500 ml Erlenmeyer flasks. Growth was assessed by observation of pressure decreases in the flask. A 3-liter fermentor, operated at 1070 rpm was used for determining cell yield (grams of dry cells/g hexadecane). The growth rate was calculated from the rate of nitrogen uptake, which was determined by a Nesslerization procedure for direct determination of ammonium ion in centrifuged samples. Stable enrichment cultures were readily obtained at 25, 35, 45, 55, and 65 C. In all cases the cultures consisted of more than one organism. Both lower cell yields and slower growth rates were observed at higher temperatures. The highest yield obtained at 65 C was 0.26 and the lowest yield at 25 or 35 C was 1.02. (Mortland-Battelle)
W72-12496

BACTERIOPHAGES OF CLOSTRIDIUM BOTULINUM,
British Columbia Univ., Vancouver. Dept. of Microbiology.
C. E. Dolman, and E. Chang.
Canadian Journal of Microbiology, Vol 18, No 1, p 67-76, January 1972. 32 fig, 1 tab, 20 ref.

Descriptors: *Bacteriophage, *Clostridium, *Electron microscopy, Cultures, Toxicity, Nutrients, Centrifugation, Systematics, Pathogenic bacteria.
Identifiers: Lysogeny, Culture media, *Clostridium botulinum, Sample preparation.

Electron microscopy was used in a study to determine the extent and variety of the phage flora associated with Clostridium botulinum. Over one-half of the strains studied were isolated in the investigating laboratory between 1944 and 1969; the others were obtained from a wide variety of sources throughout the world. Practically every strain produced toxin whose type was verified by specific botulinus anti-toxin-neutralization tests in mice. The GPBI-ground meat medium was used for routine maintenance of cultures. Single colonies were selected from cultures plated out on brain heart agar or blood agar medium to ensure purity. Cultures were transferred to a TYG medium (3 percent tryptone, 2 percent yeast extract, 1 percent glucose, and 0.1 percent sodium thioglycollate) for electron microscope preparation. A 5 percent solution of glutaraldehyde in 0.2 m phosphate buffer at pH 6.2 was added and cultures were subjected to a two-stage centrifugation. One microgram of Mitomycin-C per milliliter was added to 4 hr growth in the TYG medium followed by further inoculation at 37 C for about another 4 hr to induce cultures. It was concluded that characteristic phage particles are to be found, generally in small numbers, in the majority of young toxic cultures, regardless of their type. (Mortland-Battelle)
W72-12497

CAPACITY OF DESERT ALGAL CRUSTS TO FIX ATMOSPHERIC NITROGEN,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
A. N. Macgregor, and D. E. Johnson.
Soil Science Society of America Proceedings, Vol 35, No 5, p 843-844, September-October 1971. 7 ref.

Descriptors: *Algae, *Nitrogen fixation, *Nitrogen fixing bacteria, *Rainfall, *Arid lands, *Arizona, Grasslands, On-site data collections, Plant growth.

In addition to their role in increasing nitrogen, algal crusts, which contain a variety of microorganisms, are reported to enhance soil water infiltration and to provide a layer of organic matter suitable for seed germination. A study was undertaken to determine how soon algal crusts from a semiarid soil are able to fix N after being moistened and the rate of N fixation per unit area of moistened crusts. The study was conducted in a grassland area in the Tucson Basin of southern Arizona where approximately 4% of the soil surface possessed algal crust formations. Three hours after being moistened, algal crusts produced detectable levels of N fixation as measured by the acetylene-ethylene method. It was estimated that 1 ha of desert grassland receives a N input of 3-4 g/hr following a rainfall. This is fortunate in view of the burst of herbaceous plant growth and subsequent plant N requirements during the rainy season in the Sonoran Desert. (Casey-Arizona)
W72-12505

DEPLETION OF OXYGEN BY MICROORGANISMS IN ALASKAN RIVERS AT LOW TEMPERATURES,
Federal Water Pollution Control Administration, College, Alaska. Water Lab.
For primary bibliographic entry see Field 05C.
W72-12553

PREDICTION OF DISSOLVED OXYGEN LEVELS IN THE SOUTH SASKATCHEWAN RIVER IN WINTER,
New Brunswick Univ., Fredericton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.

W72-12554

POLLUTION - A BIOLOGICAL STUDY OF SOME RECEIVING WATERS IN HOKKAIDO,
Nara Women's Univ. (Japan). Zoological Inst.
For primary bibliographic entry see Field 05C.
W72-12555

RESULTS OF THE ELEMENTAL PHOSPHOROUS MONITORING PROGRAM, LONG HARBOUR, NFLD. (JULY 1970-APRIL 1971),
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
R. F. Addison, M. E. Zinck, R. G. Ackman, P. Chamut, and A. Jamieson.
Fisheries Research Board of Canada, Technical Report No. 303, 1972. 25 p, 4 fig, 3 tab, 8 ref.

Descriptors: *Phosphorous, *Water pollution sources, *On-site data collections, Water pollution, Chemical wastes, Industrial wastes, Water analysis, Water sampling, Chemical analysis, Chromatography, Sediments, Cores, Herrings.
Identifiers: Mackerel, *Long Harbour (Nfld).

Surface and bottom harbor water samples were examined for elemental phosphorous along with samples taken from settling ponds and associated points around the Electric Reduction Company of Canada (ERCO). Core samples from the harbor and samples of mackerel and herring caught in the harbor and suspected of being poisoned by elemental phosphorous were also examined. The period covered was free of major emergencies due to phosphorous pollution. It seems that pollution control measures implemented by ERCO have had some success, but are not entirely satisfactory. (Svensson-Washington)
W72-12571

ELEMENTAL PHOSPHOROUS LEVELS IN WATER SAMPLES FROM LONG HARBOUR, NFLD. (JULY, 1969-JUNE, 1970),
Fisheries Research Board of Canada, Halifax (Nova Scotia).
R. F. Addison, R. G. Ackman, L. S. Cowley, D. Mascaluk, and S. Pond.
Fisheries Research Board of Canada, Technical Report No. 254, 1971. 29 p, 3 fig, 3 tab, 10 ref. append.

Descriptors: *Phosphorous, *Water pollution, *Industrial wastes, 8on-site data collections, Water pollution sources, Chemical analysis, Chromatography.
Identifiers: *Long Harbour (Nfld).

During the period studied, elemental phosphorous (P sub el) levels in Long Harbour water rarely exceeded about 0.003 mg/l in areas where large amounts of P sub el are known to have been deposited in a previous accidental spill. In periods of bad weather, or when ship movements could have disturbed these deposits, traces or easily measurable levels of P sub el were observed in water up to 3 miles from the plant. Dredging operations did not appear to redistribute significant amounts of stable P sub el into harbor waters, either as a result of mechanical disturbance of sediments, or by recirculating supernatant from treatment processes back into the harbor. At present no P sub el is being liberated into the harbor from the source of the previous spill. The only known source of P sub el is the deposits on the bottom. This P sub el is probably being released slowly into solution (or colloidal form), as is indicated by the relatively low levels (ppb range) consistently encountered. (Svensson-Washington)
W72-12572

ACCUMULATION OF YELLOW PHOSPHOROUS BY SEVERAL MARINE INVERTEBRATES AND SEAWEED,
Memorial Univ. of Newfoundland, St. John's.
For primary bibliographic entry see Field 05C.
W72-12574

IMPROVED METHOD OF TREATING PONDS WITH ANTIMYCIN A TO REDUCE SUNFISH POPULATIONS,
Southeastern Fish Control Lab. Warm Springs, Ga.
For primary bibliographic entry see Field 05C.
W72-12575

CHARACTERIZATION OF NATURALLY OCCURRING DISSOLVED ORGANOPHOSPHORUS COMPOUNDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W72-12637

CONCENTRATION OF BROMIDE IONS IN SEAWATER BY ISOTOPIC EXCHANGE,
Naval Ordnance Lab., White Oak, Md.

Available from the National Technical Information Service as AD-734 383, $3.00 in paper copy, $0.95 in microfiche. Report No. NOLTR 71-216, 8 November 1971, 15 p. 2 fig, 3 tab, 12 ref.

Descriptors: *Seawater, *Radioactivity techniques, *Bromides, Bromine, Separation techniques, Ions, Flow rates, Ion exchange, Gamma rays, Methodology, Water analysis, Pollutant identification.
Identifiers: *Isotope exchange, Counting, Desorption, Silver bromide, Br-82, Bromine radioisotopes, Gamma ray counter.

A method for the in situ determination of radioactive bromide ions in seawater involves passing samples containing Br-82 through an isotopic exchange column of AgBr bound into a crystal lattice. The amount of Br-82 exchanged is determined by gamma counting aliquots of the samples before and after running them through the column. A 3x3 factorial experiment was devised to study the effect of factors on the amount of Br-82 exchanged. The factors studied were: (1) height of the AgBr column, (2) flow rate, and (3) residence time. Each of these factors was found to have a significant effect on the amount of bromide exchanged. The desorption rate of Br-82 from the column was also studied. The results indicate that bromide ions in sea water can be concentrated by the isotopic exchange technique, that retention factors of 20-30 percent can be achieved by reduction of detector size, provided suitable flow-rates can be achieved, and that the desorption time is not excessive. (Mackan-Battelle)
W72-12638

AMINO ACID TRANSPORT IN NITZSCHIA OVALIS ARNOTT,
California Univ., Irvine. Dept. of Developmental and Cell Biology.
For primary bibliographic entry see Field 05C.
W72-12643

STREAM INSECTICIDE MONITORING STUDIES, BERRIEN COUNTY, MICHIGAN OCTOBER 1968 THRU JULY 1970,
Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
R. B. Willson, C. M. Fetterolf, Jr., J. L. Hesse, and J. W. Bedford.
Report, February 1971. 36 p, 4 fig, 11 tab, 2 ref.

Descriptors: *Dieldrin, *Monitoring, *Streams, Aquatic animals, Water pollution, Caddisflies, Dragonflies, Path of pollutants, Pollutant identification, Water analysis, Runoff, Pesticide kinetics, Flow, Aquatic insects, Movement, Sediments, Persistence, Mussels, Benthic fauna, Aquatic life, Mollusks, Clams, Freshwater fish, Snails, Sunfishes, *Michigan.
Identifiers: *Chlordane, Japanese beetles, Macroinvertebrates, Chubs, Dace, Burbot, Glossiphonia stagnalis, Amnicola, Ferrisia, Gyraulus, Helisoma, Physa, Stagnicola, Pisidium, Sphaerium, Gammarus, Cambarus robustus, Orconectes, Caenis, Calopteryx, Belostoma fluminea, Gerris, Limnogonus, Microvelia, Notonecta, Ranatra, Cheumatopsyche, Anacaena limbata, Coptotomus, Cymbiodyta minima, Cymbiodyta vindicata.

A program to monitor insecticide application and assess its effects on the environment was begun following a decision in 1968 to apply dieldrin and chlordane to areas in Michigan in order to control a Japanese beetle infestation. Assessments were made of resident fish populations, and water, sediment, and tissues from caged mussels were monitored for chlordane and dieldrin before and after applications at two control and four test-stream stations. Gas chromatography of sample eluates provided pesticide identification and quantitations. Stream gauging equipment measured flow rates and run-off rates, and qualitative collections of benthic fauna were made twice after insecticide applications. Before treatment, chlordane mean concentrations were less than 0.2 ppb, 50 ppb, and 34 ppb in water, sediments, and mussel tissues, respectively; those of dieldrin were less than 0.02 ppb, 5 ppb, and 7.83 ppb for water, sediments, and mussels. Following treatment chlordane concentrations reached individual station highs of 3.4, 22,000 and 7,530 ppb, and dieldrin concentrations were 2, 2,000, and 1,137 ppb for water, sediments, and mussel tissues, respectively. Most of the movement of chlordane from land to streams occurred in the first 3 months while dieldrin continuously contributed but at a lower initial level. Test stream fish levels dropped in numbers and changed in species composition for as long as a year after applications. (Mackan-Battelle)
W72-12650

STUDIES ON THE PERSISTENCE OF SOME CARBAMATES INSECTICIDES IN THE AQUATIC ENVIRONMENT I: HYDROLYSIS OF SEVIN, BAYGON, PYROLAN AND DIMETILAN IN WATERS,
National Research Center, Cairo (Egypt). Water Pollution Dept.
O. M. Aly, and M. A. ElDib.
Water Research, Vol 5, No 1, p 1191-1205, December 1971. 5 fig, 4 tab, 9 ref.

Descriptors: *Hydrolysis, *Pesticide kinetics, *Persistence, *Aquatic environment, *Carbamate pesticides, Chemical degradation, Chemical reactions, Rates, Pesticide residues, Hydrogen ion concentration, Stability, Colorimetry, Environmental effects, Water temperature, Water pollution, Color reactions, Aqueous solutions, Water pollution sources, Water temperature, Ultraviolet radiation, Water quality control, Degradation.
Identifiers: *Sevin, *Baygon, *Pyrolan, *Dimetilan, Ultraviolet spectrophotometry, Hydroxyl ion concentration, Detection limits, Absorbance, l-naphthyl-N-methylcarbamate, O-isopropoxyphenyl-N-methyl carbamate, l-phenyl-3-methyl-5-pyrazolyl-dimethyl carbamate, 2-dimethyl carbomyl-5-pyrazolyl-dimethylcarbamate, United Arab Republic.

The rate of hydrolysis of the monoalkyl carbamate pesticides Sevin and Baygon, and the dialkyl carbamates Pyrolan and Dimetilan in the aquatic environment were studied while investigating the physical, chemical, and biological factors that may influence the persistence of carbamate pesticides. The rate of hydrolysis was determined with different hydroxyl ion concentrations, at different pH values (4.0-10.0), and at different temperatures. A colorimetric and an ultraviolet spectrophotometric method were used for the quantitative determination of the carbamate esters and their hydrolytic products. The hydrolysis of the 4 carbamate insecticides investigated in alkaline medium was found to be a function of the hydrox-

yl ion in the solution and was first order with respect to these ions. The second order rate constants, k sub 2, for the mono N-methyl substituted esters, Sevin and Baygon, were much higher than those for the N,N-dimethyl substituted ones. Second order rate constants for Sevin, Baygon, Pyrolan and Dimetilan at 20 C were found to be 204, 3.04, 0.70, and 0.0034 l/mol/min, respectively, indicating that the dialkyl carbamates were more stable to alkaline hydrolysis than the monoalkyl carbamates. All the compounds were stable to hydrolysis within the acidic pH range. However, measurable hydrolysis was observed at pH 7.0 and 8.0 for Sevin and Baygon, respectively, and the rates of hydrolysis increased with the rise of the pH value. At pH 8.0 about 99 per cent of Sevin was hydrolyzed in 9 days while Baygon reached the same level of hydrolysis. After 107 days, Pyrolan and Dimetilan, on the other hand, were stable towards hydrolysis within the investigated pH range. Temperature increases resulted in an increase of the reaction velocity. The rate of hydrolysis increased 2-3 times for each 10 degree C rise over a range of 3-40 C. The persistence of the carbamate pesticides in natural waters is greatly influenced by the pH value and temperature of the aquatic environment. (Mackan-Battelle)
W72-12651

COMPATIBILITY OF SUBSURFACE RESERVOIRS WITH INJECTED LIQUID WASTES,
Alabama Univ., University. Natural Resources Center.
D. M. Grubbs, C. D. Haynes, T. H. Hughes, and S. H. Stow.
Available from the National Technical Information Service as PB-211 326, $3.00 in paper copy, $0.95 in microfiche. Report 721, June 1972. 89 p, 25 fig, 7 tab, 13 ref, 3 append. OWRR B-030-ALA (1).

Descriptors: *Injection wells, *Waste disposal wells, *Industrial wastes, *Underground storage, Permeability, *Porosity, Temperature, Pressure, Underground waste disposal.
Identifiers: *Chemical compatibility, *Reservoir temperature, *Reservoir pressure.

Conclusions on effects of injection of incompatible liquids on permeability and porosity include: permeability decreased substantially after periods of injection, porosity decreased nominally after injection, effects of permeability diminuition pose greater problems than reduction in porosity, permeability appears to decline to a minimum value and stabilizes, normal subsurface pressures have little effect on magnitude of permeability reduction, reservoir temperatures may accelerate chemical reactivity, suspended solids sharply reduce permeability, chemical reactions and their ultimate effects on porosity and permeability can be predicted from chemical analyses of waste, interstitial water and rock, laboratory studies can provide reliable data for design and operation of disposal systems, and engineering considerations of pressure buildup will insure that normal pressure gradient of subsurface reservoirs will not be exceeded. The feasibility of subsurface disposal of liquid wastes is established, but this ultimate method of discarding toxic or undesirable wastes should be undertaken only after competent studies of geological, geochemical, and engineering parameters have been performed in each instance. (Warman-Alabama)
W72-12656

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART I. SUBSURFACE WASTE INJECTION.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151, as PB-211 340 Price: $3.00 paper copy; 95 cents microfiche. Report WRSIC 72-220E, March 1972, 56 p, 105 ref.

Descriptors: *Bibliographies, *Water pollution, *Groundwater, *Waste disposal wells, Injection wells, Underground waste disposal, Malenclaves, Waste storage, Water pollution sources, Water pollution effects, Legal aspects, Landfills, Leaching, Path of pollutants.
Identifiers: *Groundwater pollution, *Subsurface water pollution.

Subsurface Water Pollution is a selective bibliography produced by the Environmental Protection Agency from the computerized data base of the Water Resources Scientific Information Center, U. S. Department of the Interior. This bibliography represents published research and development in water resources as abstracted and indexed in the semimonthly journal, Selected Water Resources Abstracts (SWRA). This bibliography represents a search of a 33,980-item data base, covering SWRA from October 1968 through December 1971, and is published in three parts. Part I covers pollution associated with subsurface waste injection. The bibliography contains references to technology dealing with the prevention or abatement of pollution, litigation pertaining to incidences of pollution, and laws and regulations pertaining to the construction and operation of subsurface waste disposal facilities. The index is made up of a fraction of the descriptors and identifiers by which each paper in this bibliography has been indexed, and represents weighted terms that best describe the information content. (See also W72-1286 and W72-12687) (Knapp-USGS)
W72-12685

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART II. SALINE WATER INTRUSION.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151, as PB-211 341 Price: $3.00; 95 cents microfiche. Report WRSIC 72-221E, March 1972, 161 p, 104 ref.

Descriptors: *Bibliographies, *Water pollution, *Groundwater, *Saline water intrusion, Malenclaves, Water pollution sources, Water pollution effects, Legal aspects, Landfills, Leaching, Path of pollutants.
Identifiers: *Groundwater pollution, *Subsurface water pollution.

Subsurface Water Pollution is a selective bibliography produced by the Environmental Protection Agency from the computerized data base of the Water Resources Scientific Information Center, U. S. Department of the Interior. This bibliography represents published research and development in water resources as abstracted and indexed in the semimonthly journal, Selected Water Resources Abstracts (SWRA). This bibliography represents a search of a 33,980-item data base, covering SWRA from October 1968 through December 1971, and is published in three parts. Part II covers pollution associated with saline water intrusion. The bibliography contains references to technology dealing with the prevention or abatement of pollution, litigation pertaining to incidences of pollution, and laws and regulations pertaining to the construction and operation of subsurface waste disposal facilities. The index is made up of a fraction of the descriptors and identifiers by which each paper in this bibliography has been indexed, and represents weighted terms that best describe the information content. (See also W72-12685 and W72-12687) (Knapp-USGS)
W72-12686

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART III. PERCOLATION FROM SURFACE SOURCES.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151, as PB-211 342 Price: $3.00 paper copy; 95 cents microfiche. Report WRSIC 72-222E, March 1972, 162 p, 107 ref.

Descriptors: *Bibliographies, *Water pollution, *Groundwater, *Percolating water, *Waste disposal wells, Injection wells, Underground waste disposal, Malenclaves, Waste storage, Water pollution sources, Water pollution effects, Legal aspects, Landfills, Leaching, Path of pollutants.
Identifiers: *Groundwater pollution, *Subsurface water pollution.

Subsurface Water Pollution is a selective bibliography produced by the Environmental Protection Agency from the computerized data base of the Water Resources Scientific Information Center, U. S. Department of the Interior. This bibliography represents published research and development in water resources as abstracted and indexed in the semimonthly journal, Selected Water Resources Abstracts (SWRA). This bibliography represents a search of a 33,980-item data base, covering SWRA from October 1968 through December 1971, and is published in three parts. Part III covers pollution associated with percolation from surface sources. The bibliography contains references to technology dealing with the prevention or abatement of pollution, litigation pertaining to incidences of pollution, and laws and regulations pertaining to the construction and operation of subsurface waste disposal facilities. The index is made up of a fraction of the descriptors and identifiers by which each paper in this bibliography has been indexed, and represents weighted terms that best describe the information content. (See also W72-12685 and W72-12686) (Knapp-USGS)
W72-12687

GEOCHEMISTRY OF HOLOCENE BEDS OF LAKE MUTNOYE (GEOKHIMIYA GOLOTSENOVYKH OTLOZHENIY OZ. MUTNOGO),
Akademiya Nauk SSSR, Moscow, Institut Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 02H.
W72-12688

NITROGE, PHOSPHORUS, AND POTASSIUM CONTENT IN ATMOSPHERIC PRECIPITATION IN BELORUSSIA (POSTUPLENIYE AZOTA, FOSFORA I KALIYA S ATMOSFERNYMI OSADKAMI V BELORUSSII),
Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR).
For primary bibliographic entry see Field 02B.
W72-12696

PHOSPHATES - A CHALLENGE TO ENVIRONMENTAL SCIENCES,
Toronto Univ. (Ontario).
P. H. Jones.
Water and Pollution Control, Vol 110, No 4, p 19-24, April 1972. 13 ref.

Descriptors: *Phosphates, *Detergents, *Water pollution sources, *Social aspects, Surfactants, Social impact, Industrial production, Legislation, Water pollution control, Water quality control, Nitrilotriacetic acid, Eutrophication, Water pollution effects, Water quality act, Canada, Phosphorus, Water pollution.

The issue of phosphates in the environment is shown to have reached public attention by the same stages or steps as any other pollution issue:

(1) presence of the problem, yet unrecognized as a problem; (2) recognition; (3) action; (4) reaction; and (5) legislation and regulation. The problem of phosphates is discussed in relation to the production and use of detergents, the use of NTA as a substitute, and those forces affecting industrial producers. The effects of social and scientific concern on the legislation are also discussed. (Mackan-Battelle)
W72-12708

NATURAL ABUNDANCE OF THE STABLE ISOTOPES OF CARBON IN BIOLOGICAL SYSTEMS,
Texas Univ., Austin. Dept. of Botany.
B. N. Smith.
BioScience, Vol 22, No 4, p 226-231, April 1972. 4 fig, 1 tab, 64 ref.

Descriptors: *Isotope studies, *Stable isotopes, *Carbon radioisotopes, Environmental effects, Methodology, Algae, Aquatic plants, Isotope fractionation, Carbon dioxide, Respiration, Marine plants, Bicarbonates, Mass spectrometry, Distribution, Separation techniques.
Identifiers: *C-13, *C-12, Biological systems, Belemnitella americana, Terrestrial plants, Combustion, Isotope ratios, Spectrometry, Lichens, Mosses, Gymnosperms, Angiosperms.

The gaseous CO2 used in measuring the stable carbon isotopes, C-12 and C-13, is collected with specific apparatus from the combustion of organic material at 800-900 degrees C in excess oxygen or from respiration of living tissue. After collection, the gaseous CO2 is analyzed on an isotope ratio mass spectrometer. The C-13/C-12 ratio in any given sample is then compared with a standard - CO2 from the fossil carbonate skeleton of Belemnitella americana (PDB sub 1) according to the function: delta C-13 per mil is equal to 1000 times the C-13/C-12 of the sample minus the C-13/C-12 of the standard divided by C-13/C-12 of the standard. The precision of measuring delta C-13 with the mass spectrometer is plus or minus 0.1 per mil. Results of these methods have shown marine and freshwater plants to have relatively more C-13 than most terrestrial plants. The presumed difference allowed for distinguishing between marine and freshwater sediments, plants and petroleum, and has suggested that environmental effects (e.g., temperature) may account for some of the isotopic fractionations in organisms and plants. (Mackan-Battelle)
W72-12709

LEAD IN A CONNECTICUT SALT MARSH,
Yale Univ., New Haven, Conn. School of Forestry.
T. G. Siccama, and E. Porter.
BioScience, Vol 22, No 4, p 232-234, April 1972. 2 fig, 2 tab, 6 ref.

Descriptors: *Salt marshes, *Lead, Retention, Heavy metals, *Path of pollutants, Estuarine environment, Separation techniques, *Connecticut, Absorption, Sulfides, Chelation, Organic compounds, Soil analysis, Spatial distribution, Profiles, Chemical analysis, Sampling.
Identifiers: *Atomic absorption spectrophotometry, Accumulation, Spartina patens, Spartina alterniflora, Phragmites communis, Typha augustifolia.

The examination of the possibility that salt marshes may serve as sinks for heavy metals trapped by chelation with complex organic molecules and/or precipitated as sulfides was accomplished by checking the horizontal and vertical distribution of lead in a Connecticut salt marsh in the upper reaches of East Haven River near New Haven. Grab samples and core samples were collected, dried at 100 C, a 2g sample ashed, the ash eluted with HNO3, and the lead in the elutant determined by atomic absorption spectrophotometry. Lead concentrations in surface samples ranged from 9-190 ppm and in meter samples from 3-123 ppm, decreasing downward to 20-30 cm and then becoming quite stable. It was concluded that salt marshes are effective in removing lead from inflowing waters from urban centers and that accumulation does take place in the soil as well as in the tissues of the higher plants and animals inhabiting the marsh. (Mackan-Battelle)
W72-12710

PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS,
Texas A and M Univ., College Station. Remote Sensing Center.
G. L. Huebner, Jr.
Available from the National Technical Information Service as AD-737 348, $3.00 in paper copy, $0.95 in microfiche. Final Report RSC 756-1, November 1971, 91 p. 14 ref. Contract No. N62306-71-C-0029.

Descriptors: *Remote sensing, *Aerial photography, *Water temperature, Water circulation, Hydrography, Regional analysis, Gages, Currents (Water), *Estuaries, Mapping, Measurement, *Monitoring, Upwelling, *Thermal pollution, Aircraft, Data collections, Instrumentation, Equipment.
Identifiers: Experimental design.

A study was conducted on the planning and implementation of remote sensing experiments. Two experiments were designed - investigation of water upwelling near the Virgin Islands and the other, coastal circulation and hydrographic effects of effluents from rivers into the northwestern Gulf of Mexico. Measurements were to be made from aircraft by remote-sensing instruments and correlated with surface observations. However, due to unfavorable conditions, aerial observations were impossible for the water upwelling experiment so the data were collected by four research vessels equipped with surface and subsurface temperature and salinity devices. Salinity and temperature values were then plotted against depth measurements. It was suggested that photographic data would be obtained from 15,000 feet while thermal measurements should be made with a light plane at much lower altitudes. (Long-Battelle)
W72-12712

LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYVINYL CHLORIDE FORMULATIONS OF DURSBAN (TRADEMARK),
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
L. L. Nelson, and T. A. Miller.
Available from the National Technical Information Service as AD-736 423, $3.00 in paper copy, $0.95 in microfiche. Report No. USAEHA-31-008-72, April-May 1971. 5 p, 2 fig, 1 ref.

Descriptors: *Pesticide residues, *Separation techniques, Insecticides, Water pollution sources, Water pollution effects, Gas chromatography, Pollutant identification, Water analysis.
Identifiers: *Dursban, *Polyvinyl chloride, *Plastisols, Electron capture gas chromatography, Hexane, Organic solvents, Partitioning.

A laboratory study was conducted to determine residue levels that would be maintained in water treated with polyvinyl chloride plastisols (PVC) containing various concentrations of Dursban (trademark) (O,0 - diethyl-0- (3,5,6-trichloro-2-pyridyl) phosphorothioate). Water samples were taken weekly for 8 weeks and extracted by solvent partitioning using Nanograde hexane. Samples were subjected to three separate partitionings of 10, 5, and 5 ml, respectively. Dursban concentrations in the hexane fractions were determined by electron capture gas chromatography. The sensitivity of the method was 0.2 ppb Dursban. Average residues over the test period were 70.2 ppb for 9.6 percent Dursban PVC, 76.8 ppb for 19.1 percent Dursban PVC, 67.3 ppb for 29.0 percent Dursban PVC, and 69.0 ppb for 37.8 percent Dursban PVC. All the formalations maintained residues in the water over an 8-week period, and it was concluded that differences in the percentage of Dursban in the formulations had little effect in the levels maintained in water. (Mortland-Battelle)
W72-12713

LABORATORY RELEASE RATE STUDIES OF DIAZINON AND SUPRACIDE (TRADEMARK) FROM POLYVINYL CHLORIDE FORMULATIONS,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
L. L. Nelson, and J. T. Whitlaw, Jr.
Available from the National Technical Information Service as AD-736 422, $3.00 in paper copy, $0.95 in microfiche. Report No. USAEHA-31-019-71/72, 8 p, March 1971. 2 fig, 2 tab, 1 ref.

Descriptors: *Pesticide residues, *Diazinon, *Separation techniques, Water pollution sources, Water pollution effects, Radioactivity techniques, Gas chromatography, Pollutant identification, Solvent extractions, Laboratory tests, Organophosphorus pesticides, Phosphothioate pesticides.
Identifiers: *Polyvinyl chloride, *Supracide, C-14, Scintillation counting, Electron capture gas chromatography, Hexane, Organic solvents, Liquid scintillation.

Laboratory evaluations were conducted over an 8-week period to determine the release rates and residue levels maintained in water treated with formulations of diazinon and Supracide in polyvinyl chloride (PVC). Both non-radioactive and radioactive C-14-labeled formulations were tested. Radioactive samples were taken weekly and analyzed by liquid scintillation counting. The scintillation fluid contained naphthalene, PPO (2,5-diphenyloazole), POPOP (1,4-bis-2 (5-phenyloxazolyl) benzene), xylene, dioxane, and ethylene glycol monoethyl ether. Weekly non-radioactive water samples were extracted by three separate solvent partitionings of 10,5, and 5 ml, respectively, using nanograde hexane. Diazinon and Supracide concentrations in the fractions were determined by electron capture gas chromatography. The results indicated that the release rates of diazinon and Supracide from PVC are approximately linear with increasing percent composition. The released substances maintained residues for at least 8 weeks in the laboratory. (Mortland-Battelle)
W72-12714

MODELS OF ION AND SUBSTRATE COTRANSPORT AND THE EFFECT OF THE MEMBRANE POTENTIAL,
Michigan Univ., Ann Arbor. Dept. of Physiology; Michigan Univ., Ann Arbor. Medical School; and Michigan Univ., Ann Arbor. Dept. of Biostatistics.
J. A. Jacquez.
Mathematical Biosciences, Vol 13, No 1/2, p 71-93, February 1972. 6 fig, 1 tab, 67 ref.

Descriptors: *Mathematical models, *Ions, Model studies, Ion transport, Carriers, Equilibrium, Kinetics, Membrane processes, Water pollution effects.
Identifiers: *Cotransport, *Substrates, *Carrier models, Membrane potential.

Several mathematical expressions have been used to illustrate the implications of a carrier model of ion and substrate cotransport. In the carrier model, each carrier is assumed to have one ion and one substrate binding site. The model includes features that have not been included in previously published models. These features are the effect of the membrane potential and of the assumption that

all carrier forms, with or without bound substrate and with or without various bound ions, can cross the membrane. The model is of a two-state (gate-type) carrier with transition rate constants. In one state the carrier interacts with outer bulk phase; in the other state it interacts with the inner bulk phase. Equilibrium in the reactions between ion, substrate, and carrier is assumed at each surface. (Mackan-Battelle)
W72-12727

THE GRADUAL DESTRUCTION OF SWEDEN'S LAKES,
National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 05C.
W72-12729

MERCURY ACCUMULATION IN FOOD CHAINS,
Swedish Water and Air Pollution Research Lab., Stockholm.
A. Jernelov, and H. Lann.
Oikos, Vol 22, No 3, p 403-405, 1971. 2 fig, 1 tab, 6 ref.

Descriptors: *Mercury, *Benthic fauna, Predation, *Food chains, Nutrition, Pikes, Aquatic animals, Bottomfish, Sediments, Absorption, Metals, Heavy metals, Water pollution, Water pollution sources, Water pollution effects.
Identifiers: Liver, Muscle, Kidneys, Esox lucius, Sweden, *Methyl mercury, Phenyl mercury, Tissue, Delangeran River, Lake Vanern, Lake Hjalmaren, Bioaccumulation.

The total mercury content of benthic animals is found to be of little value when calculating the rate of mercury transport from benthic animals to predatory fish. Tissue analysis that reveals the percentage of methyl mercury in total mercury content of benthos is much lower than the percentage in fish and the total mercury content is variable. Methyl mercury transport from benthic fauna to bottom-feeding fish appears insignificant and it seems that Hg bioaccumulation is actually a function of a predator adding uptake from water to a basic level' found in the food chain. (Snyder-Battelle)
W72-12730

UPSTREAM MOVEMENTS OF GAMMARUS PULEX PULEX (AMPHIPODA) IN A SOUTH WEDISH STREAM,
Lund Univ. (Sweden). Dept. of Animal Ecology.
For primary bibliographic entry see Field 05C.
W72-12732

DECONTAMINATION OF RADIOACTIVITY NFECTED WATER BY PEAT, (DEKONTAMINIERUNG RADIOAKTIV VERSEUCHTEN WASSERS MIT TORF).

Schweizerische Zeitschrift fuer Hydrologie, Vol 2, No 1, p 226-270, June 30, 1970. 23 fig, 10 tab, 2 ref.

Descriptors: *Radioactive wastes, *Peat, *Cation exchange, Nuclear wastes, Soils, Rainfall, Iodine, Iodine radioisotopes, Radioisotopes, Strontium, Strontium radioisotopes, Yttrium, *Yttrium radioisotopes, Anion exchange, Calcium, Cations, Percolation, Alkaline earth metals, Anions, Radioecology, Water pollution, Adsorption.
Identifiers: *Switzerland, Jura mountains, Decontamination, Removal, I-131, Sr-90, Y-90.

Experiments were carried out to determine the decontamination of rain and model water containing Strontium-90-Yttrium 90, Iodine 131 by various peats. The chemical composition of the model water was similar to rain, especially, cistern water. Peat samples were taken in the Jura mountains, Neuchatel region, Switzerland and percolation experiments carried out in laboratory ion-exchange columns of the usual dimensions and in pilot scale installations to determine the decontamination capacity of three types of peats. Good decontamination effects were determined for Strontium 90-Yttrium 90. The main parameters influencing the breakthrough capacity are: type of peat, degree of drying, and deep freezing. In addition, other factors, particularly those with regard to exchange capacity, are also significant. A measurable retention of anionically available Iodine-131 was observed only at extremely low concentrations less than 1 nanomole NaI/liter. Retention increases exponentially with increasing dilution ratios. A solution of less than 1 picomole I-131-labeled NaI/liter showed a retained activity of 60 to 90 percent, related to the inflowing solution. The experiments yielded useful findings with regard to soil science. Particularly interesting are the irreversible structure changes of peat due to deep freezing and drying, and the correlation between calcium content or degree of decomposition and exchange or breakthrough capacity for cations. (Mortland-Battelle)
W72-12735

BIODEGRADATION OF NITROLOTRIACETIC ACID AND RELATED IMINO AND AMINO ACIDS IN RIVER WATER,
Monsanto Co., St. Louis, Mo.
C. B. Warren, and E. J. Malec.
Science, Vol 176, No 4032, p 277-279, April 21, 1972. 1 fig, 1 tab, 20 ref.

Descriptors: *Biodegradation, *Nitrolotriacetic acid, *Amino acids, Organic acids, Organic compounds, *Gas chromatography, Methodology, Aquatic environment, Chromatography.
Identifiers: *Imino acids, *Detroit River, N-methyliminodiacetic acid, Iminodiacetic acid, Sarcosine, Glycine, *Meramec River, N N-dimethylglycine, N-nitrosoiminodiacetic acid.

A gas chromatographic procedure is capable of: (1) the quantitative detection of nitrilotriacetic acid, N-methyliminodiacetic acid, iminodiacetic acid, sarcosine, and glycine, and (2) the qualitative detection of N,N-dimethylglycine and N-nitrosoiminodiacetic acid in river water, primary, and secondary sewage effluent and water containing nitrite ions. The method has been used to search for intermediates during and after the degradation of NTA and to determine the biodegradability of NTA, NMIDA, IDA, SARC, GLY, and N-nitroso IDA. When the amino acids were added to samples from the Detroit and Meramec Rivers, they were completely degraded at approximately equal rates, with no accumulation of intermediates. NTA was always completely degraded when added to water from either of the rivers. There was accumulation of the above amino acids, no appearance of new gas chromatographic peaks, or any clues obtained about its biodegradation pathway. (Holoman-Battelle)
W72-12743

ABSENCE OF CHLORINATED DIBENZODIOXINS AND DIBENZOFURANS FROM AQUATIC ANIMALS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 05A.
W72-12745

ORGANIC EXCRETION BY DUNALIELLA TERTIOLECTA,
Duke Univ., Beaufort, N.C. Marine Lab.
For primary bibliographic entry see Field 05C.
W72-12750

PRECIPITATION SCAVENGING (1970).

Available from NTIS, Springfield, Va 22151 as CONF-700601, Price $6.00 (paper copy). Proceedings of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, December 1970. 499 p.

Descriptors: *Conferences, *Air pollution, *Nucleation, *Fallout, *Water pollution sources, Documentation, Precipitation (Atmospheric), Cloud physics, Meteorology, Particle size, Pollutant identification, Rainfall, Gases, Aerosols, Model studies, Forecasting, Mathematical studies, Analytical techniques.
Identifiers: *Precipitation scavenging, *Airborne pollutants, Particle transport.

The proceedings of a symposium concerning the removal of airborne particles and gases by precipitation are presented. The symposium, held at Richland, Washington, June 2-4, 1970, was sponsored by Pacific Northwest Laboratory, Battelle Memorial Institute, and U. S. Atomic Energy Commission. Thirty-six technical papers were presented under five main topics: (1) field experiments; (2) laboratory experiments and techniques; (3) scavenging of gases; (4) microphysics in scavenging; and (5) models and predictions. Air pollution sources are operated without regard as to whether precipitation occurs. The prediction of scavenging is one of combining precipitation climatology with what is known about below-cloud and in-cloud scavenging so that for a particular source a calculation can be made of deposition on a climatological basis. The effects of contaminated precipitation on surface waters and vegetation are of concern. (See W72-12753 thru W72-12788) (Woodard-USGS)
W72-12752

RADAR OBSERVATIONS OF CONVECTIVE STORM CIRCULATION AND ITS RELATION TO PRECIPITATION SCAVENGING,
National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
R. M. Lhermitte.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 13-20, December 1970. 3 fig, 15 ref.

Descriptors: *Precipitation (Atmospheric), *Storms, *Air pollution, *Fallout, *Pollution abatement, Radar, Self-purification, Atmosphere, Hydrologic cycle, Clouds, Forecasting, Rainfall, Nucleation, Convection, Weather patterns, Analytical techniques, Water pollution.
Identifiers: *Precipitation scavenging, Storm circulation.

The use of radar for probing convective storms is reviewed. Emphasis is placed on Doppler radar methods that probe precipitation-particle motion and thereby provide information on storm circulation. Also discussed is a vertically pointing Doppler radar, which enables the evaluation of precipitation particle size spectra from observations of vertical particle velocity distribution. Comments are included on the applicability of these methods to the study of scavenging by precipitation. (See also W72-12752) (Woodard-USGS)
W72-12753

SCAVENGING OF TRACER IN SEVERE STORMS,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
A. N. Dingle.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 21-35, December 1970. 7 fig, 10 ref.

Descriptors: *Pollution abatement, *Air pollution, *Fallout, *Precipitation (Atmospheric), *Storms, Tracers, Analytical techniques, Cloud physics, Nucleation, Particle size, Humidity, Condensation, Atmosphere, Water pollution, Meteorology, Climatology, Rain gages, Radar.
Identifiers: Air-blown particles, Airborne water.

Field experiments designed to study severe storms by tracer scavenging are presented. Criteria used in the selection of indium as an atmospheric tracer and in choosing the emission and placement techniques are discussed. Specific experiments using updraft inoculation and middle-level indraft air labeling are outlined, and idealized flight plans and deposition patterns for these are presented. Finally, the operational procedure used in the field experiments is given. (See also W72-12752) (Woodard-USGS)
W72-12754

INTERACTIONS OF CLOUD CONDENSATION NUCLEI AND ICE NUCLEI WITH CLOUD AND PRECIPITATION ELEMENTS: A REVIEW,
Washington Univ., Seattle. Dept of Atmospheric Sciences.
L. F. Radke, W. D. Scott, and C. E. Robertson.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 37-48, December 1970. 7 fig, 15 ref. NSF Grant GA 17381 and WSU Contract 14-06-D-5970.

Descriptors: *Precipitation (Atmospheric), *Nucleation, *Fallout, *Chemistry of precipitation, *Clouds, Ice, Condensation, Rainfall, Snowfall, Air pollution, Water pollution, Reviews, Analytical techniques.
Identifiers: *Precipitation scavenging, Cloud condensation nuclei.

Ground and aircraft measurements showing the effects of rainfall, snowfall, and cloud formation and evaporation on the concentration of cloud condensation nuclei (CCN) and ice nuclei (natural and artificial) are reviewed. Cumulus clouds are shown to be sinks for CCN when they are growing and sources of CCN when they evaporate. The removal of sea-salt nuclei by precipitating stratiform over the ocean is detailed. Snowfall is relatively ineffective in scavenging artificial ice nuclei. The effect of the onset of rain during shower activity is discussed with reference to ice-nuclei concentration. (See also W72-12752) (Woodard-USGS)
W72-12755

ENTRY OF FREEZING NUCLEI INTO PRECIPITATION,
Wyoming Univ., Laramie. Natural Resources Research Inst.
G. Vali.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 49-68, December 1970. 13 fig, 15 ref. NSF Grant 1527, Bur Reclam Contract/14-06-D-6801.

Descriptors: *Precipitation (Atmospheric), *Nucleation, *Ice, *Hail, *Convection, Rainfall intensity, Time, Heat transfer, Fallout, Air pollution, Water pollution, Storms, Chemistry of precipitation, Clouds.
Identifiers: *Precipitation scavenging, Freezing nuclei.

Variations of the concentrations of freezing nuclei in convective-type rain with variations of time and rate of rainfall were investigated. There was a direct relation between rate of rainfall and nucleus content: almost 50% higher concentrations for each 10 mm/hr increase in rainfall rate. The nucleus content of hailstones is relatively uniform throughout the volumes of the stones. Rain and hail occurring simultaneously have very nearly identical concentrations of nuclei. Freezing nuclei are transferred to cloud droplets by diffusion and take an active role in initiating precipitation. This concept is supported by the fact that appreciable fractions of the nuclei are only hundredths of microns in diameter. (See also W72-12752) (Woodard-USGS)
W72-12756

IN-CLOUD SCAVENGING ANALYSIS FROM COSMOGENIC RADIONUCLIDE MEASUREMENTS,
Battelle-Pacific Northwest Labs., Richland, Wash.
R. W. Perkins, C. W. Thomas, J. A. Young, and B. C. Scott.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 69-97, December 1970. 11 fig, 2 tab, 10 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Precipitation (Atmospheric), *Air pollution, *Fallout, *Radioactivity, *Pollutant identification, Analytical techniques, Gamma rays, Spectrometers, Clouds, Rainfall, Nucleation.
Identifiers: *Precipitation scavenging, Airborne water.

A technology was developed for the measurement of the short-lived cosmogenic radionuclides Na-24, Cl-38, and Cl-39 in water from a rainstorm during consecutive sampling periods down to minutes in duration. The technique involves collecting Na-24, and Cl-38 and Cl-39, on cation- and anion-resin beds and counting them directly on multidimensional gamma-ray spectrometers. Passing the rainwater through an Al2O3 bed before it goes to the ion-exchange beds removes the radon daughter Bi-214, which would otherwise be retained on anion-exchange beds and cause some interference in the radiochlorine measurements. The radionuclides can be measured with a precision of better than plus or minus 10%, which provides excellent resolution for studying in-cloud processes. (See also W72-12752) (Woodard-USGS)
W72-12757

STABLE ELEMENTS OF THE ATMOSPHERE AS TRACERS OF PRECIPITATION SCAVENGING,
Battelle-Pacific Northwest Labs., Richland, Wash.
L. A. Rancitelli, R. W. Perkins, T. M. Tanner, and C. W. Thomas.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 99-108, December 1970. 2 fig, 4 tab, 14 ref. AEC Contract AT (945-1)-1830.

Descriptors: *Precipitation (Atmospheric), *Rain water, *Pollutant identification, *Fallout, Analytical techniques, Sampling, Data collections, Nucleation, Chemical analysis, Water analysis, Water pollution sources, Trace elements, Elements (Chemical).
Identifiers: *Precipitation scavenging.

Rainwater samples collected at Quillayute, Wash., were analyzed by a multielement technique of neutron activation analysis to estimate the origin and removal rates of atmospheric aerosols. The concentrations of 19 elements measured in each sample were compared with concentrations in seawater and the earth's crust to establish the origin of each element. The Na, Cl, and Br are primarily of marine origin; the Sc, Co, Mn, K, Cr, Rb, and Cs could come from continental dust. The Ag, Se, Sb, As, Zn, and possibly Cu appear to have origins independent of the marine aerosol or continental dust. Scavenging coefficients were estimated from the concentrations of Co, Fe, Sc, and Sb in rainwater and known trace-element profiles in the atmosphere. (See also W72-12752) (Woodard-USGS)
W72-12758

CONCENTRATION VARIATION OF SOME TRACE METALS IN PRECIPITATION FROM GREAT PLAINS THUNDERSTORMS,
Chadron Atmospheric Research Inst., Nebr.
D. H. Steffe.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 109-120, December 1970. 3 fig, 2 tab, 2 ref.

Descriptors: *Precipitation (Atmospheric), *Chemical analysis, *Fallout, *Trace elements, *Thunderstorms, Analytical techniques, Spectrophotometry, Zinc, Data collections, Rain water, Hail, Nucleation.
Identifiers: *Silver, Atomic absorption spectrophotometer.

In the summer of 1969, sequential rain and hail samples were collected from several thunderstorms in western South Dakota and Nebraska. Samples were collected in rapid time sequence at a fixed geographical point in the path of the most intense storm activity. The samples were analyzed for concentrations of zinc and silver using atomic absorption spectrophotometer. Both silver and zinc concentrations in rain generally decreased with time but sometimes varied sharply (about 50 to 5 pg/ml in 5 min). The silver and zinc concentrations in hail were always as high as, or higher than, those of the accompanying rain. The distribution of silver in the precipitation was of particular interest because silver looked promising as a future tracer element in dynamic cloud studies. Impetus was added to the study of silver distribution by the interest of several groups using silver iodide as a seeding agent in weather-modification activities. Zinc was selected so that there would be an alternate element with which to compare the behavior of the silver through the precipitation shaft. (See also W72-12752) (Woodard-USGS)
W72-12759

SCAVENGING BY SNOW AND ICE CRYSTAL
Illinois Inst. of Tech., Chicago.
S. K. Sood, and M. R. Jackson.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 121-136, December 1970. 13 Fig, 3 tab, 11 ref. AEC Contract AT (11-1)-578-32.

Descriptors: *Precipitation (Atmospheric), *Air pollution, *Aerosols, *Pollution abatement, *Snowfall, Sodium chloride, Self-purification, Atmosphere, Chemical analysis, Analytical techniques, Data collections, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles, Polystyrene latex, Sodium chloride aerosols.

The scavenging efficiency of naturally precipitating snow and ice crystals was determined for submicron polystyrene latex and sodium chloride aerosols. The effect of crystal habit, crystal dimensions, and particle size on scavenging efficiency was established. Scavenging efficiency is a function of both the crystal diameter and the particle diameter. The scavenging efficiency of snow and ice crystals is independent of crystal habit for the particles studied. The scavenging efficiency increases with decreasing crystal diameter. There is a minimum scavenging efficiency of snow and ice crystals for particles in the size range 0.3 to 0.5 microns. (See also W72-12752) (Woodard-USGS)
W72-12760

SCAVENGING OF SOLUBLE DYE PARTICLES BY RAIN,
Battelle-Pacific Northwest Labs. Richland, Wash.
M. T. Dana.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 137-147, December 1970. 5 fig, 1 tab, 9 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Air pollution, *Pollution abatement, Precipitation (Atmospheric), *Self purification, Tracking techniques, Tracers, Fluorescent dye, Rhodamine, Particle size, Rainfall, Data collections, Analytical techniques, Mathematical studies, Meteorological data, Path of pollutants, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles.

A number of precipitation scavenging field experiments using uranin and rhodamine dye particles were conducted at an Olympic Peninsula (Wash.) field site. Most experiments employed air-jet atomization of a methanol solution of the tracer; variation of the solution concentration produce tracer plumes of selectable particle size. Mass median particle radii (unit density equivalent) for the experiments ranged from 0.4 to 7.5 microns. For particle radii of 3 microns and larger, experimental washout coefficients agreed with those expected from the theory of inertial capture. Smaller particle experiments showed much higher washout than theory--as much as 10 times higher for particles of about 0.5 micron radius. There is some evidence that electrical effects contributed to the scavenging of the smaller particles. (See also W72-12752) (Woodard-USGS)
W72-12761

COLLECTION EFFICIENCIES OF RAINDROPS FOR SUBMICRON PARTICULATES,
Illinois State Water Survey, Urbana.
R. Adam, and R. G. Semonin.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 151-160, December 1970. 5 fig, 4 ref. AEC Contract AT (1199) NSF Grant GA-4576.

Descriptors: *Air pollution, *Spores, *Pollution abatement, *Precipitation (Atmospheric), *Pollutant identification, Laboratory tests, Cultures, Raindrops, Analytical techniques, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles, Bacillus subtilis.

The scavenging efficiency of raindrops falling at terminal velocity for submicron biological aerosols is determined. The experimental apparatus and methods used to produce the simulated raindrops and the aerosol are discussed. Determined scavenging efficiencies of raindrops for 1-micron bacillus subtilis spores are presented. The amount of material scavenged is very small, approximately 0.004% for a 2-mm-diameter drop. The scavenging efficiency increases exponentially with decreasing drop size to a value of 0.4% for a 0.4-mm drop. Also, electric charge on the drop dramatically increases the collection of the submicron particulates. (See also W72-12752) (Woodard-USGS)
W72-12762

COLLECTION EFFICIENCY OF WATER DROPLETS IN AGCL AEROSOL,
Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry; and Clarkson Coll. of Technology, Pottsdam, N.Y. Inst. of Colloid and Surface Science.
M. Kerker, E. Matijevic, V. Hampl, and D. Cooke.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 161-167, December 1970. 1 fig, 1 tab, 6 ref.

Descriptors: *Precipitation (Atmospheric), *Aerosols, *Silver iodide, *Air pollution, *Laboratory tests, Analytical techniques, Instrumentation, Neutron activation analysis, Colorimetry, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles.

A laboratory study describes the collection efficiency of water droplets falling through an aerosol of AgCl particles with a narrow distribution of particle sizes. The aerosol is prepared thermally and is contained in a specially constructed chamber. The particle size distribution is obtained by light scattering. The mass concentration is determined by direct weighing after collection by thermal precipitation. A water droplet of known weight drops from a hypodermic syringe through a light beam; breaking the beam activates a circuit that automatically opens and shuts a pair of shutters at the entrance and the exit of the scavenging column and permits the droplet to fall through the aerosol. The amount of AgCl collected is determined both by neutron activation analysis and by a colorimetric microchemical analysis. A collection efficiency was less than 0.01% for an aerosol with radii in the range of 0.3 microns and with particle concentrations of about 1 million per liter. (See also W72-12752) (Woodard-USGS)
W72-12763

COLLECTION EFFICIENCY IN WASHOUT BY RAIN,
Berg (T. G. Owe), Inc., Garden Grove, Calif.
T. G. O. Berg.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 169-186, December 1970. 9 fig, 26 ref.

Descriptors: *Precipitation (Atmospheric), *Air pollution, *Fallout, *Rainfall, *Water pollution sources, Pollution abatement, Pollutants, Particle size, Dusts, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles.

The scavenging of atmospheric dust particles by falling raindrops is, in a sense, a fairly simple and straightforward problem of aerodynamics. It is enormously complicated by the solution of the nonlinear Navier-Stokes equations in the region between viscous flow at very small Reynolds numbers and potential flow at large Reynolds numbers, but approximate solutions have been worked out. Experimental data on collision efficiencies show some discrepancies among themselves and with respect to the theory. Thus collection on the back side of the scavenger has been reported as being in the range from nothing to 131 times that on the front side. The theory disregards collection on the back side. There are also discrepancies in the optimum scavenger size. These are explainable, but the collection on the back side poses a serious problem that needs study. (See also W72-12752) (Woodard-USGS)
W72-12764

SCAVENGING OF AEROSOL PARTICLES BY SPRAYS,
Battelle-Pacific Northwest Labs., Richland, Wash.
J. D. McCormack, and R. K. Hilliard.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 187-204, December 1970. 8 fig, 8 tab, 4 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Fallout, *Air pollution, *Spraying, *Aerosols, *Laboratory tests, Analytical techniques, Model studies, Nucleation, Particle size, Cesium, Iodine, Pollution abatement, Laboratory equipment.
Identifiers: *Spray scavenging, Aqueous sprays, Uranium oxide particles.

Eight experiments are described in which the washout of aerosol particles by aqueous sprays in a closed chamber was measured. The chamber volume was 750 cubic meters, and the average fall distance for drops was 11.6m. Experimental conditions covered a range of those expected in a containment vessel following a loss-of-coolant accident in a pressurized water reactor, including room-temperature air. The washout of three types of aerosol particles was measured: water-soluble cesium and iodine particles and insoluble uranium oxide particles. The time-dependent mass concentrations of these aerosol materials were measured at many locations within the enclosed gas space. A model was developed which described the particle washout by relating the washout coefficient to the single-drop collection efficiency. The washout of all particle types was significantly higher than predicted by the model using particle sizes measured by cascade impactor sampling during the tests. Drop-collection efficiencies for capturing cesium and particulate iodine decreased with spraying time from about 0.04 to about 0.005. Efficiencies for uranium were about half the magnitude indicated for the soluble particles. (See also W72-12752) (Woodard-USGS)
W72-12765

CONTINUOUS CHARGED CLOUD-PARTICLE SAMPLER,
Manchester Univ. (England). Dept. of Physics.
C. P. R. Saunders, M. H. Smith, and J. Latham.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 205-212, December 1970. 4 fig, 1 tab, 12 ref.

Descriptors: *Clouds, *Particle size, *Particle shape, Cloud physics, Instrumentation, Electric currents, Electrical properties, Analytical techniques, Air pollution, Precipitation (Atmospheric), Ice, Volume, Nucleation.
Identifiers: *Cloud-particle sampler, Airborne particles.

An instrument was designed which will measure continuously the charge and dimensions of individual ice crystals or water droplets within clouds, particle-size distribution, and volume charge densities inside clouds. A collimated beam of particles passes through a transverse electric field before impinging on a moving belt of 35-mm film coated with Formvar which has been softened immediately before exposure to the beam. Each

particle is deflected by an amount proportional to its chargeeto-mass ratio. The dimensions, type, and charge of each collected particle can therefore be determined by subsequent analysis of the replicas, using a stop-motion projector allied to a data-recording system. If required, the dimensions of selected particles can be determined more precisely by a scanning electron microscope. (See also W72-12752) (Woodard-USGS)
W72-12766

PULSED-LASER HOLOGRAPHY FOR ANALYSIS OF PARTICLE SIZE AND DISTRIBUTION,
Battelle-Pacific Northwest Labs., Richland, Wash.
F. R. Reich, and B. P. Hildebrand.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 213-216, December 1970. 2 fig, 10 ref.

Descriptors: *Cloud physics, *Fallout, *Particle size, *Distribution patterns, Analytical techniques, Instrumentation, Light penetration, Deflection, Nucleation.
Identifiers: *Laser, Holography.

The potential of holography in cloud physics can best be pointed out by describing the holographic process and the unique properties of a hologram. Basically a hologram is a recording of an optical wave front since both phase and amplitude information can be obtained from the hologram. The principles of pulsed-laser holography and its application to particle studies are reviewed. Holography is an interferometric technique for recording a three-dimensional scene or volume on a two-dimensional medium such as film. The image retains the three dimensionality of the scene along with depth of focus and parallax. This technique is useful for the study of particle distributions since the hologram can be made with a laser having pulse lengths in the microsecond to nanosecond range, in effect stopping any particle motion. Some experimental results are shown. (See also W72-12752) (Woodard-USGS)
W72-12767

THERMAL-DIFFUSION CHAMBERS AS CLOUD-NUCLEI COUNTERS,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
V. K. Saxena, and J. L. Kassner, Jr.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 217-238, December 1970. 5 fig, 1 tab, 97 ref. OWR THEMIS Contract N00014-68-A-0497.

Descriptors: *Cloud physics, *Fallout, *Measurement, *Particle size, *Thermal properties, Instrumentation, Evaluation, Design criteria, Air pollution, Radioactivity, Nucleation.
Identifiers: *Cloud-nuclei counters, *Thermal-diffusion chambers.

Thermal-diffusion chambers were introduced 30 years ago to detect rare nuclear particles in clouds. During the last decade they have been so widely used in these investigations that all information available regarding the variation in concentration of cloud nuclei may be considered as acquired with these chambers. They are readily adaptable to the production, maintenance, and control of low supersaturations such as those encountered in natural cloud formation. In contrast to their application to nuclear particle detection, the operation of thermal-diffusion chambers for cloud nuclei counting brings in a transient effect associated with the sample introduction. Also, two other detrimental effects accompany the wall heating and vapor depletion and may cause uncertainty in measurements. Depending upon the operating supersaturations, there are some limitations on the counting technique used with these chambers, which has usually been direct photography of the sensitive region. In the light of these findings, the designs of existing thermal-diffusion chambers are analyzed and some suggestions outlined for future improvement in their performance. (See also W72-12752) (Woodard-USGS)
W72-12768

AUTOMATIC SEQUENTIAL RAIN SAMPLER FOR SCAVENGING STUDIES,
Argonne National Lab., Ill. Radiological Physics Div.
D. F. Gatz, R. F. Selman, R. K. Langs, and R. B. Holtzman.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 239-244, December 1970. 2 fig, 1 tab, 5 ref.

Descriptors: *Rain water, *Sampling, *Chemical analysis, *Instrumentation, *Automation, Methodology, Rainfall, Fallout, Air pollution, Water pollution sources, Nucleation.
Identifiers: *Rain sampler (Automatic).

A sequential rain sampler for chemical analysis is described that collects up to 70 samples with volumes of 500 to 1000 ml from each 0.5 mm to 1.0 mm of rain. Any additional rain is automatically discharged. The area of the collector is 1 sq m. All surfaces touched by the rainwater, including the bottles used to contain the samples, are polyethylene or Teflon. After every sample an event mark is recorded on a strip chart; after the first mark the chart speed increases from 1.5 in/hr to 1.5 in/min. This provides adequate resolution between event marks for the computation of rainfall rate. If a time reference is provided while the chart is on fast speed, the starting and ending times of individual samples are known to within 1 sec. The sampler can operate unattended during rain for a time period that depends on the length of strip chart left when the fast chart drive is activated. (See also W72-12752) (Woodard-USGS)
W72-12769

EFFECTS OF SOLUBILITIES OF GASES ON THEIR SCAVENGING BY RAINDROPS,
Battelle-Pacific Northwest Labs., Richland, Wash.
A. K. Postma.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm. Symposium Series 22, p 247-259, December 1970. 8 fig, 7 ref.

Descriptors: *Rainfall, *Fallout, *Gases, *Solubility, Reviews, Chemical reactions, Air pollution, Pollution abatement, Water pollution sources, Pollutants, Diffusivity, Numerical analysis, Nucleation.
Identifiers: *Rainfall scavenging.

Raindrops absorb atmospheric gases and thus provide an important mechanism for cleaning the earth's atmosphere. The relative effectiveness of scavenging of gases by falling drops depends on physical parameters, such as drop size, pollutant concentration, solute gas diffusivity, and equilibrium solubility of the absorbed gas in water. Equilibrium solubility is one of the most important physical parameters in drop scavenging because this parameter limits the maximum amount of solute gas that can be absorbed by a given drop. Existing data on gas absorption raindrops are reviewed to show the relative importance of solubility on scavenging in the atmosphere. Numerical examples of washout coefficients for a number of gases show the influence of solubility and chemical reaction. Information needed to predict drop absorption rates for specific cases is reviewed. (See also W72-12752) (Woodard-USGS)
W72-12770

LABORATORY INVESTIGATIONS ON WASHOUT OF TRACE GASES,
Frankfurt Univ. (West Germany). Institut fuer Meteorologie und Geophysik.
S. Beilke.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 261-269, December 1970. 6 fig, 5 ref.

Descriptors: *Rainfall, *Air pollution, *Fallout, *Gases, *Laboratory tests, Analytical techniques, Water pollution sources, Pollution abatement, Laboratory equipment, Nucleation.
Identifiers: *Rainfall scavenging, Washout, Trace gases.

Laboratory investigations are discussed on the washout by rainfall of SO2, NO2, and CO2. The order of magnitude of trace-gas washout coefficients was determined, and the reasons for different washout behavior of these three gases are explored. The artificial rain could be varied in intensity as well as in droplet size. Droplets of different sizes were generated by varying the diameters of the nozzles. The intensity of the artificial rain was varied by changing the number of nozzles with equal diameter. Since the nozzles were installed at the bottom, the drops followed ballistic trajectories. The disadvantage of this experiment compared with experiments in the atmosphere is that the speed of free-falling droplets is greater in the atmosphere than the mean velocity of droplets with the same size in the chamber. The different Sherwood numbers, however, determine the deviation. How high the concentration of a trace gas can be and still be considered completely absorbed depends essentially on the solubility of the trace gas in water. (See also W72-12752) (Woodard-USGS)
W72-12771

WASHOUT OF GASEOUS IODINE SPECIES,
Battelle-Pacific Northwest Labs., Richland, Wash.
L. F. Coleman, and A. K. Postma.
In: Precipitation Scavenging (1970); Proc Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 271-288, December 1970. 8 fig, 12 ref. AEC Contract AT (45-1) 1830.

Descriptors: *Fallout, *Air pollution, *Iodine, *Gases, *Spraying, Laboratory tests, Analytical techniques, Particle size, Pollution abatement, Laboratory equipment, Nucleation.
Identifiers: *Spray scavenging, Aqueous sprays.

Eight experiments were made to measure the washout of airborne iodine species by aqueous sprays. The spray chamber volume was 750 cubic meters and the average drop fall distance was 11 m. The spray drop size was 0.77 or 1.2 mm volume median diameter. Other parameters considered were temperature, spray flow rate, and spray solution composition. Spray washout models are presented for elemental iodine and methyl iodide. Absorption rates measured for elemental iodine agree with the theoretical model based on mass transfer limited by gas-phase resistance. Methyl iodide washout was in agreement with a model based on absorption with simultaneous reaction. (See also W72-12752) (Woodard-USGS)

72-12772

UROPEAN INTEREST IN ACIDIC RECIPITATION: A REVIEW,
attelle Memorial Inst., Seattle, Wash. Research enter.
. Reiquam.
: Precipitation Scavenging (1970); Proc of Symsium, Richland, Wash, June 2-4, 1970, sponred by Battelle Pacific Northwest Lab and U S omic Energy Comm, Div of Biology and edicine: U S Atomic Energy Comm Symposium ries 22, p 289-292, December 1970. 1 tab.

escriptors: *Air pollution, *Path of pollutants, allout, *Water pollution sources, *Precipitation tmospheric), Gases, Acidic water, Industrial astes, Reviews, Nucleation, Pollution abatement.
entifiers: *Precipitation scavenging.

ere is evidence that sulfur dioxide emitted in instrialized nations contributes to the acidity of ecipitation far downwind. Some of that evidence reviewed. Among the problems associated with g-range transport of air pollutants are poor unrstanding of the reactions, reaction rates, and moval mechanisms, which determine the reence time of pollutants, and the lack of current ta on air and precipitation chemistry worldwide. effective precipitation chemistry observation twork would be an obvious first step toward oviding factual response. (See also W72-12752) oodard-USGS)
72-12773

ASHOUT OF SO2 FROM THE PLUME OF A DAL-FIRED POWER PLANT,
ttelle-Pacific Northwest Labs., Richland, ash.
M. Hales, J. M. Thorp, and M. A. Wolf.
Precipitation Scavenging (1970); Proc of Symsium, Richland, Wash, June 2-4, 1970, sponed by Battelle Pacific Northwest Lab and U S omic Energy Comm, Div of Biology and edicine: U S Atomic Energy Comm Symposium ries 22, p 293-303, December 1970. 8 fig, 5 ref. APCA Contract CPA22-69.

escriptors: *Air pollution, *Fallout, *Industrial stes, *Sulfides, *Water pollution sources, cipitation (Atmospheric), Gases, Power plants, als, Data collections, Sampling, Rainfall, Pollun abatement, Sulfates, Nucleation.
ntifiers: *Precipitation scavenging, Sulfur dioxn.

ld measurements of washout by rain and snow SO2 in plumes from 800-ft stacks at the world's gest mine-mouth electric power generating plant monstrate some complexities arising from the eraction of meteorological and physicochemical tors. Tall stacks are necessary to provide dilun of the stack effluent so as to avoid intolerable centrations at the ground. The Keystone erating station in western Pennsylvania has o 800-ft stacks to elevate the gaseous effluent m the 7800 tons of coal consumed daily in the duction of 1800 Mw of power. Large sources of 2 comparable to the Keystone station do not st within the same distances to the samplers. sequently, background effects should not be ificant. However, two physicochemical ects that amplify the importance of background 2 and other pollutants have been identified. se are the rate and the equilibrium aspects. e also W72-12752) (Woodard-USGS)
2-12774

AVENGING OF SO2 BY CONVECTIVE ORMS,
earch Council of Alberta, Edmonton.
. Summers.
Precipitation Scavenging (1970); Proc of Symium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 305-318, December 1970. 3 fig, 3 tab, 7 ref.

Descriptors: *Air pollution, *Fallout, *Sulfides, *Water pollution sources, Precipitation (Atmospheric), Data collections, Sampling, Gases, Aircraft, Rainfall, Storms, Chemical analysis, Clouds, Pollution abatement, Sulfates, Nucleation.
Identifiers: *Precipitation scavenging, Convective storms, Sulfur dioxide.

During the summer of 1968, a meteorological research aircraft made 15 hr of airborne SO2 observations in central Alberta, Canada, with a continuous SO2 analyzer. On several occasions the aircraft measurements enabled estimates to be made of the air, moisture, and SO2 flux into the base of convective storms. Precipitation samples collected simultaneously by ground mobile units were analyzed for sulfate content by a conductometric titration method. Sulfur budgets for three storms indicate a high rainout efficiency in the range 0.19 to 0.65. (See also W72-12752) (Woodard-USGS)
W72-12775

MECHANISMS OF IODINE INJECTION FROM THE SEA SURFACE,
Florida State Univ., Tallahassee. Dept. of Oceanography.
C. S. Martens, and R. C. Harriss.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 319-324, December 1970. 4 fig, 4 ref.

Descriptors: *Air pollution, *Iodine, *Fallout, *Water pollution sources, *Marine air masses, Aerosols, Gases, Diffusion, Vapor pressure, Temperature, Ultraviolet radiation, Sea water, Data collections, Analytical techniques, Meteorological data, Nucleation.
Identifiers: Airborne particles, Sea surface influence.

Experimental studies indicate that the total flux of iodine into the marine atmosphere is controlled by sea-surface temperature, ultraviolet light, and bubbling, with temperature being more important than ultraviolet light. These experiments support the hypothesis that gaseous iodine is sorbed by aerosols in the atmosphere with relative enrichment being a function of aerosol surface area. The production of gaseous iodine increased by a factor of 3 between 11 and 30 deg C owing to temperature effects alone. After multiplying artificial production by 1.67 to correct for the estimated difference from natural sunlight, gaseous-iodine production due to ultraviolet light is approximately 50% of that due to temperature effects between the range of 11 to 30 deg C. (See also W72-12752) (Woodard-USGS)
W72-12776

MODEL FOR VARIATIONS WITH PARTICLE SIZE OF HALOGEN-ION RATIOS IN MARINE AEROSOLS,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
J. A. Robbins.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 325-351, December 1970. 11 fig, 4 tab, 27 ref.

Descriptors: *Air pollution, *Aerosols, *Marine air masses, *Water pollution sources, *Model studies, Particle size, Iodine, Bromine, Chlorine, Gases, Halogens, Chemical reactions, Mathematical studies, Analytical techniques, Vapor pressure, Winds, Nucleation.
Identifiers: Airborne particles, Halogen-ion ratios.

A mathematical model accounts for published chemical analyses of marine aerosol size fractions for iodine, bromine, and chlorine. The model assumes that iodine vapor is gained and bromine vapor is lost by particles at rates determined by gaseous diffusion around the particle. Both iodine and bromine may saturate a particle surface layer, although the detailed mechanism of saturation is not crucial to the model. By nonlinear least-squares fitting to observed data points, the model satisfactorily accounts for a decrease in the I/Cl ratio. The model accounts for the observed minimum in Br/Cl ratio for intermediate size fractions and the inverse dependence of its depth on wind speed. The model requires that most of the aerosol mass sampled is derived from a fairly narrow band of particle ages in order to account for the observed composition variation with size fraction. This assumption provides an explanation for dependence on wind speed. Among the specific questions raised in this mathematical study are the band width of aerosol particle ages with wind speed and sampling location, the chemistry of iodine and bromine retention by particles, and the mechanism of bromine loss from particles. (See also W72-12752) (Woodard-USGS)
W72-12777

THEORY OF DIFFUSIVE AND IMPACTIVE SCAVENGING,
North American Rockwell Corp., Thousand Oaks, Calif. Science Center.
G. M. Hidy.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 355-371, December 1970. 8 fig, 7 tab, 9 ref.

Descriptors: *Air pollution, *Fallout, *Pollution abatement, *Rainfall, *Cloud physics, Aerosols, Gases, Particle size, Chemical reactions, Path of pollutants, Mathematical studies, Model studies, Reviews, Water pollution sources, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles.

Recent developments in a kinetic theory of hard-sphere aerosols are reviewed with particular emphasis on microphysical and microchemical processes involved in scavenging of gases and particles by rain clouds. Of particular interest are such topics as gas and particle diffusion to cloud and rain droplets, inertial deposition of particles on droplets, the role of rarefied gas effects in such dynamical processes, the consequences of diffusiophoretic and thermal forces acting on aerosols near water droplets, removal of gases by homogeneous chemical reactions to form aerosols, chemical reactions inside and at the surface of droplets, and collision and coagulation of droplets and aerosols. Elements of the idealized theory should provide a framework within which experiments may be interpreted or checked for consistency. Disagreement between theory and observation points either to systematic experimental error or to poorly understood phenomena significant in the scavenging process. (See also W72-12752) (Woodward-USGS)
W72-12778

ATTACHMENT OF TRACE SUBSTANCES ON ATMOSPHERIC AEROSOLS,
Texas Univ., Austin.
J. R. Brock.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 373-380, December 1970. 3 fig, 4 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Aerosols, Particle size, Model studies, Mathematical studies, Equations, Pollution abatement, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles.

A vaporous or gaseous trace substance on release into the atmosphere may undergo attachment, either directly or after some physicochemical alteration, by a variety of processes including absorption and condensation to the existent atmospheric aerosol. The atmospheric aerosol with the attached trace substance may also undergo coagulation and thus concentrate the trace substance even more. Finally, because a single raindrop can accrete a large number of aerosol particles, the process of precipitation scavenging can lead to still further concentration of the trace substance. Several factors are examined which lead to characteristic distributions of trace substances in atmospheric aerosols. The implications of these distributions in atmospheric cleansing processes are discussed. (See also W72-12752) (Woodard-USGS)
W72-12779

RECENT CALCULATIONS OF COLLISION EFFICIENCIES,
University Coll., London (England). Dept. of Mathematics.
L. M. Hocking.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 381-383, December 1970. 2 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Cloud physics, *Mathematical studies, Particle size, Adhesion, Nucleation.
Identifiers: *Precipitation scavenging, Colliding particles, Collision efficiencies.

Small airborne particles collide when there is an approach mechanism to bring them together and an adhesion mechanism to prevent them from being separated. Two sets of calculations for collisions are discussed: one for liquid drops and one for solid particles. The first set of calculations concerns collisions between drops of unequal size falling in still air. When the collision efficiency was greater than 0.2, low collision efficiencies differed by up to 40%. When the results are applied to changes in a cloud-droplet spectrum by collisions, the inaccuracy in the small efficiencies will not produce significant errors since the process is dominated by the most efficient collisions. The second set of calculations relates to the motions of solid particles in a shear flow. The particles are of equal size and are sufficiently small for their sedimentation rate to be negligible. (See also W72-12752) (Woodard-USGS)
W72-12780

PROCESSES INFLUENCING EVOLUTION OF DROPLET OR AEROSOL SPECTRUM,
National Center for Atmospheric Research, Boulder, Colo.
R. L. Drake.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 385-402, December 1970. 45 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Aerosols, Cloud physics, Model studies, Regression analysis, Mathematical studies, Equations, Correlation analysis, Precipitation (Atmospheric), Particle size, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles, Particle transport.

The state of the art of the scalar transport equation that arises in the study of an evolving size spectrum of aerosol particles or cloud water droplets is reviewed. An integrodifferential equation contains terms accounting for coagulation or coalescence of particles, particle breakup, sedimentation of particles, particle scavenging, and droplet production due to condensation. This review includes the theoretical developments of Melzak, McLeod, and Morgenstern; the exact solutions of Golovin, Martynov, Bakanov, Scott, and Drake; the numerical models of Warshaw, Berry, Friedlander, Wang, Levin, and Sedunov; and other approximate methods of Enukashvili and Golovin. Also considered are results of studies concerning the upper and lower bounds of the power moments of the particle distribution and how these results affect the choice of the collection kernel in the integrodifferential equation. Ideas concerning the numerical solution of the coalescence equation by the method of perturbing the kernel and by similarity approximation are given. (See also W72-12752) (Woodard-USGS)
W72-12781

PARTICLE-FREE SPACE IN STEFAN FLOW,
Istituto di Fisica dell'Atmosfera, Bologna (Italy).
O. A. Vittori, and V. Prodi.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 403-410, December 1970. 3 fig, 2 tab, 9 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Particle size, *Laboratory tests, Gases, Thermodynamics, Temperature, Analytical techniques, Evaporation, Diffusion, Nucleation.
Identifiers: *Particle-free space, *Stefan flow, Dust-free space, Vapor diffusion, Dark-space boundary.

In airborne particles, sources of heat or vapor bounding an aerosol are soon surrounded by a region free of particles. Observed in lateral illumination, this particle-free region appears as a dark space sharply separated from the rest of the aerosol. The boundaries of the particle-free space (also called dust-free or dark space) depict a condition of dynamic equilibrium between particle diffusion and the motion caused by temperature gradient in the thermophoretic field or vapor-concentration gradient in Stefan flow and diffusiophoresis. The dust-free space around evaporating surfaces was investigated in the laboratory. A vapor-diffusion field was established in plane-to-sphere and in plane-to-plane geometries. In the plane-to-plane field, the experimental parameters can be accurately controlled. In that configuration quantitative measurements were performed on the displacement velocity of the dark-space boundary. The actual velocity was lower than the Stefan-flow velocity. This difference was interpreted in terms of Brownian diffusion of particles through the boundary. (See also W72-12752) (Woodard-USGS)
W72-12782

PHORETIC PROCESSES IN SCAVENGING,
Battelle-Pacific Northwest Labs., Richland, Wash.
W. G. N. Slim, and J. M. Hales.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U Atomic Energy Comm, Div of Biology a Medicine: U S Atomic Energy Comm Symposi Series 22, p 411-422, December 1970. 2 fig, 18 r AEC Contract AT (45-1)-1830.

Descriptors: *Air pollution, *Fallout, *Water p lution sources, *Aerosols, Transportation, Clo physics, Gases, Thermodynamics, Particle si Mathematical studies, Latent heat, Conducti Diffusion, Nucleation.
Identifiers: *Cloud scavenging, *Thermophores Airborne particles, Particle transport.

A comparison is made of the roles played by th mophoresis, Brownian diffusion, and fusiophoresis in the precipitation scavenging aerosol particles. For a certain range of partic sizes thermophoresis dominates if the latent h associated with the phase transition of wate transferred through the air to or from precipitation element by conduction. A graph the resulting washout coefficient shows that th mophoresis enhances the below-cloud scavenging of aerosol particles with radii betw 0.01 and 1.0 microns. The solution is presented the appropriate convective-diffusion equation describes thermophoretic effects in the in-cl scavenging problem. (See also W72-127 (Woodard-USGS)
W72-12783

PRECIPITATION SCAVENGING IN A LARG -CLOUD DIFFUSION CODE,
California Univ., Livermore. Lawrence Radia Lab.
K. R. Peterson, and T. V. Crawford.
In: Precipitation Scavenging (1970); Proc of S posium, Richland, Wash, June 2-4, 1970, sp sored by Battelle Pacific Northwest Lab and Atomic Energy Comm, Div of Biology Medicine: U S Atomic Energy Comm Sympos Series 22, p 425-431, December 1970. 3 fig, 11 r

Descriptors: *Air pollution, *Fallout, *Water lution sources, *Model studies, Precipitation mospheric), Pollution abatement, Particle Clouds, Transportation, Mathematical stud Nucleation.
Identifiers: *Precipitation scavenging, Airbo particles, Particle transport.

In the mid-1960's a predictive model was desig for nuclear excavation experiments at the Ne Test Site. The model was initially tested on radioactive effluent from nuclear reacts designed for spacecraft. Since that time the has been used for prediction and diagnosis o three nuclear cratering tests, namely, Cabri (January 1968), Buggy (March 1968), and Sk oner (December 1968). The model is applicab to diffusion of any large cloud, not necessa radioactive. It incorporates a precipit scavenging option with externally spec parameters for precipitation rate and was coefficient. The cratering test Cabriolet inv snowout downwind; predetonation predic and later diagnostic calculations, using obse meteorological information, were comp satisfactorily with radioactivity measure made after the Cabriolet detonation. (See W72-12752) (Woodard-USGS)
W72-12784

SCAVENGING OF AEROSOLS BY RAIN: A U-MERICAL STUDY,
IBM Scientific Center, Palo Alto, Calif.
R. N. Kortzeborn, and F. F. Abraham.
In: Precipitation Scavenging (1970); Proc of posium, Richland, Wash, June 2-4, 1970, sored by Battelle Pacific Northwest Lab and Atomic Energy Comm, Div of Biology Medicine: U S Atomic Energy Comm Symp Series 22, p 433-446, December 1970. 7 fig, 22

escriptors: *Air pollution, *Fallout, *Water pollution sources, *Model studies, Precipitation (Atospheric), Cloud physics, Rainfall, Aerosols, umerical analysis, Nucleation.
entifiers: *Precipitation scavenging, Airborne rticles, Particle transport.

washout process is considered whereby small rborne particles are scavenged below the cloud vel. Previously published models of washout ve assumed that the raindrop size distribution d the atmospheric conditions are identical at the ound and at cloud base and do not vary with ne. The mathematical model in this report allows spatially varying atmospheric profile and takes aporation and coalescence of raindrops into acunt on a dynamic basis. These effects greatly er washout at low elevations. The computanal model is explained in detail. (See also W72-752) (Woodard-USGS)
72-12785

E OF NATURAL RADIOACTIVITIES TO TIMATE LARGE-SCALE PRECIPITATION AVENGING,
SA Research Labs., Silver Spring, Md. Air sources Lab.
Machta, R. J. List, M. E. Smith, Jr., and H. schger.
Precipitation Scavenging (1970); Proc of Symsium, Richland, Wash, June 2-4, 1970, sponed by Battelle Pacific Northwest Lab and U S omic Energy Comm, Div of Biology and dicine: U S Atomic Energy Comm Symposium ries 22, p 465-474, December 1970. 7 fig, 22 ref.

scriptors: *Air pollution, *Fallout, *Water pollion sources, *Argon, *Beryllium, Model stus, Transportation, Diffusion, Measurements, nosphere, Nucleation.
ntifiers: *Precipitation scavenging, Airborne rticles, Particle transport.

ryllium-7 and argon-37 are naturally occurring mogenic radionuclides with similar half-lives. ative productions as a function of altitude and itude are identical. Beryllium-7 is subject to cipitation scavenging; argon-37, a noble gas, is t. A one-dimensional vertical diffusion model oduces surface-air concentrations to fit the few rface-air Ar-37 measurements. Scavenging is ed to the diffusion model to compare predicthis with the observed Be-7 vertical profile. The usion-scavenging model can also be tested inst the distribution of Pb-210 resulting from decay of radon gas emitted from the earth's face. The technique promises useful informaon on large-scale precipitation scavenging. (See W72-12752) (Woodard-USGS)
2-12787

AVENGING PREDICTION USING RATIOS CONCENTRATIONS IN AIR AND CIPITATION,
ision of Biology and Medicine (AEC), shington, D.C.
. Engelmann.
Precipitation Scavenging (1970); Proc of Symum, Richland, Wash, June 2-4, 1970, sponed by Battelle Pacific Northwest Lab and U S mic Energy Comm, Div of Biology and licine: U S Atomic Energy Comm Symposium Ses 22, p 475-485, December 1970. 2 fig, 20 ref.

criptors: *Air pollution, *Fallout, *Nucleati, *Water pollution sources, Theoretical analyi Mathematical studies, Gases, Meteorological , Precipitation (Atmospheric), Weather casting.
tifiers: *Precipitation scavenging, Airborne icles, Particle transport.

hout ratios (factors) are applicable to the preion of scavenging by precipitation of widely ing particle sizes and, perhaps, gases. The explanation is compatible with observed variations of pollutant concentration in rain with rainfall rate and dew point, with the consistency of observed ratios, and with an elementary equation that is derived to explain the ratios. As cloud droplets grow by condensation on nuclei, the concentration of nuclei in the cloud droplets decreases. When droplets coalesce, the concentration remains constant. Condensation proceeds until the droplet reaches a critical size; then both condensation and coalescence proceed--in a proportion determined by the updraft speed, with strong updrafts giving a greater proportion of condensation. Precipitation rate varies directly with updraft strength. Updrafts are stronger in the more vertically developed clouds, which happen to occur more frequently in summer and in the lower latitudes. It follows that the pollutants that are scavenged as or attached to nuclei will have concentrations in precipitation that are noticeably and inversely related to precipitation rate. (See also W72-12752) (Woodard-USGS)
W72-12788

FISH AND FISHERIES IN THE CONTEXT OF ENVIRONMENTAL CONCERN,
Food and Agriculture Organization of the United Nations, Rome (Italy). Dept. of Fisheries.
For primary bibliographic entry see Field 05C.
W72-12793

GROUND-WATER POLLUTION IN MICHIGAN,
Michigan State Geological Survey, Lansing. Dept. of Conservation.
N. Billings.
Sewage and Industrial Wastes, Vol 22, No 12, p 1596-1600, December, 1950.

Descriptors: *Groundwater, *Waste disposal, *Toxicity, *Water pollution sources, Recharge, Water resources, Regulation, Time, Michigan flow, Geology.
Identifiers: *Flow direction, *Time response, Liability.

The effect of pollutant infiltration into groundwater reservoirs is discussed. Where groundwater recharge is important, waste penetration into the soil may be harmful. Examples of time responses for contaminated groundwaters are prepared for plating, picric acid, phenolic, salt, gasoline, cheese factory, and septic dry well wastes. Subsurface flows are difficult to predict. Influencing factors include hydraulic gradient, high-capacity water wells, drainage ditches, local cloudbursts, and dam construction. Major considerations with waste disposal on the ground are enumerated. They are waste toxicity, soil conditions and geology, effect of waste on groundwater, and flow direction of waste. Pumping tests provide some criteria and help establish liability in cases of well contamination. Legal restrictions are being formulated to consider waste disposal effect on underground resourcesendangering a neighbor's welfare. Close regulation is needed to conserve water resources for this and future generations. (Nardozzi-AWWA)
W72-12797

UNDERGROUND WASTE DISPOSAL AND CONTROL.
American Water Works Association, New York. Committee on Underground Waste Disposal and Control.

Journal of the American Water Works Association, Vol 49, No 10, p 1334-1342, October, 1957. 1 fig, 2 tab, 21 ref.

Descriptors: *Waste disposal, *Underground waste disposal, Surveys, Pollutants, Geology, Hydrology, Competing uses, Water sources, Control, Path of pollutants, Time.
Identifiers: *Underground pollution, Statutory control.

Examples of underground pollution problems include: well screen corrosion due to acid waste percolation in an estuarine swamp; cadmium and hexavalent chromium contamination of groundwater by aircraft waste discharged to leaching pits; and calcium chloride contamination of downstream wells by surface discharge of this concentrated waste. A survey of U. S. underground disposal practices provided information on contaminant types, waste constituents, waste sources, and statutory control in the U. S. A tabulation is made of the nature of specific pollutants and observed distance and time of travel. A recommendation is made to group states with similar control characteristics for common studies of existing problems and determination of trends. Factors to estimate potential groundwater pollution are: gaging of industrial growth rate-adequacy of existent waste facilities and future needs; urban or suburban expansion developments to provide industrial growth; available water sources and comparative use of waters; general geologic and hydrologic conditions governing underground contaminant movement; and knowledge of existing statutory controls. (Nardozzi-AWWA)
W72-12804

ROLE OF GROUND WATER CONTAMINATION IN WATER MANAGEMENT,
Geological Survey, Raleigh, N.C.
H. E. LeGrand.
Journal of the American Water Works Association, Vol 59, No 5, p 557-565, May, 1967, 1 fig, 6 ref.

Descriptors: *Water pollution, *Groundwater, Waste disposal, Water quality.
Identifiers: *Quality deterioration, Subsurface discharge.

Groundwater contamination and its complement are placed in perspective with water development. Their importance in long-range integrated plans is demonstrated. Groundwater contamination is quality deterioration of underground supplies. These are influenced by waste disposal practices, artificial recharge of aquifers, accidents, and salt water intrusion. A major objective is to maintain good health practices and minimize disposal costs. Variable factors for pollution are variety of waste material, wide toxicity range, man's disposal patterns and accidental releases, subsurface water development, elemental behavior in soil, water, and rock environment, and spatial and temporal criteria. Balanced surface and groundwater development and waste disposal policies are needed. Other considerations, and land and stream classifications are outlined. An inventory should be compiled of type and quantity of groundwater contaminants and behavior. Work must be coordinated with specific elemental effect on biota studied. (Nardozzi-AWWA)
W72-12807

DEGRADATION OF ORGANOCHLORINE INSECTICIDES IN FLOODED SOILS IN THE PHILLIPPINES,
International Rice Research Inst., Los Banos, Laguna (Philippines).
T. F. Castro, and T. Yoshida.
J Agric Food Chem. Vol 19, No 6: p 1168-1170, 1971. Illus.
Identifiers: *Insecticides, Aldrin, Chlordane, Chlorine, DDD, DDT, *Degradation (Decomposition), Dieldrin, Endrin, Heptachlor, Methoxychlor, Philippines, Residues, Soils.

The degradation of the organochlorine insecticides DDT, DDD, methoxychlor, heptachlor, chlordane, endrin, dieldrin, and aldrin was investigated under upland and flooded conditions. DDT, DDD, methoxychlor and heptachlor degraded faster in flooded soil than in upland soil and were found to degrade faster in soils with high organic matter content. DDD was found to accumulate in DDT-treated flooded soil. Endrin was degraded only in

Casiguran flooded soil. Aldrin was more persistent in flooded than in upland soil. Chlordane and dieldrin were persistent both in flooded and in upland soil.--Copyright 1972, Biological Abstracts, Inc.
W72-12808

SOURCES OF SEDIMENT IN A MOUNTAIN RIVER BASIN,
Montana State Univ., Bozeman. Water Resources Research Center.
M. G. Klages.
Available from the National Technical Information Service as PB-211 447, $3.00 in paper copy, $0.95 in microfiche. Completion Report No. 28, June, 1972, 15 p, 11 fig, 1 tab, OWRR A-041-MONT (1).

Descriptors: *Sediments, Water pollution, *Soils, *Turbidity, *Suspended solids, Measurement, *Water pollution sources, River basins, *Montana.

Turbidity measurements can be used to estimate suspended solids in water from a single watershed. The accuracy of the estimate can be improved by removing the sand and measuring it gravimetrically. Sediment yield is strongly influenced by geology of the drainage area. Mineralogy of the suspended material is also influenced by geology but to a lesser extent. Mineralogical measurements can be used to trace the sources of sediment where differences in geology exist within a watershed. They work best on smaller watersheds where the number of tributaries is small and distances short. They are probably best used in conjunction with other measurements such as suspended load and stream flow. X-ray diffraction patterns can be used to determine whether the major source of suspended clay in a stream is sheet erosion of weathered surface soil or erosion of unweathered subsoil and geologic materials. (Holje-Montana)
W72-12817

THE ROLE OF MICROORGANISMS IN THE STABILIZATION OF SOIL AGGREGATES,
Wisconsin Univ., Madison. Dept. of Bacteriology; and Wisconsin Univ., Madison. Dept. of Soil Science.
R. B. Aspiras, O. N. Allen, R. F. Harris, and G. Chesters.
Soil Biology and Biochemistry, Vol. 3, No. 4, p 347-353, November 1971. 4 fig, 13 ref.

Descriptors: *Binders, *Soil microorganisms, *Soil aggregates, *Soil environment, *Stability, Soil moisture, Soil microbiology, Biodegradation, Environmental effects, Nutrients.
Identifiers: *Water-stable compounds.

The biodegradability of chemically different soil-binding substances produced in situ by diverse microorganisms was investigated to evaluate the role of microorganisms in the promotion and destruction of soil-aggregate water-stability. Plate cultures of 7 fungi, 6 streptomycetes and 5 bacteria were grown on appropriate media for 5 days. Wet-sieve analysis was used to assess the water-stability of soil aggregates produced by pure microorganism cultures and by an indigenous soil microflora. Aggregates amended with sucrose generally showed little resistance to soil population biodegradation while aggregates amended with corn stover were more resistant, at least 60% of them being stable after 64 days. After 128 days, water-stability always deteriorated markedly, indicating that the aggregating agents were no longer being synthesized, probably because of energy source depletion. Substances synthesized at 15 degrees C were quickly biodegradable at 30 degrees C. It is felt that the status of soil aggregation is determined by the net effect of the continuous synthesis and degradation of binding materials by the microbial population en masse rather than by the activity of specific microorganisms and that this is controlled by prevailing nutritional factors and environmental conditions. (Casey-Arizona)
W72-12857

SUBSURFACE HYDROLOGY AT WASTE DISPOSAL SITES,
IBM Watson Research Center, Yorktown Heights, N.Y.
R. A. Freeze.
IBM Journal of Research and Development, Vol 16, No 2, p 117-129, March 1972. 8 fig, 2 tab, 29 ref.

Descriptors: *Waste disposal wells, *Landfills, *Water pollution sources, *Path of pollutants, *Mathematical models, Computer programs, Mixing, Unsaturated flow, Saturated flow, Waste disposal, Hydrogeology, Water pollution effects, Water quality.

One result of concern over surface-water pollution is an increase in the popularity of ground-based waste disposal practices that save the streams but have a high potential for subsurface pollution. One of these, sanitary landfill, appears quite promising in its ability to handle large waste loads with a minimum of contamination; but two others, waste lagoons and deep-well injection of liquid wastes into geologic formations, lead to irreversible subsurface pollution. A mathematical model of the subsurface flow can be used to predict results of disposal and to assess the impact on the environment of a proposed disposal site. The model can predict transient and steady state subsurface flow systems in two or three dimensions and includes consideration of both the saturated and the unsaturated zones. It can be applied at the reconnaissance stage on a regional basis to analyze a large number of alternative sites and at the chosen site to test the efficiency of various design alternatives and to provide guidance in the design of a monitoring system. The model predicts only convective transport and does not consider dispersion or hydrochemical reactions. (Knapp-USGS)
W72-12864

SANITARY LANDFILL LEACHATE TRAVEL IN VARIOUS SOIL MEDIA--A BIBLIOGRAPHY,
Vermont Univ., Burlington. Technical Information Center.
W. T. Emery.
Available from NTIS, Springfield, Va 22151-PB-208 095 Price $3.00 paper copy; $0.95 microfiche. Final Project Report, December 31, 1971. 11 p. UVM-TIC-133-71-1.

Descriptors: *Bibliographies, *Landfills, *Water pollution sources, *Path of pollutants, *Leachate, Sanitary engineering, Waste disposal, Groundwater movement, Soil properties, Leaching, Subsurface drainage, Self-purification, Documentation, Publications, Information retrieval.

A survey of literature was conducted to aid in determining how far technology had progressed in predicting the distances that sanitary landfill leachates must travel in different soil media before becoming purified to the extent that they will not contaminate sources of fresh water. The survey was conducted for the most part during the first half of calendar year 1971, with a few references added during the second half. All references (139) considered to be of value to the survey are listed in the bibliography. (Woodard-USGS)
W72-12873

A REVIEW OF CONCEPTUAL MODELS AND PREDICTION EQUATIONS FOR REAERATION IN OPNE-CHANNEL FLOW,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05G.
W72-12878

LEAD POISONING IN COWS,
Polskie Towarzystwo Nauk Weterynaryjnych, Warsaw (Poland).
Z. Denz, and A. Czarnowski.
Med Weter. Vol 26, No 7: p 412-413. 1970.

Identifiers: Cows, *Lead, *Feeds, Toxicity, *S gar beets.

Mass Pb poisoning of farm animals is rare and noted only when some source of Pb such as pai enamel, etc. comes in contact with feed. In so cases water is the source of poisoning. In the c under consideration sugar beet pulp was the c prit due to mechanical damage in the sugar b factory. Attention is called to the source in view the universal use of sugar beet pulp in feeding c tle in Poland.--Copyright 1972, Biological A stracts, Inc.
W72-12892

AGRICULTURE AS AN ENVIRONMENT FACTOR,
Norges Veterinarhoegskole, Oslo. Dept. Microbiology and Immunology.
O. Sandvik.
Nor Vet Tidsskr. Vol 82, No 12: p 698-700. 1970
Identifiers: *Water pollution sources, *Agric ture, Farm wastes, Pollution abatement.

Various aspects of agricultural influence on surrounding ecosystems are reviewed, in parti lar the pollution with manure, ensilage liquids liquids from lye-treating of straw, but a residuals from chemicals used in agriculture, su as antibiotics, pesticides, preservatives, and ac tives in foodstuffs. One of the most important ture tasks is considered to be the 'short-circuiti of nutrient wastes (fertilizers, ect.), to be reuse farming instead of polluting the surrounding Copyright 1972, Biological Abstracts, Inc.
W72-12906

SOIL CHARACTERISTICS AND SUBSURFA SEWAGE DISPOSAL,
Department of Agriculture, Guelph (Ontario).
G. J. Wall, and L. R. Webber.
Can J Pub Health. Vol 61, No 1, p 47-54. 1970.
Identifiers: Algae, *Sewage disposal, Drain Eutrophication, Ground-water, Phosphorus, S tic tanks, *Soil properties, Weeds.

The discharge of P in human sewage was mated to be 3.0 to 3.5 lb/capita yr. If 3.0 lb of s ble P were found in 100 acre-ft of water the res ing concentration would be greater than 0.01 p the value at which algae blooms. Concentrati of total P greater than 0.01 ppm in groundwater not considered normal and when this value is tained a source of contamination is suspect Soluble P concentrations in groundwaters are tually nonexistent because of chemical fixa and precipitation as insoluble compounds of Mg, Fe and Al. In this study, 10 out of 14 sam of groundwater associated with weeping systems on poorly drained soils were found to tain P in excess of the arbitrarily established centration of 0.01-0.02 ppm. Soils are classifie a medium for the disposal of septic tank effluen Particular attention was paid to the depth of watertable or bedrock, natural soil drainage, permeable soil strata and various site featur Persons with cottage sites near a lake should certain that the soil is suitable for disposal of tic tank effluents. Organic-free coarse sands gravels and any soil with a watertable less than 5 ft below the soil surface should not be sidered as a sewage disposal medium.--Copyri 1972, Biological Abstracts, Inc.
W72-12913

CONTENT OF CHLORORGANIC PESTICI IN WATER PLANTS,
Vsesoyuznyi Nauchno-Issledovatelskii Institu gieni i Toksikologii Pestitsidov, Kiev (USSR).
K. K. Vrochinskii, I. V. Grib, and A. V. Grib.
Gidrobiol Zh. Vol 6, No 6, p 107-109. 1970.
Identifiers: *Pesticides, *Aquatic plants, Acor calamus M, Chloroganic, DDT, Lemna minor, Numphaea alba D, Potamogeton pectinatus, Spirodela polyrriza M.

he content of organic pesticides was studied in ifferent organs of Lemna minor, Spirodela olyrrhiza, Nymphaea alba, Acorus calamus and otamogeton pectinatus from the Stubla River, krainian SSR. Pesticides were used extensively the river basin. The greatest amount was found N. alba (11.5 mg/kg DDT and 4.4 mg/kg hex-hlorocyclohexane. In the others it varied from 8-2.0 mg/kg DDT and 1.16-0.94 mg/kg hex-hlorocyclohexane. The amount varied according the quantity of fatty substance in the plant, hysiological characteristics which determined its vel in the water and the season.--Copyright 1972, iological Abstracts, Inc.
72-12923

CCUMULATION AND PERSISTENCE OF DDT I A LOTIC ECOSYSTEM,
aine Univ., Orono. Dept. of Entomology; and aine Univ., Orono. Dept. of Biochemistry.
B. Dimond, A. S. Getchell, and J. A. Blease.
urnal of Fisheries Research Board of Canada, ol 28, No 12, p 1877-1882, December 1971. 3 tab, ref.

escriptors: *Pesticide residues, *Lotic environ-ent, Watersheds (Basins), *DDT, *Small atersheds, Ecosystems, Pesticide kinetics, laine, Muds, Invertebrates, Fish, Birds, reams, Aquatic plants, Aquatic insects, ustaceans, Mussels, Common merganser duck, oassay, Water pollution effects, Gas chromatog-phy, Brook trout, Sampling, Separation chniques, Algae, Crayfish, Food chains, Per-tence, Runoff, Sediments.
entifiers: Chubs, Kingfishes, Salvelinus fon-alis, Semotilus atromaculatus, Cleanup, Sample eservation, Cambarus bartoni, Biological sam-es, Mergus merganser, Megaceryle alcyon, oaccumulation.

mall watersheds in Maine that had received vari-s numbers od DDT treatments starting in 1958 re studied for persistence of DDT residues with jacent untreated watersheds being used as con-ls. Muds, plants, invertebrates, and fish were llected in 1967 and 1968 and birds in 1969. Sam-s were frozen within a few hours after collec-n and held at minus 15 C until extraction of sticides. Various collections and extraction hniques were used, depending upon the type of mple. DDT was found to persist in the streams at least 10 years following light application to forest; however, residues did decline sharply er 2 - 3 years. The prolonged persistence led to mulative levels in streams sprayed more than ce and residue concentration throughout the d chain was evident. (Mortland-Battelle)
2-12930

METABOLISM OF THE HERBICIDE, 2,3,6-ICHLOROBENZOATE BY NATURAL CROBIAL POPULATIONS,
wling Green State Univ., Ohio. Dept. of Biolo-
S. Horvath.
letin of Environmental Contamination and icology, Vol 7, No 5, p 273-276, May 1972. 1 4 ref.

scriptors: *Chlorinated hydrocarbon pesticides, erbicides, *Microbial degradation, *Pesticide moval, *Aquatic microorganisms, Biodegrada-n, Chemical reactions, Halogenated pesticides, dation, Aquatic bacteria, Bactericides, Cul-es, Gas chromatography, Biological treatment, icity.
ntifiers: *Cometabolism, *2 3 6-hlorobenzoate, Brevibacterium, romobacter, Mineralization, Thin layer chro-ography, Metabolites.

cometabolism of the herbicide, 2,3,6-hlorobenzoate (2,3,6-TBA) by natural aquatic terrestrial microbial populations has been stu-d by incubating lake water samples containing the herbicide at ambient temperatures and determining concentrations of 2,3,6-TBA by gas chromatography. Oxidation of 2,3,6-TBA by pure cultures of Brevibacterium was shown to occur by a cometabolic process. In addition, the by-product which accumulated as a result of this oxidation, 3,5-dichlorocatechol, was also subject to cometabolic attack by a pure culture of Achromobacter. Examination of the samples from three separate experiments by thin layer and gas chromatography did not reveal any chlorinated compounds other than 2,3,6-TBA, indicating complete mineralization of the herbicide by the mixed culture system. Enhancement of the rate of cometabolic oxidation of the herbicide could be achieved by addition of a biodegradable analog of 2,3,6-TBA to the cometabolic system. (Byrd-Battelle)
W72-12935

ANALYSIS OF TOXIC METALS IN TRADE EFFLUENTS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
For primary bibliographic entry see Field 05A.
W72-12963

ELECTRIC POTENTIALS AND DOMESTIC WATER SUPPLIES,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05C.
W72-12970

UPTAKE AND METABOLISM OF 2,2-BIS- (P--CHLOROPHENYL)-1,1,1-TRICHLORO ETHANE (DDT) BY MARINE PHYTOPLANKTON AND ITS EFFECT ON GROWTH AND CHLOROPLAST ELECTRON TRANSPORT,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W72-12998

THE INFLUENCE OF INCREASED NITROGEN FERTILIZATION ON THE NITRATE CONTENT OF GROUND WATER,
M. Poch.
Z Gesamte Hyg Grenzgeb. Vol 17, No 8, p 588-591. 1971.
Identifiers: *Water pollution sources, Water pollution effects, *Fertilization, Groundwater, Infants, Nitrates, Nitrogen, Methemoglobinemia.

Nitrate-containing water was found to be the cause of methemoglobinemia in infants. Because of this, chemical testing of drinking water was carried out for many years. A statistical study is now reported showing that there was a significant increase in nitrate from 11.33 mg NO3/l in 1926 to 17.89 mg/l in 1962. During the same period the use of nitrogen fertilizer increased from 10 to 40 kg/hectare.--Copyright 1972, Biological Abstracts, Inc.
W72-13005

EFFECT OF URBAN AND AGRICULTURAL PESTICIDE USE ON RESIDUE LEVELS IN THE RED CEDAR RIVER,
Michigan State Univ., East Lansing. Dept. of Entomology.
M. J. Zabik, B. E. Pape, and J. W. Bedford.
Pestic Monit J. Vol 5, No 3, p 301-308. 1971. Illus. Map.
Identifiers: *Water pollution sources, Agriculture, Michigan, *Pesticides, Red Cedar River, Residues, Rivers, Seasonal, Variations, Cities.

Analyses on 1549 water and bottom samples have shown high levels of DDT and its metabolites (TDE and DDE) in the Red Cedar River. The river becomes progressively more contaminated in a downstream direction and shows seasonal variations. The concentrations of pesticides in bottom samples give a good indication of long term contamination, whereas levels in the suspended matter (that retained by a 5-micron filter) indicate the amount of pesticide being carried on a short term basis. The largest amount of pesticide contamination entering the Red Cedar River comes from the waste water treatment plants.--Copyright 1972, Biological Abstracts, Inc.
W72-13007

RESIDUE LEVELS OF DIELDRIN IN AQUATIC INVERTEBRATES AND EFFECT OF PROLONGED EXPOSURE ON POPULATIONS,
Georgia Univ., Athens. Coll. of Agricultural Experiment Stations.
For primary bibliographic entry see Field 05C.
W72-13014

5C. Effects of Pollution

EFFECT OF SPECTRAL COMPOSITION ON PHOTOSYNTHESIS IN TURBID RESERVOIRS--PHOTOSYNTHETIC PRODUCTION IN A TURBID RESERVOIR II. DETAILS OF AN INCUBATION MODEL AND COMMENTS ON THE EFFECT OF LIGHT QUALITY ON PHOTOSYNTHESIS,
Kansas Water Resources Research Inst., Manhattan.
J. A. Osborne, and G. R. Marzolf.
Available from the National Technical Information Service as PB-211 368, $3.00 in paper copy, $0.95 in microfiche. Contribution No 106, June 1972. 102 p, 8 fig, 11 tab, 69 ref, 2 append. OWRR A-047-KAN (1).

Descriptors: *Reservoirs, *Primary productivity, *Turbidity, *Photosynthesis, Limnology, *Eutrophication, *Kansas, Model studies, Ecosystems, Algae, *Light quality, Eutrophic zone, Chlorophyll, Phosphates, Nitrates, Seasonal, Regression analysis, Correlation analysis.
Identifiers: *Photosynthetic model, *Tuttle Creek Reservoir (Kan), Great Plains, Aquatic ecosystem.

A numerical model, based on some simplifying assumptions, was used to evaluate spatial and seasonal patterns in primary production in Tuttle Creek Reservoir, Kansas, from June 1970 through May 1971. The assumptions of the model best fit turbid, homothermal lakes, such as those in Kansas and the Great Plains Province. The model describes the photosynthesis-depth profile on the basis of light attenuation with depth and allows integral photosynthesis to be obtained by a simple analytical calculation. The use of the model had its greatest advantage in allowing pelagic algal photosynthesis to be monitored in shipboard incubators. Various chemical, physical, and biological features were measured simultaneously with primary production to describe the diversity of the reservoir, to evaluate horizontal production patterns, and to validate the assumptions of the model.
W72-12393

OIL SLICKS AND FILMS.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05B.
W72-12426

HEATED WATER IN AQUICULTURE,
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
W. J. McNeil.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 24-28, 1970.

Descriptors: *Beneficial use, *Heated water, *Aquiculture, *Thermal powerplants, Cooling water, Fish farming, Salmon, Catfishes, Commercial fish, Shellfish, Oysters, Pacific Northwest U.S., *Thermal pollution.

A typical one million kilowatt nuclear plant might pump 700,000 gallons of cooling water per minute. The temperature of the cooling water would rise about 15 F. Developing satellite fish farms at steam electric stations as an alternative to heating our rivers is being explored in the United States, Japan, Great Britain, Russia, and other countries. Heated water provides a sheltered nursery for young oysters on Long Island Sound. The use of heated water might extend the growing season for catfish into winter and allow production in northern latitudes. Fish raised in systems where temperature and ration can be controlled grow more rapidly and are more efficient at converting food stuffs to edible muscle than are farm animals. Problems with using heated effluent in fish farming include scheduling shutdowns of power plants, controlling the concentration of chemicals in condenser water, and elimination of radioactive wastes from supply water. Development of a successful aquiculture industry at steam-electric stations requires close liason between the fish farmer and the electric utility. (See also W72-12466) (Eagle-Vanderbilt)
W72-12469

THERMAL POLLUTION AND THE AQUATIC ENVIRONMENT,
Idaho Dept. of Fish and Game, Boise.
M. Richards.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 35-38, 1970.

Descriptors: *Heated water, *Fish conservation, *Fish, Competition, Reproduction, Fish populations, Growth rates, Temperature, Electric powerplants, Water pollution effects, *Thermal pollution.

To a large extent, water temperature determines the species of fish that are present in any given body of water and the degree of success competing species will have in maintaining their individual populations. Reproductive processes, growth, oxygen consumption, activity and even ability to stay alive are affected by temperature. Unexpected results which have occurred from alteration of temperature regimens are cited. Measures to eliminate and forestall thermal pollution problems must be taken if waters are to be used for industrial purposes and a desirable aquatic environment is still to be maintained. (See also W72-12466) (Eagle-Vanderbilt)
W72-12471

MICROBIAL DEGRADATION OF DDT METABOLITES TO CARBON DIOXIDE, WATER, AND CHLORIDE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W72-12484

INITIAL STUDIES ON THE MICROBIAL BREAKDOWN OF TRIALLATE,
Saskatchewan Univ., S, Regina, Dept. of Biology.
For primary bibliographic entry see Field 05B.
W72-12485

DEGRADATION OF N-ALKANE-1--SULFONATES BY PSEUDOMONAS,
Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).
For primary bibliographic entry see Field 05B.
W72-12490

CATIONIC UPTAKE AND EXCHANGE IN SALMONELLA ENTERITIDIS,
Georgia Univ., Experiment. Div. of Food Science.
For primary bibliographic entry see Field 05B.
W72-12491

EFFECT OF TYPE OF ENRICHMENT AND DURATION OF INCUBATION ON SALMONELLA RECOVERY FROM MEAT-AND-BONE MEAL,
Agricultural Research Service, Philadelphia, Pa. Marketing and Nutrition Research Div.
C. N. Huhtanen, and J. Naghski.
Applied Microbiology, Vol. 23, No. 3, p 578-585, March 1972. 6 tab, 18 ref.

Descriptors: *Salmonella, *Incubation, *Enteric bacteria, Cultures, Statistical methods, Fluorescence, Pollutant identification, Resistance, Enzymes, Environmental effects, Bioindicators.
Identifiers: *Enrichment, Antiserums, Biological samples, Sample preparation, Agglutination, Culture media, Substrate utilization, Selective media, Serotypes, Meat, Bone, Biochemical tests.

Twenty-five meat-and-bone meal samples were enriched with either selenite-cystine or tetrathionate and incubated for 1 and 2 days. Seven were previously found to be positive; of the other 18, 16 were positive for Salmonella. The number of somatic serogroups per sample ranged from 1 to 11 with a mean of 3.8. Significantly more (P less than 0.01) group C sub 1 salmonellae were isolated using tetrathionate than selenite, whereas significantly more of groups G, 35, and Difco polyvalent D were isolated from selenite than tetrathionate. Seventy-six percent of the presumptive colonies from Brilliant Green agar showed a positive lysine decarboxylase reaction, and there were no differences between media or times of incubation. Ninety-four per cent of the lysine decarboxylase-positive cultures showed a positive somatic antiserum response; again there were no differences between times or enrichments although there were significantly more total positive serogroups at 2 days than at 1 day from tetrathionate but not from selenite. There were indications that certain serogroups preferred either one or the other enrichment. There were no differences in total positive samples with the two enrichments although neither alone was sufficient to identify all positives. Several lactose-positive salmonellae were recovered. (Mortland-Battelle)
W72-12494

BLOOD COMPOSITION OF THE NINESPINE STICKLEBACK (PUNGITIUS PUNGITIUS) UNDER UNFAVORABLE OXYGEN CONDITIONS,
L. D. Zhiteneva.
Vopr Ikhtio. Vol 11, No 3:, p 509-517, 1971. Illus.
Identifiers: *Adaptability, *Oxygen sag, Blood, Oxygen, *Pungitius pungitius, Sticklebacks.

Studies were conducted on the adaptability of ninespine stickleback (Pungitius pungitius) when transferred to Promernoe Lake (Murmansk region), which has a low O2 concentration (0.8-0.9 ml/l. The investigations were conducted from June 1967 to April 1968, with 46 blood smears obtained from 46 specimens. The results showed that at the beginning of winter under conditions of O2 insufficiency erythrocytes are released into the circulation from spleen depots when the O2 deficit is of 1.5-2 mo. duration. Prolonged O2 insufficiency (4.5-5 mo. duration) results in anemia and increased erythropoiesis. The percentage of immature red cells and of phagocytic white cells increased. After 5 mo. in a state of O2 insufficiency the erythropoietic organs were exhausted and this was reflected in erythrocyte polymorphism.--Copyright 1972, Biological Abstracts, Inc.
W72-12542

INTERRELATIONS AMONG PLANKTON, ATTACHED ALGAE, AND THE PHOSPHORUS CYCLE IN ARTIFICIAL OPEN SYSTEMS,
Ithaca Coll., N.Y. Dept. of Biology.
J. L. Confer.
Ecological Monographs, Vol 42, No 1, p 1-22 1972. 10 fig, 9 tab, 32 ref.

Descriptors: *Plankton, *Algae, *Phosphorus *Model studies, Lakes, Cycling nutrients Tracers, Littoral, Kinetics, Phosphates.
Identifiers: *Phosphorus circulation, Small lakes.

Phosphorus circulation during summer stratification was studied in 200-liter aquaria, continuously supplied with tap water, by means of analytical and tracer methods. This model of phosphorus circulation is believed to apply to small lakes with extensive littoral vegetation, the phosphorus influx to various biological compartments being equaled by a corresponding outflow. A major means by which phosphorus was removed from the open water was by trapping of particles by the community associated with the aquaria sides. After the first run the ponds were inoculated with water from the previous ponds. A biotic succession developed from a purely planktonic community to a more complex, two-community system of attached organisms on the sides and the plankton. The P removal rate varied widely, depending on extent of 'littoral' growth and nature of the particles. Considering succession to be the total change in physical and biological conditions over prolonged time, this open-system design developed from a one-community, few-species system into a two-community, several-species system. Nutrient circulation rate greatly increased with time and developed into this steady state, not an equilibrium system which depended on a continuous phosphorus influx to maintain concentrations and circulation rates. (Jones-Wisconsin)
W72-12543

NUTRIENTS LIMITING ALGAL GROWTH,
DSM's Central Lab., Geleen (Netherlands) Biological Dept.
J. W. Woldendorp.
Strikstof, Dutch Nitrogenous Fertilizer Review No 15, p 16-27, 1972. 3 fig, 12 photos, 26 ref.

Descriptors: *Eutrophication, *Nutrients, *Algae *Limiting factors, Phosphates, Chlorophyta Cyanophyta, Nitrogen, Carbon, Diatoms, Bacteria, Carbon dioxide, Chlamydomonas Scenedesmus, Chlorella, Silica, Light intensity Temperature, Mud, Growth rates, Anabaena Nitrogen fixation, Denitrification, Water pollution effects, Water pollution control.
Identifiers: Netherlands, Limiting nutrients.

Literature on excessive algal growth is reviewed. Although limnologists argue that algal growth is generally limited by phosphorus, nitrogen can also be limiting in some cases; it is also argued that carbon, not phosphorus, is the limiting nutrient. If a correlation is found between phosphorus concentration and algal yield, it is not proper to conclude that phosphorus is the limiting nutrient. It will take a considerable time before any effect of phosphate removal is observed, considering the vast quantities of phosphates stored in the mud. Microbial processes in toto probably have a regulating effect on nitrogen concentration of surface waters. It is unlikely that carbon would be the limiting element in view of high bicarbonate content of most waters. Whether bicarbonates or carbon dioxide are utilized by algal populations is discussed. Literature concerning the influence of N, P and C on algal growth in surface waters does not indicate clearly which element has limiting effect under the prevailing Netherland conditions. All forms of pollution by heat, chemicals, pathogenic microorganisms, etc., must be diminished if the water is to continue to support life. (Jones-Wisconsin)
W72-12544

HE EUTROPHICATION OF SURFACE VATER BY AGRICULTURE AND THE URBAN OPULATION,
nstitute for Soil Fertility, Haren-Groningen Netherlands).
. J. Kolenbrander.
trikstof, Dutch Nitrogenous Fertilizer Review, Jo 15, p 56-67, 1972. 2 fig, 5 tab, 28 ref, 4 photos.

escriptors: *Eutrophication, *Surface waters, Agriculture, Urbanization, Leaching, hosphates, Runoff, Soil types, Grassland, Arable nd, Domestic wastes, Detergents, Drainage, enitrification, Ammonia, Farm wastes, Fertil-ers, Nitrogen.
dentifiers: *The Netherlands.

lutrients and the sources from which they riginate were studied. Comparison was made etween the contribution of nitrogen and hosphorus through the soil and main drainage to utch surface waters. Lysimeter investigations nd river-water analyses are in reasonable agree-ent regarding losses of phosphate and nitrogen om cropland. Nitrogen leaching depends on soil pe, nature of crop, and amount and timing of fer-lizer application. Leaching of phosphate seems tle affected by fertilizers due to high P-fixing soil apacity. Contribution of urban populations to trophication by phosphate is considerably eater than that of the soil. Townspeople release million kg/year phosphate while a 2.2 million ectare cropland contributes about 3.5 million g/year. The nitrogen contribution from wnspeople is 48 million kg/year; from farmers 70 illion kg/year. Half of the phosphate contribu-on from townspeople originates from detergents. recent decades agriculture has contributed to trophication only by increasing volume of far-yard manure applied in winter. Most nitrogen mes from arable land, which has decreased arply, thus increase in nitrogen eutrophication is obably not significant. Contribution of osphate has not significantly increased. Any duction of N and P would be at the expense of il fertility. Only chemical purification of effluent n reduce the phosphate burden of surface water preciably. (Jones-Wisconsin)
72-12545

FECT OF BENTHAL DEPOSITS ON OX-GEN AND NUTRIENT ECONOMY OF FLOW-G WATERS,
ew York Univ., Bronx. Dept. of Civil Engineer-g.
Fillos, and H. Molof.
urnal Water Pollution Control Federation, Vol , No 4, p 644-662, 1972. 15 fig, 2 tab, 27 ref. 521-P-186

scriptors: *Bottom sediments, *Oxygen, utrients, Decomposing organic matter, Aerobic nditions, Anaerobic conditions, Oxygen de-nd, Mud-water interfaces, Laboratory tests, del studies, Biochemical oxygen demand, emical oxygen demand, Dissolved oxygen, osphates, Ammonia.
ntifiers: Benthal deposits, Oxygen uptake.

chanism of benthal decomposition and its ef-t on the overlying water quality were studied h a continuous-flow model. This approach to thal deposit study has the advantages of bling the investigator to test different parame-s under steady-state conditions and of being a ly simple system to define mathematically. It mits calculation of oxygen uptake rate and D release along with other parameters. Benthal composition of sludge bottoms involves both obic and anaerobic processes. Aerobic activi-s are restricted to the mud surface a few mil-eters deep. Anaerobic decomposition is active hin the remainder of the sludge depth and comes more significant in benthal stabilization the depth increases. Oxygen uptake rate of thal deposits is relatively independent of dge depths for depths greater than about 4 inches. In addition to the oxygen demand of benthal deposits, the BOD and COD releases are also important parameters. The release of nutrients, phosphate and ammonia, from benthal deposits increases appreciably when the DO falls below 1.5 mg/l. A dual DO standard is needed both for the bulk of surface and for the bottom of the natural water body. (Jones-Wisconsin)
W72-12546

THE DETERMINATION OF MINERALIZATION LOSSES IN CORRELATION WITH THE ESTIMATION OF NET PRIMARY PRODUCTION WITH THE OXYGEN METHOD AND CHEMICAL INHIBITORS,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
H. L. Golterman.
Freshwater Biology, Vol 1, p 249-256, 1971. 1 tab, 7 ref.

Descriptors: *Measurement, *Primary productivity, *Oxygen, *Chemistry, *Inhibitors, Eutrophication, Carbon, Nitrogen, Temperature, Bacteria, Respiration, Photosynthesis, Laboratory tests.
Identifiers: *Mineralization losses, Lake George (Uganda).

Calculation of net primary production using the light-dark bottle technique for which the oxygen uptake in darkness is subtracted from gross oxygen production under illumination is based on two assumptions: the overnight oxygen consumption is due only to algal respiration or mineralization of algal material by bacteria--and should therefore be subtracted from the algal material produced during day time, and oxygen consumption in the light and dark bottles is the same. This study determined whether specific bio-chemical inhibitors may be used to test the assumptions. In eutrophic lake water samples, incubated with dinitrophenol, decrease of particulate-carbon was about equal to decrease of particulate-nitrogen and was lower than the simultaneous oxygen consumption. This suggests that mineralization of the particulate material is caused by a bacterial process and not only by respiration. Therefore, only part of the oxygen consumption in darkness should be subtracted from the net algal production in light to estimate net daily production. It could be demonstrated with samples incubated with DCMU that oxygen consumption in light bottles is larger than in dark bottles. Both effects increase the results of the daily primary production from field observations. (Jones-Wisconsin)
W72-12547

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES.
Alaska Univ., College. Inst. of Water Resources.

Copy available from GPO Sup Doc EP 2.10 : 16100EXH 11/71, $2.50; microfiche from NTIS as PB-211 316, $0.95. Papers presented at Symposium at University of Alaska, College, July 22-24, 1970. Environmental Protection Agency Water Pollution Control Research Series, November 1971. 332 p. EPA Program 16100 EXH 11/71.

Descriptors: *Cold regions, *Water pollution control, *Wastewater treatment, *Water pollution effects, Water pollution, Water pollution sources, Alaska, Biological treatment, *Lakes.

An international symposium on water pollution control in cold climates was sponsored by the Alaska Institute of Water Resources and the Federal Water Quality Administration in July 1970. Invited papers discussed waste treatment technology and effects of wastes upon Far Northern receiving waters (see W72-12549 thru W72-12566).
W72-12548

SYNOPTIC STUDY OF ACCELERATED EUTROPHICATION IN LAKE TAHOE--AN ALPINE LAKE,
California Univ., Davis. Inst. of Ecology.
C. R. Goldman, G. Moshiri, and E. de Amezaga.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 1-21. 9 fig, 2 tab, 28 ref.

Descriptors: *Eutrophication, *Lakes, *Alpine, *Synoptic analysis, Cold regions, Nutrients, Biological communities, Algae, Periphyton, Phytoplankton, Photosynthesis, Invertebrates, Biomass, Benthic fauna, Benthic flora, Human population, Primary productivity, Water chemistry, *California, *Nevada.
Identifiers: *Lake Tahoe (Calif-Nev).

Lake Tahoe was studied by the synoptic approach which provides a nearly instantaneous evaluation of conditions existing on a given day, allowing nutrient sources to be located accurately. Increased fertility was evident at the South Shore under the influence of the Truckee River and high resident population, in Crystal Bay which contained highly disturbed land drainage, and near the lake outflow where there were high resident population and fairly extensive shallow water areas. Although occasional high periphyton values were encountered near tributaries, there was less correlation with tributaries than was found for phytoplankton productivity and biomass; distribution of periphyton was fairly uniform around the lake. The abundance and diversity of benthic organisms may not be functions of the same environmental property as the abundance, productivity, and diversity of the phytoplankton. The primary producers must be viewed as a more sensitive indication of increased fertility than chemical parameters, since any additional nutrients appear to move rapidly into the phytoplankton. Little or no measurable change in water chemistry was found while phytoplankton photosynthesis showed a very significant change. (See also W72-12548) (Jones-Wisconsin)
W72-12549

THE SOUTH BASIN OF LAKE WINNIPEG - AN ASSESSMENT OF POLLUTION,
Department of Mines and Natural Resources, Winnipeg (Manitoba). Fisheries Branch.
J. M. E. Crowe.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 22-47. 4 fig, 5 tab, 95 ref, 2 append.

Descriptors: *Water pollution, *Benthos, *Chemical analysis, Lakes, Limnology, Water pollution effects, Biological communities, Water pollution sources, Diptera, Fish, Cold regions, Gastropods, Mayflies, Amphipoda, Nematodes, Oligochaetes, Standing crops, Commercial fish, Mercury.
Identifiers: *Lake Winnipeg (Manitoba), *South Basin.

That Lake Winnipeg is undergoing a eutrophication cycle similar to Lake Erie is illustrated by changes that have occurred in the benthic fauna since 1930, standing crop and composition, chemical composition of the water, and reduced commercial fish production. Surveys on the south basin were conducted twice yearly, between March 1962 and September 1969, to determine changes attributable to pollution. The only ionic component showing an increase since 1930 is calcium. Mean concentrations of calcium, iron, sulphate, and total solids were higher in 1969 than in 1930. Maximum levels for most chemical components were recorded in 1966 and 1967, corresponding to high water levels; the lack of any significant increases in concentrations is believed to be due to low residence time and effective flushing. Benthic densities have increased from 437 and 578/sq m to 776/sq m during the 1962-1969

period. Benthos composition shifted from that dominated by Amphipoda and Ephemeroptera to the present Chironomidae-Oligochaeta configuration. Approximately 39% of all chironomids and 95% of all oligochaetes, between 1962 and 1969, were composed of pollutional species. As enrichment proceeds, benthos in Lake Winnipeg's south basin will ultimately be dominated by oligochaetes. (See also W72-12548) (Jones-Wisconsin)
W72-12550

EUTROPHICATION IN SOME LAKES AND COASTAL AREAS IN FINLAND, WITH SPECIAL REFERENCE TO POLYHUMIC LAKES,
Helsinki Univ. (Finland). Dept. of Limnology.
P. O. Lehmusluoto.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 48-60. 6 fig, 6 tab, 31 ref.

Descriptors: *Eutrophication, *Lakes, *Fjords, Phytoplankton, Primary production, Light penetration, Cold regions, Humus, Organic matter, Turbidity, Diatoms, Trophic level, Nitrogen, Phosphorus, Water pollution sources, Coasts, Nutrients, Domestic wastes, Pulp wastes, Sea water, Solar radiation, Temperature.
Identifiers: *Finland, Polyhumic lakes, Lake Saimaa (Finland), Lake Hakojarvi, Limiting nutrients, Coastal waters.

Finnish polyhumic lakes with their fast melting ice cover, short growing season, and great seasonal light variations are discussed with relation to these effects on primary production. It is suggested that the mean maximum primary production rate per unit volume in the water column during the growing season be measured in situ, or in constant light, and used as an index for many kinds of water bodies to give a relative but objective index of the phototrophic level. It would not reflect the total amount of organic material built up in the whole water column (which can be estimated by the light extinction curve), but it may be informative about the degree of eutrophication. Experiments showing the role of nitrogen and phosphorus in the eutrophication process in Lake Hakojarvi indicated that nitrogen was the primary limiting nutrient. Some data on eutrophicative effects of domestic sewage and pulp mill effluents, typical pollutants in Finland, are presented from Lake Saimaa and two coastal areas. Experimental results of one of the fjord systems are given briefly. Annual primary production in the innermost bay was over five times higher than in the unpolluted areas in the Gulf of Finland. (See also W72-12548) (Jones-Wisconsin)
W72-12551

THE RECOVERY PROCESS OF A LAKE WHICH RECEIVED WASTEWATER FROM AN ORE DRESSING PLANT,
Swedish Water and Air Pollution Research Lab., Stockholm.
B. Ahling.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 61-70. 11 fig.

Descriptors: *Self-purification, *Lakes, *Pollution abatement, Water pollution control, Physicochemical properties, Industrial wastes, Color, Turbidity, Hydrogen ion concentration, Conductivity, Iron, Oxygen, Biota, Aquatic life.
Identifiers: *Ore dressing plant, *Balsjon (Sweden).

Lake Bal (Balsjon), Sweden had been receiving waste water from a dressing plant for magnetite and hematite which closed in 1967. For two years before the plant closing, Balsjon and a similar lake, as control, were investigated to develop comparative material with which to study the lake's recovery. The water had been so turbid that the Secchi disk transparency was reduced to only a few centimeters. The first part of the recovery stage was reached in 1970 and was concerned chiefly with the physico-chemical factors and was a relatively simple process--mainly a question of sedimentation rates. The important problem is how rapidly the embankments of waste along the shores can be bound by vegetation for the prevention of inorganic matter being washed into the lake by rain and melt water. The second stage is chiefly development of a balanced biosystem, and is difficult to foretell. Results show that the number of species in the system in on the increase; certain species begin to become predominant with a mass development. Presumably this tendency will continue until an organic layer has been formed above the inorganic sediment which is essential to give the different organisms protection against predacity and thus reduce fluctuations. (See also W72-12548) (Jones-Wisconsin)
W72-12552

DEPLETION OF OXYGEN BY MICROORGANISMS IN ALASKAN RIVERS AT LOW TEMPERATURES,
Federal Water Pollution Control Administration, College, Alaska. Water Lab.
R. C. Gordon.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 71-95. 14 fig, 4 tab, 41 ref.

Descriptors: *Ice cover, *Alaska, *Rivers, *Dissolved oxygen, *Bacteria, Metabolism, Cold regions, Temperature, Growth rates, Nitrogen, Carbon, Phosphorus, Sewage treatment, Cycling nutrients, Pseudomonas.
Identifiers: *Oxygen depletion, Psychrophilic bacteria.

The aquatic biota of Alaskan rivers survives extreme fluctuations of dissolved oxygen throughout the year. Problems arise when oxidizable domestic or industrial wastes enter these rivers. Psychrophiles (bacteria that grow well at zero centigrade within two weeks) are important in cycling of matter. A pure culture study of psychrophilic bacteria isolated from a subarctic river suggested that domestic pollution caused a change in population composition. Effect of added organic and inorganic nutrients and incubation temperature on rate and extent of dissolved oxygen depletion was investigated. In studying effect of sewage treatment plant effluents on DO depletion in unpolluted subarctic river water, the bacterial population in the river water appeared to have some effect on the extent of DO depletion at 10 and 20C since the rate and extent of depletion was increased when the effluent was incubated in river water. There are general similarities between arctic and subarctic rivers but more study is necessary to define the effects of pollutants on arctic rivers. Results showed that incubation temperature and diluent had an effect on DO depletion with sewage treatment plant effluents; therefore the receiving water should be used as the diluent and the incubation temperature should be at or near the temperature of the receiving water. (See also W72-12548) (Jones-Wisconsin)
W72-12553

PREDICTION OF DISSOLVED OXYGEN LEVELS IN THE SOUTH SASKATCHEWAN RIVER IN WINTER,
New Brunswick Univ., Fredericton. Dept. of Civil Engineering.
R. C. Landine.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 96-111. 5 fig, 3 tab, 20 ref.

Descriptors: *Dissolved oxygen, *Rivers, *Ice cover, *Model studies, Cold regions, Waste water (Pollution), Biochemical oxygen demand, Computer programs, Winter.
Identifiers: *South Saskatchewan River.

The most critical DO levels, important parameter for measuring river pollution, are experienced i winter. Better methods are needed for predictin DO levels under ice conditions. An investigatio was made into DO levels of a prairie river, Sout Saskatchewan River, in winter. Models wer developed from basic considerations, checke against field observations, and modified t reproduce existing situations. Theoretically, th model could be used to predict what would happe to the DO profile if certain changes, such as rive flow and waste loading, occurred. The importar factors considered in developing the equations t calculate the DO profile are discussed. Conside ing the basic forces of oxygen supply and deman it was possible to write a series of DO equation which satisfactorily represented the oxyge balance. The magnitude of the first-order deo ygenation rate constant was not critical in evalua ing DO levels when the biochemical oxygen d mand of the waste water loadings at zero ce tigrade was known. The results illustrated th reaeration, in open water reaches and at weirs, very beneficial in the oxygen economy und winter ice cover. (See also W72-12548) (Jone Wisconsin)
W72-12554

POLLUTION - A BIOLOGICAL STUDY C SOME RECEIVING WATERS IN HOKKAIDO,
Nara Women's Univ. (Japan). Zoological Inst.
M. Tsuda, T. Watanabe, and K. Tani.
In: International Symposium on Water Pollutic Control in Cold Climates, July 22-24, 197 University of Alaska, College, p 113-124. 2 fig, tab, 5 ref.

Descriptors: *Rivers, *Water pollution effec *Biota, Industrial wastes, Water quality, Co mine wastes, Benthic flora, Sewage effluen Benthic fauna, Water pollution sources, Pu wastes, Coal mine wastes, Silts.
Identifiers: *Ishikari River (Japan).

The Ishikari River, Japan, receives wastes fr manufacturing industries, a pulp mill, and c mines. Discoloration of the water results and bed is covered by coal mines silt. Temperatu pH, and transparency of the water at the static studied are recorded. Sewage treatment efflu and other sewage of the City of Sapporo and dustrial wastes are discharged into a tributa Records of flora and fauna at the sampling statio and their relation to the various sources of pol tion are given. Two kinds of effects on the biolo cal water quality must be considered: that of ganic pollution from municipal sewage and pa or pulp mills and that of silt from coal mines. P lution by the pulp and paper mills is the most se ous. The dissolved organic materials from the p zone and the low water temperature in m months of the year are the reasons why the bro water color and high COD value hold in the wh middle and lower course of the river. T suspended silt and sand on the river bed downstream resulting in an unstable bottom wh hampers development of benthic microorganis including bacteria, indicating reduced potentia of natural river purification. (ee also W72-125 (Jones-Wisconsin)
W72-12555

CHEMICAL EFFECTS OF SALMON DECO POSITION ON AQUATIC ECOSYSTEMS,
Alaska Univ., College. Inst. of Marine Science.
D. C. Brickell, and J. J. Goering.
In: International Symposium on Water Pollu Control in Cold Climates, July 22-24, 19 University of Alaska, College, p 125-138. 7 fi tab, 8 ref.

scriptors: *Sea water, *Chemical properties, ecomposing organic matter, *Salmon, Bays, ter pollution sources, Estuaries, Freshwater, laska, Nitrogen, Ammonia, Organic matter, xicity, Commercial fishing, Spawning, Inter- l areas, Streams.
ntifiers: *Sea food processing wastes, Lliuliuk r (Alaska), Sashin Creek (Alaska), Little Port lter (Alaska), Bering Sea, Amaknak Island laska), Unalaska Island (Alaska).

ial investigations are presented on the effects salmon carcass decomposition and sea food cessing wastes on the nitrogen chemistry of the er in which the decomposition occurs, the form distribution of the organic matter which is rned to the marine system, and the rate at ch remineralization occurs. Observed ammoni- and dissolved organic nitrogen concentrations icate that decomposing salmon carcasses in- nce stream chemistry significantly. Survival of non eggs was considerably lower in the lower am reaches. The chemical parameter normally ociated with egg survival in the spawning bed is olved oxygen, but ammonium or other carcass omposition products significantly influence survival. Large dissolved organic nitrogen centrations in surface waters of Little Port ter undoubtedly reflect salmon carcass decom- tion in the stream and in the intertidal zone. ary bottom received most of the carcasses re final decomposition occurs. Sediment sam- of Little Port Walter estuary bottom showed a tinous quality even when taken prior to the osition of the fish, suggesting that sediment act as a nutrient sink. This gelatinous com- tion probably results from long term accumu- n of fish carcasses. All sediment samples from do Harbor (the control area) were granular. (See also W72-12548) (Jones-Wisconsin)
-12556

OSPHORUS BINDING MECHANISMS DUR- SELF-PURIFICATION OF POLLUTED ES,
dish Water and Air Pollution Research Lab., kholm.
erner.
International Symposium on Water Pollution trol in Cold Climates, July 22-24, 1970, versity of Alaska, College, p 139-152. 9 fig, 4 12 ref.

criptors: *Chemical reactions, *Self-purifica- *Lakes, *Sediments, *Iron compounds, ophication, Alkalinity, Oxygen, Hydrogen ion centration, Carbon dioxide, Carbon, Aerobic itions, Stratification, Hypolimnion, Ice r, Phosphates, Primary productivity, Alu- m, Oxydation-reduction potential, Sulfides.
tifiers: *Phosphate binding, Ferric iron, ogen carbonate.

theory discussed illustrates that in order to nce the capacity of the sediments to act as for phosphorus, advantage could be taken of ct that the binding of phosphate to ferric iron o aluminum will increase in stability when the pH is lowered. Supplemental experiments are ibed where the reactions of a sediment m to changes in hydrogen carbonate concen- n and pH were examined in sediments and from the hypertrophic Lake Lillsjon, en. In accordance with theory, the phorus concentration shows the largest drop series having no alkalinity and a low pH. the series having a measurable alkalinity an apparent relationship between the eter and phosphorus concentration. The the pH of the water, the less phosphorus will solution, thus indicating that phosphorus will sorbed by the sediment system in a direct de- nce upon pH under aerobic conditions. (See W72-12548) (Jones-Wisconsin)
12557

THE INFLUENCE OF TEMPERATURE ON THE REACTIONS OF THE ACTIVATED SLUDGE PROCESS,
Research Institute for Water Resources Development, Budapest (Hungary). Water Quality and Technology Dept.
For primary bibliographic entry see Field 05D.
W72-12558

THE EFFECTS OF THE WARM WATERS DISCHARGED BY THE KONAKOVO POWER STATION ON THE DISTRIBUTION AND GROWTH OF YOUNG FISH IN THE IVANKOVO RESERVOIR,
M. P. Boitsov.
Vopr Ikhtiol, Vol 11, No 2, p 325-331, 1971, Illus.
Identifiers: Water pollution effects, *Thermal pollution, Bleak, Bream, Discharge (Water), Distribution, Fishes, Growth, *Ivankovo Reservoir, Roach, Rudd, USSR.

Investigations were conducted on the effects of warm water discharge from the Konakovo Power Station of the distribution and growth of fish in the Ivankovo Reservoir. Out of the 10 spp. of fish which were investigated, the young thermophilic fishes (white bream, rudd, bleak) predominated in the warmer regions, as well as roach which is a eurythermic fish. As a result of the influence of the warmer waters on all the fish, the vegetative phase of the young fish was prolonged. The monthly increment in the growth of the fish was either the same as that of control fish, or somewhat greater; however, due to the prolonged vegetative period, the yearlings were larger in size and in weight.--Copyright 1972, Biological Abstracts, Inc.
W72-12559

EVALUATION OF AERATED LAGOONS AS A SEWAGE TREATMENT FACILITY IN THE CANADIAN PRAIRIE PROVINCES,
Metropolitan Corp. of Greater Winnipeg (Manitoba). Water Works and Waste Disposal Div.
For primary bibliographic entry see Field 05D.
W72-12560

DESIGN CONSIDERATIONS FOR EXTENDED AERATION IN ALASKA,
Federal Water Quality Administration, College, Alaska. Cold Climate Research Program.
For primary bibliographic entry see Field 05D.
W72-12561

CHEMICAL TREATMENT OF MECHANICALLY AND BIOLOGICALLY TREATED WASTE WATER,
Norwegian Inst. for Water Research, Oslo.
For primary bibliographic entry see Field 05D.
W72-12562

BIOLOGICAL AND CHEMICAL WASTE TREATMENT EXPERIMENTS IN FAR NORTHERN SWEDEN,
For primary bibliographic entry see Field 05D.
W72-12563

BIOLOGICAL SEWAGE TREATMENT IN A COLD CLIMATE AREA,
Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05D.
W72-12564

MICROBIOLOGIC INDICATORS OF THE EFFICIENCY OF AN AERATED, CONTINUOUS--DISCHARGE, SEWAGE LAGOON IN NORTHERN CLIMATES,
North Dakota Univ., Grand Forks. School of Medicine.
For primary bibliographic entry see Field 05D.
W72-12565

DISINFECTION AND TEMPERATURE INFLUENCES,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W72-12566

STRUCTURE AND FUNCTIONING OF ESTUARINE ECOSYSTEMS EXPOSED TO TREATED SEWAGE WASTES.
North Carolina Univ., Chapel Hill. Inst. of Marine Sciences.

Available from the National Technical Information Service as COM-71-00688, $6.00 in paper copy, $0.95 in microfiche. Annual Report for 1970-1971, February 1971. 345 p, 62 fig, 50 tab, 110 ref. NOAA GH 103.

Descriptors: *Ecosystems, *Productivity, *Estuarine environment, *Domestic wastes, *Salt marshes, *Carbon cycle, *Phosphorus compounds, *Nitrogen cycle, *Crabs, *Fishes, Ecology, Food chains, Estuarine fisheries, Marine fisheries, Sewage disposal, Sewage lagoons, Brackish water fish, Biological treatment, Oxidation lagoons, Phytoplankton, Aquatic insects, Waterfowl, Marine algae, Aquiculture.
Identifiers: Meiofauna, Foraminifera.

This is the third annual report from an investigation of the ecological systems which develop when estuarine waters are enriched with sewage wastes. Various phases of community structure and metabolism of six experimental brackish-water ponds, three of which received treated sewage wastes, and of a small tidal creek and its salt marshes were studied. Included are chapters on productivity, carbon metabolism, the phosphorous budget, nitrogen, and bacterial heterotrophy; on the standing crops of phytoplankton, decapod crustaceans, fishes, meiofauna, foraminifera, insects, mollusks, and birds; on calcium analysis; and on growth and reproduction of algae. The wastes ponds have developed into productive, well integrated, but slightly unstable systems. They perform some of the functions of tertiary treatment and hold promise for production of harvestable seafood protein. (See also W72-12568) (Katz-Washington)
W72-12567

STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES.
North Carolina Univ., Morehead City. Inst. of Marine Sciences.

Available from the National Technical Information Service as PB-199 537, $6.00 in paper copy, $0.95 in microfiche. Annual Report for 1969-1970, May 1970. 364 p, 50 fig, 60 tab, 170 ref.

Descriptors: *Ecosystems, *Food chains, *Productivity, *Succession, *Estuarine environment, *Estuarine fisheries, *Marine fisheries, *Domestic wastes, *Sewage lagoons, *Aquatic productivity, *Carbon cycle, *Zooplankton, *Crabs, Ecology, Physiological ecology, Sewage disposal, Phytoplankton, Benthic flora, Organic loading, Waste assimilative capacity, Bacteria, Crustaceans, Brackish water fish, Marine fungi.
Identifiers: Spartina marsh.

This is the second annual report in a study of ecological systems that develop when treated wastes from municipal sewage systems flow into estuarine waters. Studies by a team of faculty and students considered a small marsh-lined estuary, Calico Creek, which received wastes following secondary treatment, and a set of three ponds in which estuarine water and treated sewage mixture flows. Three control ponds received tapwater and estuarine water. In their second year, the ponds were rich in productivity with successive algal

blooms throughout the year and a food chain culminating in blue crabs. Chapters are included on the events in the salinity regime and input management, photosynthetic productivity and respiration, algal growth, phosphorous and nitrogen, bacteria, and animal populations. The presence of a substantial ecological system suggests a viable intermediary system interface is possible between man's municipal wastes and normal estuaries. These systems have potential for aquiculture and waste amelioration. (See also W72-12567) (Katz-Washington)
W72-12568

DDT AND PCB IN SOUTH SWEDISH STREAMS,
Lund Univ. (Sweden). Dept. of Animal Ecology.
A. Sodergren, B. Svensson, and S. Ulfstrand.
Environmental Pollution, Vol. 3, p 25-36, 1972. 4 fig, 27 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, *Water pollution, *Path of pollutants, *Pesticide kinetics, Pesticides, Chlorinated hydrocarbon pesticides, Pesticide residues, Bioindicators, Amphipoda, Streams, Aquatic environment, Pesticide drift, Aquatic life, Ecology, Seasonal, Chromatography.
Identifiers: *Pesticide distribution, Gammarus spp.

Gammarus pulex (Amphipoda) was used as an indicator organism in a regional study of the distribution of chlorinated hydrocarbon residues in different streams in southern-most Sweden. Levels of total DDT and PCB residues covaried regionally in spite of the different mechanisms involved in the dispersal of the substances. Seasonal changes seemed to be correlated with runoff conditions. Only diffuse relationships between residue levels and the age and trophic levels of organisms in a stream ecosystem were found. This suggests that transport routes and accumulation processes are much more complicated and inter-specifically variable phenomena than is often assumed. (Svensson-Washington)
W72-12569

DDT RESIDUES: DISTRIBUTION OF CONCENTRATIONS IN EMERITA ANALOGA (STIMPSON) ALONG COASTAL CALIFORNIA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
R. Burnett.
Science, Vol. 174, p 606-608, November 5, 1971. 1 fig, 1 tab, 13 ref.

Descriptors: *Pesticide residues, *DDT, *DDE, *DDD, *Waste water (Pollution), *Water pollution sources, Pesticides, Insecticides, Chlorinated hydrocarbon pesticides, Water pollution, Sediments, Industrial wastes, Chemical wastes, Crabs, Absorption, Pesticide drift, Sewage effluents.
Identifiers: Sand crabs, *Emerita spp., Biological magnification.

The total concentrations (tDDT) of DDT, DDD, and DDE in Emerita analoga from 19 California beaches reflect tDDT contamination nearby. Animals near the Los Angeles County sewer outfall contain over 45 times as much tDDT as animals near major agricultural drainage areas. Sediments near the outfall probably contain over 100 metric tons of tDDT--a reservoir for input into marine organisms. The effluent from a plant that manufactures DDT is a probable source. (Svensson-Washington)
W72-12570

INVESTIGATIONS INTO THE TOXICITY OF YELLOW PHOSPHOROUS TO FISH,
Memorial Univ. of Newfoundland, St. John's.
G. L. Fletcher.
In: Proceedings of the Canadian Society of Wildlife and Fishery Biologists, Atlantic Chapter Annual Meeting, November 4-6, 1970, Fredericton, New Brunswick, p 138-139. 4 ref.

Descriptors: *Phosphorous, *Fish physiology, *Fishkill, *Industrial wastes, *Toxicity, *Lethal limit, Bioassay, Mortality, Water pollution effects, Salmon, Trout, Herrings, Aquatic environment, Chemical wastes, Fish diseases, Pathology, Animal pathology.
Identifiers: *Yellow phosphorous, Cod, Hemolysis, Hematocrits, Red herring.

Yellow phosphorous has been demonstrated to be lethal to fish at concentrations as low as 0.5 micrograms/1. Herring, salmon and trout turned red and showed signs of extensive hemolysis and reduced hematocrits. Cod, in contrast, did not exhibit any of these phenomena. Brief exposures of salmon or cod to yellow phosphorous resulted in delayed mortalities, which in some cases was as long as 2-3 weeks. (Svensson-Washington)
W72-12573

ACCUMULATION OF YELLOW PHOSPHOROUS BY SEVERAL MARINE INVERTEBRATES AND SEAWEED,
Memorial Univ. of Newfoundland, St. John's.
G. L. Fletcher.
Journal of the Fisheries Research Board of Canada, Vol. 28, No. 5, p 793-796, 1971. 1 tab, 14 ref.

Descriptors: *Phosphorous, *Absorption, *Animal physiology, Marine animals, Marine plants, Lobsters, Clams, Mussels, Bioassay.
Identifiers: *Seaweed, *Biological magnification, *Marine invertebrates, *Yellow phosphorous, Quahogs, Periwinkles, Starfish.

Lobsters, clams, quahogs, periwinkles, mussels, starfish, and seaweed accumulated yellow phosphorous from seawater containing this element. In an experiment exposing all of the organisms to 15 plus or minus 9 micrograms/liter of yellow phosphorous for 48 hr, the concentration of yellow phosphorous in whole animals ranged from 10 (mussels) to 40 (periwinkles) times the seawater level. The highest concentrations of yellow phosphorous were found in the pyloric caeca of starfish (100 times seawater), and in the ovary and hepatopancreas of lobster (300 and 100 times seawater). Periwinkles, mussels, seaweed, and a quahog, clam, and starfish contained no yellow phosphorous seven days after transfer to seawater free of yellow phosphorous. (Svensson-Washington)
W72-12574

IMPROVED METHOD OF TREATING PONDS WITH ANTIMYCIN A TO REDUCE SUNFISH POPULATIONS,
Southeastern Fish Control Lab. Warm Springs, Ga.
R. M. Burress.
In: Proceedings of the 24th Annual Conference of the Southeastern Assn. of Game and Fish Commissioners, 1970, p 464-472. 3 tab, 8 ref.

Descriptors: *Piscicides, *Antimycin A, *Sunfishes, *Chemcontrol, *Crappies, *Rates of application, Pesticides, Fish, Fish management, Fish control agents, Fish populations, Fisheries, Ponds, Largemouth bass, Application methods.
Identifiers: White crappie.

A new method of using antimycin to thin overcrowded sunfish populations was tested in five ponds from 2.8 to 8.2 acres in surface area. Concentrations of 0.6 to 1.6 micrograms per liter of antimycin applied in the shallow upper ends of the ponds removed from 21.0 to 102.1 pounds per acre of sunfishes, but killed almost no largemouth bass of any size. The partial treatment method worked well in every pond in which it was tested desp some wide diurnal fluctuations in pH. (Svensso Washington)
W72-12575

THE EFFECT OF MARINE POLLUTANTS (LAMINARIA HYPERBOREA,
Marine Biological Station, Port Erin, Isle of M (England).
R. Hopkins, and J. M. Kain.
Marine Pollution Bulletin, Vol. 2, No. 5, p 75- May 1971. 1 tab, 3 ref.

Descriptors: *Algae, *Bioassay, *Plant physic gy, Pollutants, *Toxicity, Water pollution effe Respiration, *Heavy metals, Chemical was Mercury, Copper, Zinc, Pesticides, Pesticide t icity, *Herbicides, Dalapon, 2-4-D, Insecticid Phenols, *Detergents, *Lethal limit, Alkylbenz sulfonates.
Identifiers: *Laminaria, Sublittoral region, C ture experiments, Atrazine, MCPA, Endosulf Fairy liquid, Blusyl, Sodium lauryl, Ether sulf Sodium dodecyl, Benzene sulfonate, Cocon fatty acid, Pluronics, Diethanolamide.

A study has been made of the toxic concentrati of 15 chemical pollutants, including examples heavy metals, detergents, and herbicides, us Laminaria hyperborea as the test organism. T plant is ecologically the most important in t sublittoral region around much of the coast Britain. Two different bioassay techniques w used, one of a culture experiment type, and e other utilizing respiration measureme (Svensson-Washington)
W72-12576

EFFECT OF ENVIRONMENTAL FACTORS BENTHAL OXYGEN UPTAKE,
Pennsylvania State Univ., University Park.
A. J. McDonnell, and S. D. Hall.
Journal of the Water Pollution Control Federati Vol. 41, No. 8, Part 2, p R353-R363, August 19 fig, 5 tab, 20 ref. OWRRA-003-PA (5).

Descriptors: *Baseline studies, *Biochemical ygen demand, *Oxygen requirements, Water t perature, Dissolved oxygen, Oxygen, Aquatic vironment, Tubificids.
Identifiers: *Environmental influence, *Beral deposits, Eutrophic streams, Benthic fau Benthic community, Macroinvertebra Chironomids, Invertebrates.

An attempt to define the relative effects of ch factors as oxygen concentration, temperature, d the character of the biological community, on oxygen demand of benthal deposits sampled fr a mildly polluted eutrophic stream is presente It was found that oxygen uptake rates of the ben systems are dependent on oxygen concentra and temperature, and essentially independent of sample depth. The presence of measurable di ties of macroinvertebrates proved significant to the characteristics of the benthal response. An tempt has been made to approximate the demds associated with microbial and invertebrate resp tion, thereby delineating the relative importan of each. (Svensson-Washington)
W72-12578

STUDY OF MIGRATORY PATTERNS OF SH AND SHELLFISH THROUGH A NATUR PASS,
Texas Parks and Wildlife Dept. Austin.
B. D. King, III.
Available from the National Technical Infor tion Service as COM-72-10407, $3.00 in pa copy, $0.95 in microfiche. Texas Parks and Wildlife Dept., Technical Series No. 9, 1971. 54 p fig, 34 tab, 70 ref. NOAA 2-55-R.

scriptors: *Baseline studies, *Spatial distribu-
n, *Distribution patterns, *Commercial fish,
ommercial shellfish, *Texas, *Migration pat-
ns, Temporal distribution, Ecological distribu-
n, Vertical distribution, Horizontal distribution,
staceans, Shrimp, Aquatic animals, Pink
imp, Crabs, Drums, Sea water, Estuarine en-
nment, Seasonal.
ntifiers: *Seasonal abundance, *Abundance,
aeus spp., Environmental variables, Brown
imp, White shrimp, Blue crabs, Red drums,
ck drums, Flounders, Southern flounders,
epsheads, Seatrout, Spotted seatrout, Statisti-
analysis.

movements of commercially important spe-
of fish and crustaceans through Cedar Bayou
t, Texas were monitored to determine the spa-
distribution and seasonality of each species
to identify environmental factors which cause
affect movements between oceanic and
arine waters. The species studied included the
wn, pink and white shrimps, blue crab, red
m, black drum, southern flounder, sheepshead,
spotted seatrout. Data concerning the seasonal
ndance and vertical and horizontal distribution
ach species are presented and the results of
istical analyses of correlated environmental
iables are discussed. (Svensson-Washington)
2-12579

**REVIEW OF LITERATURE ON TFM (3-
IFLUOR-METHYL-4-NITROPHENOL) AS A
MPREY LARVICIDE,**
eau of Sport Fisheries and Wildlife La Crosse,
. Fish Control Lab.
. Schnick.
eau of Sport Fisheries and Wildlife, Investiga-
s in Fish Control, No. 44, April 1972. 31 p, 162
2 append.

criptors: *Pesticides, *Larvicides,
mpreys, *Pest control, *Reviews, *Chemcon-
, Aquatic environment, Piscicides, Pesticide
dues, Pesticide toxicity, Pesticide drift, Pesti-
kinetics, Great Lakes, Water chemistry.
ntifiers: *TFM, *Lampricides, *3-trifluor-
hyl-4-nitrophenol, Non-target organisms.

search for a selective toxicant to control the
lamprey culminated in the discovery of TFM
e late 1950's. The research, however, had only
n on its chemical and physical properties, ef-
y, toxicity to non-target and target species,
lues, and required methods. Federal, State,
ersity and industrial agencies contributed
h in the effort to determine the effect of TFM
he environment and other organisms; how-
, much still remains to be done if TFM is to
continued clearance by the Environmental
ection Agency for use as a larval lampricide in
quatic environment. (Svensson-Washington)
-12580

. OF RIGHTS FOR LAKE MICHIGAN,
se, Washington, D.C.
primary bibliographic entry see Field 06E.
-12585

**IOISOTOPIC STUDY OF CALCIFICATION
THE ARTICULATED CORALLINE ALGA
SIELLA ORBIGNIANA,**
ornia Inst. of Tech., Pasadena. Div. of
ogical and Planetary Sciences.
Pearse.
nal of Phycology, Vol. 8, No. 1, p 88-97,
h 1972. 10 fig, 39 ref.

riptors: *Photosynthesis, Calcium chloride,
activity techniques, Metabolism, Tracers,
activity, Carbon dioxide, Salts, Marine al-
ifiers: *Calcification, *Coralline algae, Calci-
adioisotopes, *Bossiella orbigniana, Paper
natography, Scintillation counting, Ca-45.

In an attempt to link calcification to photosynthetic processes in plants, 2-3 cm branches of Bossiella orbigniana were separated from the plants and incubated in light or dark in Millipore filtered seawater containing 2 microcuries/ml Ca-45 as calcium chloride. After 32 hr incubation, the branches were washed, post-incubated in media free of Ca-45, and the media periodically assayed for Ca-45 activity by methods of decalcification, scintillation counting, and paper chromatography. Data indicate that calcification in Bossiella orbigniana (Corallinaceae) is characterized by a series of features which vary according to the age of the segment (intergeniculum). From the youngest segment at the branch tip to older, more basal segments: (1) weight and degree of mineralization increase, while rate of weight gain decreases; (2) rate and stability of Ca-45 labeling decrease; (3) effect of light on Ca-45 labeling rate decreases, while effect of light on stability of label increases; however, for all segments, Ca-45 labeling is more rapid and more stable in the light than in the dark; (4) rate of Ca-45 labeling in killed controls decreases. Comparative studies with the tropical coralline alga Amphiroa yielded similar results. Characteristics of the gradients in calcification and effect of light in these coralline algae are very similar to those found in a reef-building coral containing symbiotic algae, and the data suggest that organic products of photosynthesis may be of general importance to calcification. (Mackan-Battelle)
W72-12634

STUDIES ON THE EXCREMENTS OF THE FISH,
Nihon Univ., Tokyo. Coll. of Agriculture and Veterinary Science.
T. Kobashi, and Y. Deguchi.
Bull Coll Agric Vet Med Nihon Univ. 28. 92-99. 1971. Illus.
Identifiers: *Fish physiology, *Fish management, Carassius auratus, Carassius carassius, Cyprinus carpio, Excrements, Fish, Ponds.

The problem of fish excrements in fish-pond management, was studied. The mucus width in excrements becomes thin in Carassius auratus, Cyprinus carpio and Carassius carassius. The number of mucus cells of the posterior intestine is more than that of the anterior intestine. Excretion time is affected by water temperature; in low water temperature excretion time becomes longer. The proportion of the excrement weight to the food weight was 5.0% in Cyprinus carpio, 6.2% in Carassius carassius and 6.8% in Carassius auratus.--Copyright 1972, Biological Abstracts, Inc.
W72-12636

CHARACTERIZATION OF NATURALLY OCCURRING DISSOLVED ORGANOPHOSPHORUS COMPOUNDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. A. Minear.
Environmental Science and Technology, Vol. 6, No. 5, p 431-437, May 1972. 11 fig, 6 tab, 30 ref.

Descriptors: *Algae, *Phosphorus, *Lakes, Cultures, Phosphates, Nutrients, Chlorophyta, *Organophosphorus compounds, Washington, Separation techniques, Distillation, Spectrophotometry, Chlorophyll, Hydrolysis, Phytoplankton, Fluorescence, Phosphorus compounds, Chlamydomonas, Water analysis, Fluorometry, Pigments.
Identifiers: *Orthophosphates, Chlamydomonas reinhardtii, Moses Lake, Pine Lake, Lake Washington, Chlorophyll a, *DNA, *Dissolved organophosphorus compounds, Natural organics.

Two sources of dissolved organic phosphorus compounds (DOP) were used in a study concerned with the formation and mechanisms of release of DOP compounds in natural waters: (1) pure cultures of the green alga, Chlamydomas reinhardtii, grown in a carbon-dioxide enriched atmosphere; and (2) natural water samples taken from three separate lakes. Spectrophotometry was used for orthophosphate determination and DNA analyses. Chlorophyll a and total pigment were determined fluorimetrically. In the pure algal cultures, high levels of soluble organic phosphorus were obtained with accompanying low residual orthophosphate. Molecular sieve samples of the natural lake water samples showed that up to 20 percent of the recoverable organic phosphorus is high-molecular-weight material. A sizable percentage (up to 50 percent) of this material appeared, in most cases, to be DNA or its fragments. The natural origin of the DOP, especially, DNA, and other high-molecular-weight components was substantiated in special culture studies which utilized dual chamber vessels divided by 0.22 micron membranes. The presence of DNA in the pure algal cultures and the correlation with chlorophyll and total pigment for natural water samples suggest that this material originates from the phytoplankton. (Mortland-Battelle)
W72-12637

AMINO ACID TRANSPORT IN NITZSCHIA OVALIS ARNOTT,
California Univ., Irvine. Dept. of Developmental and Cell Biology.
B. B. North, and G. C. Stephens.
Journal of Phycology, Vol. 8, No. 1, p 64-68, March 1972. 2 fig, 2 tab, 19 ref.

Descriptors: *Amino acids, *Diatoms, *Absorption, Metabolism, Nitrogen, Chrysophyta, Carbon radioisotopes, Tracers, Chemical analysis, Radioactivity techniques, Path of pollutants, Inhibition, Marine plants.
Identifiers: Absorption rates, *Nitzschia ovalis, Arginine, Lysine, Glutamate, Glycine, Serine, Scintillation counting, Maximum uptake velocity, C-14, Accumulation.

In order to test the amino acid uptake of the marine diatom Nitzschia ovalis, C-14-labeled amino acids were added to harvested cell suspensions at concentrations of 1 microcurie/20 ml (15.0-43.0 micromoles/l, depending upon the amino acid: arginine, lysine, glutamate, glycine, or serine), and the subsequent uptake rates were determined by (1) periodically taking 1 ml aliquots of cell suspensions, filtering them, and placing them in scintillation vials for counting, and (2) removing cells by centrifugation from a portion of the medium and determining the radioactivity present in 1 ml of medium. Cell nitrogen was measured with a nitrogen analyzer. It was determined that N. ovalis possesses at least 3 amino acid uptake systems, specific for transport of acidic, polybasic, and neutral amino acids. Maximum uptake velocity (V sub max) for each site is inversely related to the nitrogen content of the cell, and to the nitrogen available in the culture medium. It appears that high concentrations of nitrogen repress amino acid transport, while under natural conditions (low N2) amino acid uptake may significantly contribute to the N2 economy of Nitzschia populations. (Mackan-Battelle)
W72-12643

THE EFFECTS OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF PIKE PERCH YEARLINGS (LUCIOPERCA LUCIOPERCA) AND ROACH YEARLINGS (RUTILUS RUTILUS HECKELI (NORDM.)) IN VARIOUS REGIONS OF THE SEA OF AZOV,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
T. M. Avedikova.
Vopr Ikhtiol. Vol 11, No 3, p 484-494. 1971. Illus. Map.
Identifiers: *Environmental effects, Aquatic environment, *Fish populations, Distribution, Environment, Lucioperca lucioperca, Nutrition, Perches, Roach, Rutilus rutilus, Rutilus rutilus heckeli, Salinity, USSR, Yearlings, Sea of Azov.

The effects of salinity and nutrition on the distribution of pike perch (Lucioperca lucioperca) and roach (Rutilus rutilus heckeli) yearlings in the Sea of Azov were evaluated. Ecologic studies showed that salinity affects the yearling only at lethal or sublethal concentrations, but is usually superseded by the importance of nutritional factors. Furthermore, the area occupied by the pike perch and roach depends on the size of the population and, alone, cannot be interpreted as indicating the effects of salinity on these fishes. The distribution of pike perch and roach yearlings was always related to the quantity of food in a given region (r = 0.91 plus or minus 0.08 at n = 25 and p = 0.95, and r = 0.89 plus or minus 0.04 at n = 23 and p = 0.95, respectively). The biomass of the benthos was always greater at decreased salinity.--Copyright 1972, Biological Abstracts, Inc.
W72-12645

SALINITY TOLERANCE OF COMMON CARP: (CYPRINUS CARPIO, L.),
Ministry of Agriculture, Baghdad (Iraq). Div. of Hydrobiology and Fisheries.
M. I. Al-Hamed.
Bull Iraq Nat Hist Mus (Univ Baghdad). Vol 5, No 1, p 1-7. 1971. Illus.
Identifiers: *Carp, Cyprinus carpio, Salinity, *Salt tolerance.

C. carpio, ranging in length from 8.5 to 12.7 cm were exposed directly and gradually to different salinity levels. In direct exposure experiments, fish lived at salinities as high as 12% for 10 wk (the duration of the experiment). Higher salinities proved unfavorable. In gradual acclimatization experiments during a period of 4 days fish lived at salinities as high as 17%, but higher levels were lethal. Fertilized ova of carp hatched at salinities from 2% to 10%, but the favorable level was up to 6.6%.--Copyright 1972, Biological Abstracts, Inc.
W72-12647

THE SEDIMENT-INHABITING TESTATE AMOEBAE (RHIZOPODA, TESTACEA) FROM THE FINSTERTALER SEEN (TYROL/AUSTRIA), (SEDIMENTBEWOHNENDE SCHALENAMOBEN RHIZOPODA, TESTACEA) DER FINSTERTALER SEEN (TIROL)),
Biological Station, Lunz am See (Austria).
For primary bibliographic entry see Field 05A.
W72-12653

ELECTROENCEPHALOGRAPHIC STUDIES OF THE EFFECT PRODUCED BY THE DRINKING WATER TEMPERATURE ON MAN,
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
P. I. Shpil'Berg, and I. A. Kibal'Chich.
Gig Sanit. Vol 36, No 3: p 14-19, 1971. Illus. English summary.
Identifiers: *Heated water, *Public health, Potable water, Electroencephalographic studies, Water temperature.

An urgent hygienic problem arises with the increase of temperature of surface waters due to the discharge of thermal waters from electric power stations. An EEG method was used to study the effect of thirst and its quenching with water of different temperature levels. The changes in the EEG obtained point to a high excitation of the CNS as the result of thirst. This condition disappeared at the quenching of thirst with water of 20 deg. However, drinking of warm water (25-30 deg) did not alter the changes of EEG produced by the thirst. The persons under observation drank 30-50% less warm water than cold. In the discharge of thermal waters a rise of the temperature of water in a stream serving as a source of water supply above 25 deg is highly undesirable.--Copyright 1972, Biological Abstracts, Inc.
W72-12659

THE POLAROGRAPHIC ESTIMATION OF BAYLUSCIDE,
National Research Centre, Cairo (Egypt).
For primary bibliographic entry see Field 05A.
W72-12664

AN ANNOTATED BIBLIOGRAPHY OF ATTEMPTS TO REAR THE LARVAE OF MARINE FISHES IN THE LABORATORY,
Scripps Institution of Oceanography, La Jolla, Calif.
R. C. May.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.35. National Oceanic and Atmospheric Administration, NOAA Technical Report NMFS SSRF-632, August 1971. 24 p, 68 ref, 2 app.

Descriptors: *Marine fish, *Larvae, *Laboratory animals, *Bibliographies, *Nutrient requirements, *Aquiculture, *Fish eggs, Reviews, Fish behavior, Fish physiology, Animal growth, Growth rates, Mortality, Fish diets, Temperature, Fish hatcheries, Fish farming, Fish food organisms.
Identifiers: *Fish rearing, Feeding experiments, Survival.

A bibliography was compiled of 68 papers, arranged alphabetically by authors' names, which describe attempts to rear the larvae of marine fishes in the laboratory, covering the period 1878 to 1969. Annotations summarize each paper, and appendixes list the species of fishes studied and the types of food used. (Svensson-Washington)
W72-12669

SUBLITTORAL ECOLOGY OF THE KELP BEDS OFF DEL MONTE BEACH, MONTEREY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-12670

MARINE FOULING ORGANISMS IN MONTEREY HARBOR, CALIFORNIA, JUNE THROUGH SEPTEMBER 1966,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-12671

THE GROWTH AND SURVIVAL OF PLANTED CLAMS, MERCENARIA MERCENARIA, ON THE GEORGIA COAST,
Georgia Game and Fish Commission, Brunswick. Marine Fisheries Div.
For primary bibliographic entry see Field 05A.
W72-12672

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT, FINAL REPORT. SECTION 2: BENTHIC STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.

Available from the National Technical Information Service as AD-739 532, $3.00 in paper copy, $0.95 in microfiche. Report to Army Corps of Engineers, Coastal Engineering Research Center, February 1972. 273 p, 149 fig, 10 tab.

Descriptors: *Benthic fauna, *Invertebrates, *Molluscs, *Water pollution, *Metals, *Coliforms, Animal pathology, Sludge disposal, New York, Solid wastes, Waste disposal, Water quality, Atlantic Ocean, Marine bacteria, Worms.
Identifiers: *New York Bight, *Benthic meiofauna, *Dredging spoils, *Polychaeta, Species diversity, Meiofaunal communities, Species distribution, Amphipoda, Decapoda, Pelecypoda, Spisula, Arctica.

Results of studies to evaluate the effects of s waste disposal on the marine environment of New York Bight are presented. Section two c tains a study of the distribution of the ben meiofauna and macrofauna relative to the w disposal, benthic microbiology, pathological fects of wastes on larger benthic crustaceans an investigation of the basic chemical variable fecting species diversity. (Katz-Washington)
W72-12673

RESPIRATORY RESPONSE OF THE TELE POECILIA RETICULATA TO RISING T PERATURE,
Texas Univ., Port Aransas.
M. Sage.
Comparative Biochemistry and Physiology, 40A, p 851-853, 1971. 1 fig, 5 ref.

Descriptors: *Respiration, *Teleosts, physiology, Oxygen requirements, Water perature, Thermal stress, Bioassay.
Identifiers: Poecilia reticulata, Respiratory rat

The respiratory rate of Poecilia reticulata measured while the temperature increased fro to 30 C at a rate of 0-25 C/min. There was a initial increase in oxygen consumption stopped when the temperature rise was compl This was followed by a level of oxygen uptake was higher than the initial rate and had a Qsub 1.7. The rapidity of the responses indicates vous mediation, and/or a direct effect of tem ture on individual cells rather than an endo control. (LeGore-Washington)
W72-12674

EXCRETION OF UREA BY TWO TELE EXPOSED TO DIFFERENT CONCEN TIONS OF AMBIENT AMMONIA,
Michigan State Univ., East Lansing.
K. R. Olson, and P. O. Fromm.
Comparative Biochemistry and Physiology, 40A, p 999-1007, 1971. 1 fig, 2 tab, 20 ref. 18050DST.

Descriptors: *Ammonia, *Ureas, *Rainbow Nitrogen compounds, Teleosts, Trout, Bio Proteins, Fish physiology.
Identifiers: *Excretion, *Goldfish, Salmo neri, Carussius auratus.

The effect of the increase of ambient ammo urea excretion in two teleosts has been st Rainbow trout show little alteration in their o nitrogen excretion pattern with the except decreased ammonia excretion as ambien monia increased. Long-term exposure to am had little effect on urea excretion rates of Goldfish showed a significant increase i excretion rates as ambient ammonia incr These excretion rates were dependent o prevailing acclimation ammonia concentr and duration of acclimation. (Svensson-Wa ton)
W72-12675

THE EFFECTS OF DIFFERENT ACC TION TEMPERATURES ON GAS SECRE IN THE SWIMBLADDER OF THE BLU SUNFISH, LEPOMIS MACROCHIRUS,
Virginia Polytechnic Inst. and State Blacksburg.
R. A. McNabb, and J. A. Mecham.
Comparative Biochemistry and Physiolog 40A, p 609-616, 1971. 6 fig, 1 tab, 17 ref.

Descriptors: *Sunfishes, *Buoyancy, Wat perature, Thermal properties, Freshwate Fish physiology, Oxygen, Carbon dioxide.
Identifiers: *Swimbladders, *Gas sec *Bluegill sunfish, Acclimation temper Lepomis macrochirus.

er acclimation to 12, 22 or 32 C, the swimbladd- s of bluegill sunfish (Lepomis macrochirus) e partially deflated. Rates of gas secretion into bladder were measured. Total gas secretion, sured as the rate of reinflation, was tempera- independent. The rates of oxygen secretion the swimbladder increased with increasing ac- ation temperature; simultaneously, the rate of on dioxide secretion decreased. (LeGore- shington)
2-12676

DY ON THE BIO-ASSAY METHOD FOR E EVALUATION OF WATER POLLUTION- USE OF THE FERTILIZED EGGS OF SEA CHINS AND BIVALVES,
)kubo, and T. Okubo.
letin of the Tokai Regional Fisheries Research oratory, No. 32, p 131-140, January 1962. 2 fig, b, 5 ref. English summary.

criptors: *Bioassay, *Laboratory animals, xicity, *Mussels, *Oysters, *Testing cedures, Marine animals, Marine biology, nol, Bioindicators.
ntifiers: *Artificially fertilized eggs, *Sea ins, *Bivalves, *Disturbed metamorphosis, t organisms, Hemicentrotus spp., hocidanis spp., Crassostrea spp., Mytilus spp., ium cyanide, Mercuric chloride, Copper ate, Copper sulfate, Ferric chloride, Man- se chloride, Zinc sulfate, Chromium sulfate, monium chloride, Ammonium acetate, ome alum, Picric acid, Tannic acid, Parathion, nine, Rhodamine B, Alcohol, Acetone, roform, Pulping waste.

ethod of bioassay has been developed by using icially fertilized eggs of sea urchins and lves as test organisms. The procedures of ssay with fertilized eggs of the test organisms described and the results obtained for various utants are compared. The method proposed in report is advantageous because the effects of utants on the development of eggs were easily gnizable in disturbed metamorphosis. Four ies tested, two species each for sea urchins bivalves, were similar in sensitivity to pollu- . The sensitivity of the present test organisms llutants was much higher than that shown by r test organisms. The morphologically ineffec- concentration of some pollutants for the emb- ic development of sea urchins and bivalves be directly equal to the safe level of the pollu- concentration for littoral fishes. (Katz- hington)
-12677

YCHLORINATED BIPHENYLS AND OR- OCHLORINE PESTICIDES IN SOME SHWATER AND MARINE FISHES,
eries Research Board of Canada, St. Andrews / Brunswick).
tko.
tin of Environmental Contamination and cology, Vol. 6, No. 5, p 464-470, 1971. 2 fig, 1 2 ref.

riptors: *Chlorinated hydrocarbon pesticides, icide residues, *Polychlorinated biphenyls, , Pesticides, Insecticides, DDD, DDE, DDT, achlor, Dieldrin, Aroclors, Pollutant identifi- n, Analytical techniques, Chromatography, ae fish, Freshwater fish, Eels, Atlantic sal- Herrings, Mussels, Perches, Absorption, cide kinetics, Path of pollutants.
ifiers: Lindane, Epoxide, Hex- robenzene, Cod, Mackerels, Pickerels, Pla- cean perch, White hake, Hake.

les of ten species of freshwater and marine collected in New Brunswick and Nova Scotia extracted with hexane, concentrated by ration, separated on an alumina column, and ractions were analyzed by gas chromatog- raphy for PCB, DDT, DDE, DDD, and C6C16. Error due to differences between commercial PCB and PCB found in the samples was difficult to estimate. Of the organochlorine pesticides, DDE was present in highest concentrations, followed by DDT and DDD. Most of the samples contained a small amount of hexachlorobenzene. (Svensson-Washington)
W72-12679

A PRELIMINARY INVESTIGATION: THE EFFECT OF ELEVATED TEMPERATURE ON THE AMERICAN OYSTER CRASSOSTREA VIRGINICA (GMELIN), A SYMPOSIUM,
Florida Dept. of Natural Resources, St. Petersburg.

Professional Papers Series Number 15, June 1971. 190 p, 77 fig, 29 tab, 546 ref, 5 color plates.

Descriptors: *Thermal pollution, *Water temperature, *Water pollution effects, *Thermal stress, *Oysters, *Animal pathology, *Metabolism, *Physiological ecology, *Bioassay, *Reproduction, Temperature, Water pollution, Water quality, Water pollution sources, Stress, Aquatic animals, Benthic fauna, Commercial shellfish, Invertebrates, Marine animals, Mollusks, Shellfish, Benthos, Shellfish farming, Pathology, Animal metabolism, Animal growth, Growth, Animal physiology, Bioindicators, Proteins, Biochemistry, Carbohydrates, Lipids, Metals, Gonads, Sexual maturity, Parasitism, Animal parasites, Diseases, Ecology, Seasonal, Fluctuations, Heat resistance.
Identifiers: *Crassostrea spp., *Invertebrate pathology, *Sublethal effects, *Histological studies, Glycogen, Fat content, Gonadal development, Labyrinthomyxa spp., Dermocystidium spp., Gametogenesis.

This preliminary investigation studied the effects of constant 35 C temperature on the survival and well being of Crassostrea virginica. The basic parameters considered were: (1) fluctuations of chemical composition in tissues, (2) seasonal condition, (3) histology, (4) parasitology, particularly Labyrinthomyxa marina (Formerly Dermocystidium marinum), and (5) changes in reproductive activity. Substantial mortalities generally did not occur at constant temperatures of 35 C and approximate field salinities, but a variety of responses were observed including altered gametogenesis, glycogen decreases and tissue damage. The use of histology to delineate sublethal effects was an extremely valuable tool. (LeGore-Washington)
W72-12680

EFFECTS OF DELAYED INITIAL FEEDING ON LARVAE OF THE GRUNOIN, LEURESTHES TENUIS (AYRES),
Scripps Inst. of Oceanography, La Jolla, Calif.
R. C. May.
Fishery Bulletin, Vol. 69, No. 2, p 411-425, 1971. 4 fig, 7 tab, 50 ref.

Descriptors: *Silversides, *Larvae, *Growth rates, *Nutrient requirements, Fish, Animal growth, Mortality, Fish behavior, Fish physiology.
Identifiers: *Grunion, *Starvation, Feeding experiments, Leuresthes spp.

The initial feeding of newly hatched larvae of the grunion was delayed for various periods of time under laboratory conditions at 18 C. Unfed larvae did not develop morphologically beyond the stage reached at the time of yolk absorption, about 4 days after hatching, although some survived as long as 3 weeks. Regardless of how long initial feeding was delayed, 80% or more of previously unfed larvae began feeding when food was made available to them, and at least 40% of the larvae alive when food was offered were able to survive to the end of a 20-day experiment. When food was offered to starved larvae, growth began and generally proceeded at about the same rate as in larvae fed from day 1, although there was some indication that a few days' delay in initial feeding increased the conversion efficiency of grunion larvae feeding on Artemia nauplii. Grunion larvae probably do not experience high mortality at sea due to starvation, nor do they exhibit a classical 'critical period' at the time of yolk absorption. (Svensson-Washington)
W72-12682

TOLERANCE OF EMBRYOS OF MARINOGAMMARUS MARINUS AND ORCHESTIA GAMMARELLA (AMPHIPODA) TO LOWERED SALINITIES,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
A. G. Vlasblom, and G. Bolier.
Netherlands Journal of Sea Research, Vol. 5, No. 3, p 334-341, 1971. 3 fig, 3 tab, 14 ref.

Descriptors: *Amphipoda, *Aquatic environment, *Salinity, *Embryonic growth stage, *Animal physiology, Aquatic animals, Bioassay, Hatching, Water quality.
Identifiers: Marinogammarus spp., Orchestia spp., Osmolality.

Investigation was made into the tolerance to lowered chlorinities (4 and 7 ppt) of embryos of M. marinus and O. gammarella. The rate of development remained constant, but the number of hatched juveniles declined with chlorinity. The egg membrane of both species provides only slight protection against dilution of the medium, since isotonicity of the extra-embryonic fluid with the medium is reached fairly rapidly. The brood production of a population of M. marinus living in 4 ppt Cl' is considerably reduced. (Svensson-Washington)
W72-12683

SKEWED ALGAL DIVISION PATTERNS: EFFECTS OF AUTOSPORE YIELD ON COMPUTED SYNCHRONY INDICES,
Saint Louis Univ., Mo. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W72-12724

PHYTOPLANKTON PIGMENTS IN PORTO NOVO WATERS (INDIA),
Center of Advanced Study in Marine Biology, Porto Novo (India).
For primary bibliographic entry see Field 05A.
W72-12725

HYDROBIOLOGICAL STUDIES IN THE CATCHMENT OF VAAL DAM, SOUTH AFRICA. PART 2. THE EFFECTS OF STREAM CONTAMINATION ON THE FAUNA OF STONES-IN-CURRENT AND MARGINAL VEGETATION BIOTOPES,
National Inst., for Water Research, Congella. (South Africa). Regional Lab.
F. M. Chutter.
Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 2, p 227-240, 1971. 9 tab, 8 ref.

Descriptors: *Aquatic animals, *Aquatic environment, *Water pollution effects, *Monitoring, Chemical analysis, Limiting factors, *Nutrients, Toxicity, Resistance, Aquatic populations, Rivers, Streams, Crustaceans, Copepods, Dissolved oxygen, Nitrogen, Ammonia, Caddisflies, Nitrates, Sulfates, Sodium, Turbidity, Effluents, Water quality, Nematodes, Tubificids, Cyanophyta, Water analysis, Aquatic habitats, Periphyton, Sampling, Midges, Aquatic insects, Mayflies, Larvae, Environmental effects, Annelids, Physiochemical properties.
Identifiers: *Biotopes, *Vaal Dam (South Africa), Macroinvertebrates, Phormidium, Nais spp., Bur-

nupia spp., Thiochaete chutteri, Neurocaenis, Centroptilum excisum, Micronecta spp., Cloeon spp., Pseudogrion spp., Chaetogaster, Chironomus spp., Choroterpes (Euthraulus), Cheumatopsyche thomasseti, Amphipsyche scottae, Flatworms, Stenelmis thusa, Chironomids, Nychia marshalli, Baetis bellus, Baetis gaucus, Cloeon africanum, Caridina nilotica, Macronema capense, Afronurus, Species diversity.

A study has been conducted on the effects of pollution on the composition of fauna of the rivers and streams in the Vaal Dam (South Africa) catchment. Six sampling stations located in the unstable depositing zone served as the sites of collection and monitoring of fauna as well as for chemical analysis of the water. The animals found were compared with animals in the same biotopes of natural waterways of the area. It was obvious that in contaminated rivers there were generally less diversity in the fauna, reduced numbers of some species but large growths in others, and large numbers of cladocerans and copepods. Effluent effects were attributed more to nutrient supply than to toxicity; changes in the 'marginal vegetation' fauna were less than in 'stones-in-current' fauna, suggesting a greater tolerance of the former to a wider range of ecological conditions. Species success was still largely dependent upon food chain position and biotope roles. (Mackan-Battelle)
W72-12726

MODELS OF ION AND SUBSTRATE COTRANSPORT AND THE EFFECT OF THE MEMBRANE POTENTIAL,
Michigan Univ., Ann Arbor. Dept. of Physiology; Michigan Univ., Ann Arbor. Medical School; and Michigan Univ., Ann Arbor. Dept. of Biostatistics.
For primary bibliographic entry see Field 05B.
W72-12727

ALGAL GROWTH POTENTIAL TEST IMPROVES SEWAGE EFFLUENT CONTROL,
Uppsala Univ., (Sweden). Inst. of Physiological Botany.
C. Forsberg, and A. Forsberg.
AMBIO, Vol 1, No 1, p 26-29, February 1972. 2 fig.

Descriptors: *Sewage treatment, *Water quality control, *Monitoring, *Bioindicators, Sewage effluents, Testing, Cultures, Water pollution treatment, Waste dilution, Plant growth, Growth rates, Scenedesmus, Euglena, Efficiencies, Water pollution effects, Nutrients.
Identifiers: *Algal growth potential, Euglena gracilis, Ankistrodesmus falcatus, Scenedsmus quadricauda, Selenastrum capricornutum, Sample preparation, Oocystis submarina var. variabilis, Ocystis submarina.

The algal growth potential (AGP) test is employed at several chemical treatment plants in Sweden to increase the efficiency of sewage treatment. Five-ml samples of sewage effluent are collected in small plastic tubes, frozen and taken to the laboratory where an autodiluter adds the effluent to a standard recipient solution containing 5 test algal species: Euglena gracilis, Ankistrodesmus falcatus, Oocystis submarina var. variabilis, Scenedesmus quadricauda, Selenastrum capricornutum, all of which were chosen because they flourish in dilute sewage. The resulting volume (2.5 ml) of the effluent in standard solution represents a 2.5 percent concentration. The algal volume produced by the nutrients (e.g., nitrogen, phosphorus) in the effluent is electronically determined, and the AGP determined by taking the difference between maximal algal growth in the standard with and without the added effluent. Using this test the quality of the sewage treatment can be monitored and controlled by controlling the amount of nutrients in the sewage effluents. (Mackan-Battelle)
W72-12728

THE GRADUAL DESTRUCTION OF SWEDEN'S LAKES,
National Swedish Environment Protection Board, Stockholm.
T. Willen.
AMBIO, Vol 1, No 1, p 6-14, February 1972. 9 fig, 3 ref.

Descriptors: *Lakes, *Water pollution effects, *Limnology, Water pollution, Water pollution sources, Sewage, Industrial wastes, Bioindicators, Chemical properties, Physical properties, Phytoplankton, Zooplankton, Chlorophyta, Diatoms, Cyanophyta, Benthic fauna, Aquatic animals, Invertebrates, Aquatic algae, Aerial photography, Phosphorus, Nitrates, Nitrogen, *Eutrophication, Hydrogen ion concentration, Nutrients, Chlorophyll, Pikes, Perches, Physicochemical properties, Trout, Salmon, Freshwater fish, Anabaena, *Turbidity, Chrysophyta, Aquatic plants, Midges, Oligochaetes, Annelids, Oligotrophy, Bacteria.
Identifiers: *Chlorophyll a, Macrophytes, *Sweden, Microcysis, Oscillatoria, Synura, Aroglena, Cryptophyceae, Pontoporeia affinis, Esox lucius, Perca fluviatilis, Salvelinus alpinus, Salmo trutta, Vendace, Salmon trout, Lota lota, Lake Malogen, Sweden, Char, Lucioperca lucisperca, Burbot, Coregonus lavaretus, Coregonus albula, Whitefish, Branchiura sowerbyi, Pike perch, Lake Hjalmaren, Lake Vattern, Lake Vanern.

Detrimental changes are taking place in a group of 4 Swedish lakes caused by increasing sewage disposal and industrial pollution of their waters. Water samples collected 6 times a year and biological samples (bacteria, plankton, chlorophyll) collected monthly were trested by physico-chemical methods for pH, organic matter, oxygen content, silica, turbidity, and conductivity. The flora and fauna were also studied. Long term studies reveal increasing deterioration around highly populated or industrial areas. Lake Malaren, taken as a representative lake, shows increasing turbidity, high concentrations of plant nutrients resulting in relatively high phytoplankton levels, and high volumes of zooplankton feeding or both. Although organism quantity appears to be increasing, quality and composition are not. Chlorophyll a studies show considerable yearly variation but appear to inversely correlate with turbidity levels. (Mackan-Battelle)
W72-12729

UPSTREAM MOVEMENTS OF GAMMARUS PULEX PULEX (AMPHIPODA) IN A SOUTH SWEDISH STREAM,
Lund Univ. (Sweden). Dept. of Animal Ecology.
L. Hultin.
Oikos, Vol 22, No 3, p 329-347, 1971. 19 fig, 5 tab, 28 ref.

Descriptors: *Movement, *Environmental effects, *Upstream, *Amphipoda, Crustaceans, Lotic environment, Currents, Flow, Velocity, Water temperature, Light, Diel migration, Biorhythms, Seasonal, Diurnal distribution, Water levels, Precipitation (Atmospheric), Sampling.
Identifiers: *Gammarus pulex pulex, Rheotaxis, Macroinvertebrates, *Sweden.

A study was made of the environmental influences affecting upstream movements of lotic organisms, as represented by Gammarus pulex pulex. Upstream-moving amphipods were continuously trapped by allowing stream water to trickle over a glass sheet sloping down into a water tank. Water temperature, precipitation, light periods, water level and water velocities were all measured and recorded as physical factors affecting the collection. From March 1968 through May 1969 approximately 150,000 specimens greater than 3 mm in size were captured in 2-hr catch intervals. It was discovered that upstream movements reached maximums in June and July with a minimum in March. These findings correlate well with seasonal variations of precipitation, water level, and tem perature. Activity changes due to precipitation an water levels appear related to sensitivity to wat current fluctuations resulting in positive rheotax at increasing velocities. Diel activity patterns we affected by light and temperature variations wit activities being limited mostly to the dark in wint and light in summer months. (Mackan-Battelle)
W72-12732

AUTOANTAGONISM, HETEROANTAGONISI AND OTHER CONSEQUENCES OF TH EXCRETIONS OF ALGAE FROM FRESH O THERMAL WATER, (AUTO., HETEROAN TAGONISME ET AUTRES CONSEQUENCE DES EXCRETIONS D'ALGUES D'EAU DOUC OU THERMALE),
Centre National de la Recherche Scientifiqu Paris (France). Laboratoire de Cytologie et Cytophysiologie de la Photosynthese.
M. Tassigny, and M. Lefevre.
Internationale Vereinigung Fur Theoretische U Angewandte Limnologie, Mitteilungen No 19, 26-38, November 1971. 6 fig, 4 tab, 39 ref.

Descriptors: *Aquatic algae, *Competitio *Nutrients, *Growth rates, *Inhibition, Fun Thermal springs, Cyanophyta, Bacteria, Ecolog Water pollution effects.
Identifiers: *Excretory products, *Autoa tagonism, *Heteroantagonism, Axenic culture Excretion, Aphanizomenon gracile.

Different species of algae compete directly f nutrients, or indirectly by the production of su stances that inhibit the growth of competito (heteroantagonism). Lefevre also recognizes a toantagonism, the inhibition of the growth of species by its own excretory products. Certa algae in culture reach a stage where growth ceas although there appears to be no lack of nutrien and growth cannot be restarted by the addition nutrients. It is observed in nature that, as one sp cies becomes particularly abundant, other speci become scarce. When the abundant speci declines, the others resume active multiplicatic Experimentally it was shown that species cultur in the water feeding a certain canal flourishe whereas those cultured in filtered water from t canal, where there was a large population Aphanizomenon gracile, did not. Bacteria a fungi were eliminated in a dense population of alga, and heteroantagonism was demonstrated the laboratory with strains cultured free of b teria and fungi. The substances produced by so species occasionally stimulate the growth others. The effect of one species upon another ries according to the conditions of the mediu (Holoman-Battelle)
W72-12734

ACTION OF CALCIUM ON THE GROWTH AXENIC DESMIDS, (ACTION DU CALCI SUR LA CROISSANCE DE DESMIDIEES A ENIQUES),
Centre National de la Recherche Scientifiq Paris (France). Laboratoire de Cytologie et Cytophysiologie de la Photosynthese.
M. Tassigny.
Internationale Vereinigung Fur Theoretische U Angewandte Limnologie, Mitteilungen No 19. 292-313, November 1971. 9 fig, 3 tab, 31 ref.

Descriptors: *Calcium, *Growth rates, *Cultur *Aquatic algae, Chlorophyta, Inhibitors, Wa pollution effects, Environmental effects, Co petition, Aquatic populations, Nutrients, Nutri requirements.
Identifiers: *Desmids, *Axenic cultures, Cultur techniques, Staurastrum paradoxum, Staurastr sebaldii var. ornatum, Micrasterias crux-melit sis, Closterium strigosum, Culture media.

In order to study the effect of calcium on growth of pure cultures, experiments were p

ormed in a medium buffered with sodium hosphate to prevent excessive changes in pH and 00 mg/l potassium nitrate was added to the cul- ire medium to maintain growth. Staurastrum aradoxum, which was taken originally from a cal- um-rich polluted pond, grew equally well in all our concentrations of calcium used. Populations f three other species tested increased more owly the higher the concentration of calcium in ie culture medium, though the effect on each was ot identical. S. sebaldii var. ornatum grew slowly all media; the rate at which the population in- eased was depressed by calcium, though the tal number attained varied less than did that of me other species. Calcium not only depresses ie time between divisions of Micrasterias crux- elitensis but reduces markedly the final numbers tained. Closterium strigosum differs from icrasterias mainly in that 13.5 mg/l is the concen- ation below which effect on the final size of the pulation is slight. When M. crus-melitensis and sebaldii var. ornatum are cultured together in .1 mg/l Ca, the proportion of Staurastrum falls at st because it takes longer to adapt to the new nditions of the culture medium. At Ca concen- ations of less than 17.1 mg/l the rise in the pro- rtion of Staurastrum takes place more slowly cause competition with M. crux-melitensis is aximum. There is no heteroantagonistic reaction either to the other, though this appears to be the ctor inhibiting the growth of M. crux-melitensis culture with Closterium strigosum. (Holoman- ttelle)
72-12736

YTOPLANKTON OF TWO DANISH LAKES, ITH SPECIAL REFERENCE TO SEASONAL YCLES OF THE NANNOPLANKTON,
penhagen Univ. (Denmark). Inst. of Plant natomy and Cytology.
Kristiansen.
ternationale Vereinigung Fuer Theoretische nd Angewandte Limnologie, Mitteilungen No , p 253-265, November 1971. 12 fig, 15 ref.

escriptors: *Phytoplankton, *Nannoplankton, kes, *Seasonal, *Primary productivity, Aquatic ae, Zooplankton, Chrysophyta, Chlorophyta, omass, Pyrrophyta, Spring, Summer, Autumn, mpling, Plankton nets, Diatoms, Food chains, abaena, Scenedesmus, Seasonal, Dinoflagel- es.
entifiers: Lake Esrom, Tystrup Lake, Bavelse ke, Cryptophyceae, *Denmark, Cyclotella com- Stephanodiscus hantzschii, Aphanizomenon s-aquae, Chroomonas acuta, Melosira granu- a, Ceratium, Microcystis, Rhodomonas minuta, terionella formosa, Stephanodiscus astrea, kistrodesmus, Chrysococcus minutus, Dic- sphaerium, Lagerheimia.

e phytoplankton of Tystrup-Bavelse Lakes and ke Esrom (Denmark) was examined in relation- p to composition, quantity, and seasonal cycles nannoplankton. For most of the year, about 80 cent of the total cell number was nannoplank- n. In the Tystrup-Bavelse Lakes diatoms were minant in spring, Chlorophyceae in summer, d Cryptophyceae in autumn and winter. In Lake rom, Chrysophyceae and Chlorophyceae were minant in winter and spring, Cryptophyceae in mmer and autumn. Nannoplankton constituted percent of the phytoplankton biomass in both es with a vernal maximum (50-80 percent). The sonal cycles of nannoplankton biomass were primarily to diatoms. Biomass values were cal- ated from volume estimations of each species cerned. Results were expressed in one million ic microns/ml, with values being transformed weight values, mg/l. (Snyder-Battelle)
72-12738

MINERAL NUTRITION OF PLANKTONIC ALGAE: SOME CONSIDERATIONS, SOME EXPERIMENTS,
Kohlenstoffbiologische Forschungsstation, Dortmund (West Germany).
C. J. Soeder, H. Muller, H. D. Payer, and H. Schulle.
Internationale Vereinigung Fur Theoretische Und Angewandte Limnologie, Mitteilungen No 19, p 39-58, November 1971. 6 fig, 5 tab, 53 ref.

Descriptors: *Mineralogy, *Nutrient requirements, *Phytoplankton, *Aquatic algae, Cultures, Phosphates, Nitrates, Nutrients, Salts, Trace elements, Light intensity, Scenedesmus, Chlorella, Growth rates, Resistance, Phosphorus, Iron, Manganese, Zinc, Nickel, Cobalt, Copper sulfate, Heavy metals, Metals, Sulfates.
Identifiers: *Chlorella fusca, *Scenedemus acutus var alternans, *Nitzschia actinastroides, *Staurastrum pingue, Scenedesmus quadricauda, Chlorella pyrenoidosa, Lithium chloride, Lithium, Asterionella formosa, Asterionella japonica, Staurastrum paradoxium, Culture media, Zinc sulfate, Manganese chloride, Nickel sulfate, Cobalt sulfate, Potassium bromide.

Several aspects of mineral nutrition in planktonic algae are compared based on both a literature review and several experiments. Upper limits of nutrient concentrations representing the nutrient concentration tolerance were established for each of four organisms: Chlorella fusca, Scenedesmus acutus var. alternans, Nitzschia actinastroides, and Staurastrum pingue. From these experiments it was tentatively concluded that the relative salt tolerance of freshwater algae is inversely proportional to the growth rate which is attained unless the salt concentration becomes supraoptimal. The relativity of the optimum of nutrient concentrations was also evident in studies on trace element dosage. Suspension density was found to influence optimal trace element concentrations, the average requirements of the dense cultures being higher than these of the more dilute synchronous cultures. A lengthy discussion on the role of phosphate is included. (Mortland-Battelle)
W72-12739

CULTIVATION AND GROWTH OF TWO PLANKTONIC OSCILLATORIA SPECIES,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
M. E. Meffert.
Internationale Vereinigung Fur Theoretische Und Angewandte Limnologie, Mitteilungen No 19, p 189-205, November 1971. 11 fig, 3 tab, 19 ref.

Descriptors: *Cultures, *Growth rates, *Cyanophyta, Light, Thermocline, Carbon radioisotopes, Eutrophication, Pigments, Nutrient requirements, Limiting factors, Chlorophyll, Phytoplankton, Behavior.
Identifiers: *Oscillatoria rubescens, Culture media, Morphology, Phycobilins, *Oscillatoria redekei, Plusssee Lake, C-14, Assimilation.

Samples of Oscillatoria rubescens and O. redekei were isolated from the thermocline of Plusssee (a small eutrophic lake) and cultured to study the growth and behavior of these two species. Suspensions of O. rubescens were cultured in daily shaken Erlenmeyer flasks and in aerated gas-washing-bottles at 400-1400 Lux and 20C. O. redekei was cultivated in the same type of apparatus as well as in flow culture at light intensities of 400-5000 Lux and at 25C. Extinction of suspensions was measured at 436, 546, 623, and 750 nm. Other determinations include: (1) dry-weight, (2) trichome counts and C-14-fixation in O. rubescens, (3) cell counts/trichome and phycobilin measurements in O. redekei, and (4) pigmentation via spectral absorption. The number of trichomes was found to vary according to culture conditions and physiological stage of the algae. High assimilation rates were achieved in cultures of O. rubescens with a concentration of dry substance below 200 mg/l; growth rates decreased above 200 mg/l. In O. redekei cultures, growth was seemingly directly proportional to nutrient concentration. Both Oscillatoria species vary their color at different cultivation conditions. (Snyder-Battelle)
W72-12740

THE USE OF BLUEGILL BREATHING TO DETECT ZINC,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 05A.
W72-12741

THE USE OF FISH MOVEMENT PATTERNS TO MONITOR ZINC,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. Cairns, Jr., and W. T. Waller.
Copy available from GPO Sup Doc, $0.65; microfiche from NTIS as PB-211 333, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 55 p, 1 fig, 19 tab, 26 ref. EPA Program 18050 EDP 12/71.

Descriptors: *Zinc, *Monitoring, *Toxicity, *Movement, *Fish physiology, *Fish behavior, Water pollution effects, Fry, Fish eggs, Growth stages, Fish reproduction, Pollutants, Growth rates, Mortality, Freshwater fish, Lethal limit, Shiners, Carp, Sunfishes, Heavy metals, Bioassay.
Identifiers: Lepomis macrochirus, Notemigonus crysoleucas, Carassius auratus, Goldfish, Atomic absorption spectrophotometry.

A continuous monitoring system, consisting of an apparatus to detect light beam interruptions as a sign of aberrations in fish movement patterns, has been used to stidy the effects of fish exposure to lethal and sublethal concentrations of zinc. In addition to the exposure monitoring, the growth and reproductive success of exposed bluegill (Lepomis macrochirus) were studied. In the movement tests, Notemigonus crysoleucas and Carassius auratus were exposed to 2.94-3.64 mg/l zinc ions as zinc sulfate for 96 hrs. The light system detected premortal movement aberrations allowing for survival of test fish by condition reversal. Analysis of LD50 levels was accomplished and recorded by atomic absorption spectrophotometry twice daily. Growth and reproduction tests involved exposure of one male and 3 females to Zn concentrations about equal to 0.1-0.01 of the lowest concentration detected by the monitoring tests. Eggs were collected and hatched separately. Concentrations of one-tenth the lowest zinc concentrations eliminated reproduction in the bluegills. (See also W72-12741) (Snyder-Battelle)
W72-12742

A QUALITATIVE AND QUANTITATIVE STUDY OF PLASTOQUINONE A IN TWO THERMOPHILIC BLUE-GREEN ALGAE,
Montana Univ., Missoula. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W72-12748

ORGANIC EXCRETION BY DUNALIELLA TERTIOLECTA,
Duke Univ., Beaufort, N.C. Marine Lab.
S. A. Huntsman.
Journal of Phycology, Vol 8, No 1, p 59-63, March 1972. 3 fig, 2 tab, 24 ref.

Descriptors: *Carbohydrates, *Organic compounds, Cultures, Chlorophyta, Protozoa, Radioactivity techniques, Radioisotopes, Nitrates, Ions, Light, Nutrient requirements, Colorimetry, Environmental effects.
Identifiers: *Flagellates, *Excretion, *Dunaliella tertiolecta, Culture media, Enrichment media, Excretory products, Liquid scintillation.

The effects of some environmental and physiological conditions on organic excretion by Dunaliella tertiolecta were determined. Cultures were maintained in f/2 medium at 15C under fluorescent light on a 12-hr light-12-hr dark cycle. Samples used in the excretion studies were incubated in 12 ml vials with C-14-labeled sodium bicarbonate (50 microcuries/micromole at 12-16C). The cells were removed by filtration and counted with a liquid scintillation counter. Counting efficiency was determined by addition of an internal standard of C-14-labeled benzene. Dissolved reducing carbohydrates were measured colorimetrically and dichromatic readings (485-520 millimicrons) were used to counteract interference from nitrate ions in the medium. The results indicated that in healthy cultures, percent excretion was related to cell density but independent of light and preconditioning of the medium. Excretion was lower in nutrient-limited culture than in an enriched medium, and in both cases was minimal during logarithmic growth. Increases in dissolved carbohydrate during stationary phase represented an accumulation of high molecular weight compounds. The general composition of labeled excretory products was similar in both actively growing and stationary cultures. The data suggest that excretion may involve different processes at high and low cell densities. (Snyder-Battelle)
W72-12750

THE COMPARATIVE EFFECTS OF CS AND VARIOUS POLLUTANTS ON FRESH WATER PHYTOPLANKTON COLONIES OF WOLFFIA PAPULIFERA THOMPSON,
Edgewood Arsenal, Md.
E. G. Worthley, and C. D. Schott.
Available from the National Technical Information Service as AD-736 336, $3.00 in paper copy, $0.95 in microfiche. Report No EATR 4595, December 1971. 31 p, 14 fig, 3 tab, 17 ref.

Descriptors: *Water pollution effects, *Phytotoxicity, *Pesticide toxicity, *Phytoplankton, *Organic pesticides, DDT, Aldrin, Dieldrin, 2 4-D, Toxicity, Lethal limit, Cultures, Growth rates, Bioassay, Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Cultures, Inhibitors, Carbamate pesticides, Diazinon.
Identifiers: *Malathion, *CS, Sevin, Indole acetic acid, *Wolffia papulifera, Teratogenicity, Counting, Biological samples, Sensitivity.

Colonies of Wolffia papulifera were exposed to varying concentrations of CS, DDT, aldrin, dieldrin, malathion, diazinon, sevin, 2,4-D, and indole acetic acid (IAA) and the effects observed. Wolffia colonies were grown in 125 ml Erlenmeyer flasks containing 40 ml of Hutner's medium to which were added pesticide concentrations of 0.01, 0.1, 1, 5, 10, 20, 50, 100, and 1000 ppm. The cultures were checked daily for increase or decrease in numbers, for abnormal growth, and for death. Concentrations of 1000 ppm of all compounds killed all Wolffia; at 100 ppm, only CS, DDT, malathion, diazinon, and IAA killed the entire colony. The lowest dosage that produced some abnormal effect was 10 ppm of CS, DDT, and IAA; 5 ppm of dieldrin, diazinon, and sevin; 1 ppm of aldrin and malathion, and 0.1 ppm 2,4-D. Most concentrations resulted in decreased growth rates. However, 1 and 5 ppm of aldrin, 5 ppm of dieldrin, and 5 and 10 ppm of diazinon caused a significant increase in growth rates. (Mortland-Battelle)
W72-12751

DISTRIBUTION PATTERNS OF FIVE SELECTED GASTROPODS SPECIES FROM MCCARGO LAKE,
Kansas State Univ., Manhattan.
T. J. Horst, and R. R. Costa.
Nautilus, Vol 85, No 2, p 38-43, 1971, Illus.
Identifiers: Depth, *Distribution patterns, Florida, *Gastropods, Lakes, Light, McCargo Lake, Oxygen, Species, Temperature, Turbidity, Hydrogen ion concentration.

The south shore population was significantly different from that on north shore, but no difference was found between east and west shores. Gastropod distribution is related to depth, temperature, O2, pH, H2S, light, and turbidity from samples taken at 20 stations, 8 of which yielded specimens.--Copyright 1972, Biological Abstracts, Inc.
W72-12786

CHRONIC EFFECT OF FERRIC HYDROXIDE ON CERTAIN SPECIES OF AQUATIC ANIMALS,
Pittsburgh Univ., Pa. Graduate School of Public Health.
J. L. Sykora, E. J. Smith, M. A. Shapiro, and M. Synak.
In: Proceedings , 4th Symposium on Coal Mine Drainage Research, Mellon Institute, April 26-27, 1972. Pittsburgh, p 347-369. 19 tab, 30 ref. EPA 18050 DJF.

Descriptors: *Bioassay, *Iron compounds, *Acid mine water, *Aquatic animals, *Minnows, *Brook trout, *Fish eggs, *Fry, *Caddisflies, *Aquatic insects, Animal growth, Toxicity, Water pollution effects, Coldwater fish, Growth rates.
Identifiers: *Fathead minnows, Pimephales spp., Freshwater shrimp, Gammarus spp., Caddisfly larvae, Cheumatopsyche, Constant flow apparatus, Proportional dilution, Suspended ferric hydroxide.

Experiments to determine the chronic toxicity of ferric hydroxide to fathead minnows, brook trout, freshwater shrimp, and caddisfly larvae were conducted in a flow-through system using a modified proportional diluter. Brook trout kept for over ayear showed a definite trend to slower growth in increasing concentrations of Fe (OH)3. Egg viability was high in all concentrations except 50 mg/l. Fathead minnows held a full year in suspensions of Fe (OH)3 showed a decrease in growth and an increase in mortality with increase of iron. The highest concentration of suspended iron which does not affect growth and mortality was below 12 mg Fe/l. No effect on egg hatchability up to 50 mg Fe/l was found. Caddisfly larvae were more tolerant to Fe than were young Gammarus. The study indicates that the most important effect of suspended iron on aquatic fauna is physical, producing high turbidities which inhibit fish feeding and exert some effect on the eggs and freshly hatched fry in low concentrations. (Katz-Washington)
W72-12790

TEMPERATURE ACCLIMATION IN THE NERVOUS SYSTEM OF THE BROWN BULLHEAD (ICTALURUS NEBULOSUS),
Massachusetts Univ., Amherst. Dept. of Zoology.
E. L. Bass.
Comparative Biochemistry and Physiology, Vol 40A, p 833-849, 1971. 9 fig, 9 tab, 36 ref.

Descriptors: *Fish physiology, *Water temperature, *Compensation, Temperature, *Bullheads, Biochemistry, *Thermal pollution.
Identifiers: *Acclimation, *Gustatory response, Central nervous system, Feeding, Feeding reflex, *Ictalurus nebulosus.

The gustatory response of the brown bullhead was used as an indicator system for assessing the nature and location of temperature acclimation in the nervous system. Complete acclimation was found to occur in the brains of cold-acclimated but not warm-acclimated animals. No acclimatory response was found in either the peripheral sensory nerves or the spinal portion of the reflex pathway. Data support the theory that the synapse is the primary locus of acclimatory responses although the actual mechanism of compensation remains unknown. (Svensson-Washington)
W72-12791

THE EFFECT OF CHINA CLAY ON THE SED MENTS OF ST AUSTELL AND MEVAGISSE BAYS,
Ministry of Agriculture, Fisheries and Foo Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
Journal of the Marine Biological Association the United Kingdom, Vol 50, p 577-591, 1970. fig, 1 tab, 9 ref.

Descriptors: *Industrial wastes, *Sediment *Clays, *Water pollution sources, Bays, Partic size, Surveys, Water pollution effects.
Identifiers: *China clay wastes, Size analysis, * Austell Bay, *Mevagissey Bay.

Wastes from the china-clay industry a discharged in large quantities each year Mevagissey and St. Austell Bays. The effect th these discharges have had on the sediments these two bays was studied. By comparison wi the natural sediments of Veryan Bay to the west Dodman Point it was possible to assess what tho of the bays had been before the discharges cor menced and to what extent these had been alter by the china-clay waste. An attempt has be made to assess the quantity of china-clay residu present on the sea bed of the two bays and to r late this to the total estimated quantiti discharged by the china-clay industry. The surve established that approximated two-thirds of t sediments were made up to a greater or lesser e tent of china-clay waste. This waste complete covers the sea bed of one-sixth of the area st veyed. Lack of transport is probably due to ve weak currents and long periods of slack wat (Svensson-Washington)
W72-12792

FISH AND FISHERIES IN THE CONTEXT (ENVIRONMENTAL CONCERN,
Food and Agriculture Organization of the Unit Nations, Rome (Italy). Dept. of Fisheries.
H. A. Regier, and D. W. Kelley.
FAO Fisheries Technical Paper No. 1 FIR/T110, Fisheries and Environment, 1971. 21

Descriptors: *Fisheries, *Fish manageme *Water management, *Water utilizati *Reviews, *Ecology, *Water pollution, *Wa pollution control, Commercial fishing, Fish po lations, Fish conservation, Water quality, Calif nia, Lake Erie, Environmental control, Aqua environment, Exploitation, Water resourc Water pollution sources, Water pollution effects Identifiers: Proposed management, Pollution ploitation.

An overview of the effects of toxic pollution, pl nutrient enrichment, and fisheries exploitation the detailed nature of ecological diversity and s bility of the aquatic community is presented. T examples of complex water pollution problems given. There is a pressing challenge for human to define and work for its long-term objecti with respect to the aquatic environment and communities. Svensson-Washington
W72-12793

GROWTH AND CONDITION OF FISHES NORTHERN DONETS AND ITS TRIBUTA AIDAR IN THE REGION INTO WHI WARMED WATER FROM THE LUHAN POWER STATION ARE DISCHARGED,
Akademiya Nauk URSR, Kiev. Instyt Hidrobiologii.
A. Y. Shcherbukha.
Vopr Ikhtiol. Vol 11, No 2, p 290-302. 1971. Illus
Identifiers: *Water pollution effects, *Therl pollution, Discharge (Water), Abramis bra Aidar tributary, Blicca bjoerkna, Chondrost nasus variabile, Donets, Esox lucius, Fish Growth, Luhansk, Mortality, Perca fluviat Power plants, Rutilus rutilus, USSR.

Studies were conducted on the rate of growth and he state of fish in northern Donets and its tributa- y Aidar under the influence of the warm waters lischarged by the Luhansk Power Station. The tudies were deemed especially pertinent in view of the fact that the capacity of the power station is xpected to be increased. Studies on the develop- nent of Abramis brama, Blicca bjoerkna, Chon- rostoma nasus variabile, Rutilus rutilus, Perca luviatilis, and Esox lucius, showed, that, with the ossible exception of the chondrostomes, the in- reased temperatures of the water had no signifi- ant effect on the sexual development of the fish. lowever, maturation of the eggs seemed to occur nore rapidly as indicated by earlier spawning in he warmer waters. Although the temperatures in idar River may have been raised by 10C (usually -8C), and those of the Donets by 1-4C above the ocks, no fish deaths were noted. However, fish eaths were noted in the cooling pond where the emperature frequently reached 40C and, there- ore, the waters should be cooled before they are lischarged into the cooling pond.--Copyright 1972, iological Abstracts, Inc.
W72-12841

METHEMOGLOBIN IN ERTHROCYTES OF AINBOW TROUT,
laska Univ., College. Inst. of Arctic Biology.
. N. Cameron.
omp Biochemi Physiol A Comp Physiol. Vol 40, o 3: p 743-749. 1971.
dentifiers: *Fish physiology, Ascorbic acid, Erythrocytes, *Hemoglobin, *Rainbow trout, ynthesis.

he proportion of Hb carried as oxidized (met-) Hb varied from 2.9% in a wild stock to 17% in a atchery stock of rainbow trout. Hypoxia, anemia nd the reticulocyte percentage (and consequently ell age) had little effect on the metHb content. itrates and nitrites in water had no significant ong-term effect, but i.v. ascorbic acid tends to educe metHb. The experiments revealed that lit- le or no erythrocyte synthesis takes place in esponse to hypoxia.--Copyright 1972, Biological bstracts, Inc.
W72-12907

HE STRESS OF FORMALIN TREATMENTS IN AINBOW TROUT (SALMO GAIRDNERI) AND OHO SALMON (ONCORHYNCHUS ISUTCH),
ureau of Sport Fisheries and Wildlife, Seattle, Vash. Western Fish Disease Lab.
. Wedemeyer.
ournal of Fisheries Research Board of Canada, ol. 28, No. 12, p 1899-1904, December 1971. 9 fig, ref.

escriptors: *Rainbow trout, *Fish physiology, Stress, Toxicity, Mortality, Lethal limit, Salmon, itamins, Metabolism, Oxygen, Carbon dioxide, lkalinity, Ventilation, Animal pathology, Bioas- ay, Hydrogen ion concentration, Consumptive se, Calcium, Chlorine, Anions, Cations, Bicar- onates, Juvenile fish, Water pollution effects.
dentifiers: *Formalin, *Coho salmon, Salmo airdneri, Oncorhynchus kisutch, Vitamin C, lasma, Blood, Hemolysis, Bilirubinemia, Dyscra- ia, Bilirubin, Gills, Kidneys, Liver, Tissue, iological samples, Pituitary.

hanges in gill function, acid-base balance, and ituitary activation occurring during standard 200 pm formalin treatments of juvenile rainbow trout nd coho salmon were compared. Groups of fish ere exposed to 200 or 400 ppm formalin in erated water of 20 ppm hardness at 10 C. The ish, weighing 20-40 g, were generally exposed in roups of 50 with a fish to water ratio of 1 to 40. he fish were removed in groups of 5-10 at desired ntervals and caudal arterial blood samples were aken to evaluate acid-base balance and gill, kid- ey, and liver function. This was done by measur- ing 02 consumption, plasma total carbon dioxide, HC03 and chlorine cations, calcium anions, bilirubin, and whole blood pH. Anterior kidney Vitamin C depletion was measured to evaluate pituitary-interrenal activation. Plasma anions and cations, carbon dioxide, and interrenal Vitamin C in the trout declined continuously and in proportion to exposure time. In salmon these parameters remained at initial levels. Blood pH and alkaline reserve regulation were also less affected in the salmon, particularly during prolonged exposure. Oxygen consumption was depressed in both species. Significant bilirubinemia occurred in the trout but there was little hemolysis in either species. (Mortland-Battelle)
W72-12926

HEAT: A QUESTION OF LIFE-AND-DEATH,
U. Grimas.
Zool Revy. Vol 32, No 4, p 91-99. 1970. Illus. English summary.
Identifiers: *Water pollution effects, *Thermal pollution, Effluents, Salmon, Trout, Cyanophyta.

An evaluation is made on the positive effects of warm water effluents on bodies of water. These include stimulation of food organisms for commercial fish species such as salmon and trout, increased water movements including O2 transport and stimulated purification of rivers even during winter time. The stimulated production of undesirable organisms such as blue-green algae and disturbance of migration routes of fish are also indicated.--Copyright 1972, Biological Abstracts, Inc.
W72-12928

COMETABOLISM OF THE HERBICIDE, 2,3,6--TRICHLOROBENZOATE BY NATURAL MICROBIAL POPULATIONS,
Bowling Green State Univ., Ohio. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W72-12935

BIOLOGICAL EFFECTS OF FATTY ALCOHOLS ON FRESHWATER ANIMALS (BIOLOGISCHE AUSWIRKUNGEN VON FETTALKOHOLEN AUF SUBSSWASSERTIERE),
Bundesforschungsanstalt fuer Fiscerhei, Hamburg (West Germany). Institut fuer Kuesten-und Binnenfischerei.
H. Mann.
Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 4, p 599-607, 1971. 8 ref.

Descriptors: *Aquatic animals, *Water pollution effects, *Monomolecular films, *Evaporation control, Daphnia, Crustaceans, Copepods, Tubificids, Aquatic insects, Larvae, Poisons, Freshwater fish, Air-water interfaces, Water quality control, Hexadecanol, Physical properties, Surface tension, Water properties, Rainbow trout.
Identifiers: *Fatty alcohols, Lebistes reticulatus, Gerris, Lebistes.

A monomolecular layer of fatty alcohols was spread over a water surface to determine if such anti-evaporation techniques have biological effects on freshwater animals. After an eight-day observation period, copepods, Daphnia. and tubificids showed no signs of damage. Lebistes reticulatus and Salmo gairdneri, held in a tank and fed with live or dried food passed through the fatty alcohol layer, accepted the food and showed no signs of disease or poisoning. Insects or insect larvae, however, which normally move, breathe or hatch on the surface could not overcome the decrease in surface pressure and drowned. The normal surface pressure of the water/air interface was reduced from 75 dynes/cm at 10 C to 40 dynes/cm after the addition of fatty alcohols. (Snyder-Battelle)
W72-12938

PHYSIOLOGICAL INVESTIGATIONS ON THE TOLERANCE OF FUCUS VIRSOIDES (DON) J. AG., (PHYSIOLOGISCHE UNTERSUCHUNGEN UBER DIE TOLERANZ VON FUCUS VIRSOIDES (DON) J. AG),
Zavod za Biologiju Mora, Rovinj (Yugoslavia).
F. Gessner, and L. Hammer.
Internationale Revie der Gesamten Hydrobiologie, Vol 56, No 4, p 581-597, 1971. 9 fig, 7 tab, 16 ref.

Descriptors: *Marine algae, *Kelps, *Physiological ecology, Phaeophyta, Standing crops, Resistance, Primary productivity, Biomass, Anaerobic conditions, Water temperature, Chlorides, Photosynthesis, Littoral, Respiration, Plant physiology, Bicarbonates, Water pollution effects.
Identifiers: *Fucus virsoides, Fucus spiralis, Mediterranean Sea.

The work of Linardic is reported, who proved that Fucus virsoides, through isolation has become a separate species, endemic to the Mediterranean; it is possibly a descendant of Fucus spiralis. The ecological habitat conditions are analyzed and it is noted that Fucus virsoides, avoids very exposed coasts. According to Linardic, the main growth periods are winter and spring; when compared to northern littoral algal populations, 'standing crop' and primary production seem to be very limited. The temperature limit for photosynthesis at 12 hours exposure is about 34C. After exposure to temperatures a few degrees above zero, photosynthesis remains normal, but Fucus does not tolerate freezing. In respect to temperature, respiration proves to be more tolerant than photosynthesis; however, exposure to sun throughout the day does not lead to a reduction in photosynthesis but a rise in the bicarbonate content causes a mainfold increase in rate. Air-dry conditions can be tolerated for 2-3 days without damage; however, subsequent processes in Fucus exposed to dryness lead to the death of the algae. This was proved by the increase of Cl-loss and the Winkler-titration. Fucus virsoides can tolerate 1 week in distilled water almost without damage and is amazingly tolerant to oxygen-free conditions (anaerobiosis). Photosynthesis does not decrease until several days in anaerobic conditions; in contrast, respiration remains unaffected. Fucus virsoides is not an indicator for minimal effects of polluted water; however, it disappears rapidly after strong pollution of coastal areas. (In German) (Holoman-Battelle)
W72-12940

EUTROPHICATION OF SURFACE WATERS--LAKE TAHOE.
Lake Tahoe Area Council, South Lake Tahoe, Calif.

Copy available from GPO Sup Doc EP2.10:16010 DJW 05/71, $1.25; microfiche from NTIS as PB-211 460, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, May 1971, 154 p. 17 fig., 45 tab., 25 ref., 5 append. EPA Program 16010 DJW 05/71.

Descriptors: *Water pollution sources, *Eutrophication, *Lakes, Sewage effluents, Seepage, Septic tanks, Bioassay, Chemical analyses, Nitrogen, Nutrients, Surface waters, Algae, Chemical properties, Landfills, Percolation, Drainage, Runoff, Precipitation (Atmospheric).
Identifiers: *Lake Tahoe (Calif.).

A survey was made of nutrient and other chemical constituents of surface waters from developed and undeveloped land areas, sewage effluents, seepage from septic tank percolation system and refuse fills, drainage from swamps, precipitation, and Lake Tahoe water. Algal growth stimulating potential of the samples were bioassayed with Selenastrum gracile as a test organism. Algal response to nutrients was measured by maximum growth rate and maximum cell count in a 5-day growth period. Ponds simulating the shallow portions of the lake were used for continuous flow

assay of the biomass of indigenous lake organisms produced by sewage effluent. Flask assays and chemical analyses were made over two years on three major creeks. Twenty-eight other creeks and precipitations were monitored by chemical analysis. Evaluating the eutrophication potential, Lake Tahoe is nitrogen sensitive and responds to it in proportion to its concentration. Creeks draining developed land carried twice the nitrogen as those draining relatively undisturbed watersheds. Human activity doubles nitrogen inflow to the lake. Exporting all sewage would remove 70% of the nitrogen. (Jones-Wisconsin)
W72-12955

ROLE OF BACTERIA IN THE NITROGEN CYCLE IN LAKES,
Wisconsin Univ., Madison. Dept. of Bacteriology.
E. F. McCoy.
Copy available from GPO Sup Doc EP 2.10:16010 EHR 03/72, $0.35; microfiche from NTIS as PB-211 461, $0.95. Environmental Protection Agency, Water Pollution Control Series, March 1972. 23 p, 3 fig, 2 tab, 8 ref. EPA Program 16010 EHR 03/72.

Descriptors: *Bacteria, *Nitrogen cycle, *Lakes, Fungi, Nitrification, Nitrates, Nitrites, Ammonification, Denitrification, Actinomycetes, Nitrogen fixation, Toxicity, Fish, Perches, Carp, Sticklebacks, Bullheads, Suckers, Eutrophication, Frogs, Minnows, Decomposing organic matter, Fry.
Identifiers: Autotrophic bacteria, Heterotrophic bacteria.

Biological nitrification as contributing nitrite and nitrate to lakes and streams is explored by determining: nitrifiers, growth sites and activity; denitrifying bacteria numbers and their potential activity as opposing nitrification; field data on nitrite-nitrogen and nitrate-nitrogen in terms of nitrifier and denitrifier populations. Biological nitrification, both heterotrophic and autotrophic, was demonstrated. Values for nitrate-nitrogen above 10 ppm were common; 30 to 60 ppm were found on beaches containing decomposing organic matter. At the same sites denitrifying bacteria were prevalent. More than 70% of 628 samples contained more than 10,000/ml. Even though opposing processes, nitrification and denitrification can coexist in close succession or in adjoining microhabitats. Field values for nitrate-nitrogen and nitrite-nitrogen vary considerably and must be viewed as net values at any given time. Thirteen species of fishes varied greatly in resistance to nitrite-nitrogen. Perch and brook sticklebacks were killed in 3 to 5 hours at 5 ppm. Carp and black bullheads tolerated 40 ppm two weeks and 100 ppm about 24 hours. Susceptibilities of others varied. Nitrite toxicity may influence fish species dominance in a eutrophic lake. (Jones-Wisconsin)
W72-12956

EUTROPHICATION OF SURFACE WATERS--LAKE TAHOE INDIAN CREEK RESERVOIR.
Lake Tahoe Area Council, South Lake Tahoe, Calif.

Copy available from GPO Sup Doc EP 2.10:16010 DNY 07/71, $1.25; microfiche from NTIS as PB-211 462, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, July 1971. 115 p. 25 fig, 12 tab, 20 ref, append. EPA Program 16010 DNY 07/71.

Descriptors: *Reservoirs, *Water reuse, *Water quality, *Reclaimed water, *Self-purification, Aquatic life, Recreation, *Eutrophication, Waste water treatment, Phosphorus, Nitrogen, Productivity, Trophic level.
Identifiers: *Indian Creek Reservoir (Calif), *Lake Tahoe (Calif-Nev), Nitrogen removal.

The water impounded at Indian Creek Reservoir was approximately one-third surface runoff and direct precipitation and two-thirds reclaimed water exported from South Tahoe Public Utility District plant. During 1969 to 1971 field and laboratory studies determined the temporal changes and relationships between water quality characteristics of Indian Creek Reservoir and those of the reclaimed water. Reclaimed water contained 0.01 to 0.04 mg/l phosphorus and more than 15 mg/l ammonia. Initially the reservoir would not support fish life, but as the reservoir matured, ammonia levels declined to less tha 4 mg/l and by 1970 it was an excellent trout fishery. Approximately 70% of the ammonia nitrogen was lost to the atmosphere by nitrification-denitrification. Good biological productivity indicated access to other phosphorus sources, probably runoff. Relative to conductivity and chemical components the water is of good irrigation quality. Bioassays showed growth stimulating ability of reservoir water to exceed that of reclaimed water. Various parameters showed that the reservoir responds to more complex factors than those measurable in the reclaimed waste water, raising the question of optimum water treatment for recreational impoundments. (Jones-Wisconsin)
W72-12957

USE OF ALGAL ASSAYS IN STUDYING EUTROPHICATION PROBLEMS,
National Environmental Research Center, Corvallis, Oreg. National Eutrophication Research Program.
T. E. Maloney.
Preprint, presented at 6th International Water Pollution Research Conference, Session 3, No. 6, Hall C, June 20, 1972, 10 p, 6 tab, 3 ref.

Descriptors: *Eutrophication, *Assay, *Algae, Analytical techniques, Waste water treatment, Nutrients, Nutrient requirements, Growth rates, Phosphorus, Nitrogen, *Regression analysis, Variability.
Identifiers: Dissolved phosphorus, *Algal assays, Assay procedure.

The use of algal assays to assist in the solution of practical eutrophication problems was illustrated. The Bottle Test assay, as developed by the National Eutrophication Research Program was utilized during these studies. Practical application of the assay procedure included assessment of affects of changes in waste treatment processes on receiving waters, identification of algal growth-limiting nutrients and assessment of receiving waters to determine their nutrient status and sensitivity to change. A multiple regression analysis, using the various chemical parameters as the independent variables and the maximum algal yield as the dependent variable was run to determine the nutrient having the most influence on algal growth. Dissolved phosphorus alone explained 79.84 percent of the variability in algal growth in the samples, and the six nutrients only increased this by 6.29%. (Galwardi-Texas)
W72-12966

ELECTRIC POTENTIALS AND DOMESTIC WATER SUPPLIES,
Washington State Univ., Pullman.
L. B. Craine, M. H. Ehlers, and D. K. Nelson.
Agricultural Engineering, Vol 51, p 415-417, July 1970, 2 fig, 1 tab.

Descriptors: *Water supply, Agricultural engineering, *Cattle, Electrical grounding, Water consumption, Electrical networks, Electric currents.
Identifiers: *Electrical potential, Voltage.

Electric potentials on domestic water systems affected water consumption and productivity of cattle. The problem of annoying voltage resulted from a single-phase two-wire multiple-grounded system with primary distribution and secondary utilization neutrals solidly bonded together. The problem was solved by separation of grounded neutrals of the primary distribution system from the farm secondary system. An electrified fountain system was built to test effects of controlled water system voltages on animal water consumption. At current levels of 19 ma and at a level of 8 volts the cattle would not drink for an 8 hour period. (Galwardi-Texas)
W72-12970

PROJECT HYPO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Fairview Park, Ohio. Ohio District Basin Office.
Noel M. Burns, and C. Ross.
Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972. 182 p, 6 append.

Descriptors: *Lake Erie, *Eutrophication, *Hypolimnion, *Dissolved oxygen, *Anaerobic conditions, Algae, Sediments, Oxygen demand, Phosphorus, Nitrogen, Nutrients, On-site data collections, Lakes.

Interdisciplinary findings and estimates resulting from Project HYPO, an investigation of the Central Basin of Lake Erie, lead to one definite conclusion: Phosphorus input to Lake Erie must be reduced immediately; if this is done a rapid improvement can be expected; if it is not done, the rate of deterioration will be much greater than it has been in recent years. Contributions discuss in detail the effects of algae, causes and site of oxygen depletion, sediment oxygen demand, budget calculations, hypolimnion volume increase, upwelling of water masses, proximity of a process of continual self-fertilization, and phosphorus and nitrogen elimination from the lake system. Evidence is presented which suggests that 76% of the phosphorus and 57% of the nitrogen in algal material which sediments to the lake floor is retained there if oxic conditions are maintained in the overlying water. Approximately 80% of the phosphorus and 56% of the nitrogen loaded into Lake Erie from external sources will be removed from the water if oxygenated conditions are maintained. Appendix I describes an automatic underwater camera system designed for use during this project and Appendix II describes a submersible automatic dissolved oxygen-temperature monitoring system. (See W72-12991 thru W72-12997) (Auen-Wisconsin)
W72-12990

OXYGEN DEPLETION IN THE HYPOLIMNION OF THE CENTRAL BASIN OF LAKE ERIE, 1929 TO 1970,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
H. H. Dobson, and M. Gilbertson.
In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 3-8. 4 fig, 13 ref.

Descriptors: *Hypolimnion, *Lake Erie, Anaerobic conditions, Eutrophication, Dissolved oxygen, Phytoplankton, Nutrients, Thermocline, Stratification, Phosphates.
Identifiers: *Oxygen depletion, *Lake Erie Central Basin.

Information from published and preliminary reports concerning oxygen values in the hypolimnion of Lake Erie's Central Basin, lying between Port Burwell and Erie in the east and Pelee Point and Sandusky in the west, was studied. The oxygen concentration at the beginning of the stratified period had not changed in four decades. However, oxygen depletion rate has markedly increased and onset of deoxygenated conditions in

ıe bottom water occurs earlier. Deoxygenation of ıe unmixed bottom water of the hypolimnion has ıcreased in the last two decades at the approxiıate annual rate of .075 mg/l per month/year. ince the duration of the stratification period is bout 100 days, a critical depletion rate of 3.0 mg/l er month determines whether much of the basin ill become deoxygenated before the autumnal verturn. It appears that this critical value ocurred about 1960 and this is consistent with the ıcreased incidence of zero values for dissolved xygen in samples analyzed since that year. The ıain source of organic matter is detrital hytoplankton material, sedimented to the lake ottom where it is decomposed by bacteria. (See lso W72-12990) (Jones-Wisconsin)
/72-12991

HYSICAL PROCESSES AFFECTING THE 'YPOLIMNION OF THE CENTRAL BASIN OF AKE ERIE,
epartment of Energy, Mines and Resources, urlington (Ontario). Canada Centre for Inland /aters; and Environmental Protection Agency, airview Park, Ohio.
O. Blanton, and A. R. Winklhofer.
ı: Project HYPO: Canada Centre for Inland /aters Paper No 6, and Environmental Protection gency Technical Report TS-05-71-208-24, ebruary 1972, p 9-37. 22 fig, 4 tab, 9 ref.

escriptors: *Hypolimnion, *Lake Erie, *Disolved oxygen, Temperature, Currents (Water), /inds, Thermocline, Algae, Sediments.
lentifiers: *Lake Erie Central Basin, Pointe Pelee Ontario), Oxygen depletion.

ı situ automatic monitoring devices, existing land ıonitoring stations, and cruise sampling furnish ata to determine relationship between dominant inds, dominant motions in the hypolimnion, and ıermocline response to these motions. Hypolimion volume increases were explained by low wind nergy periods followed by brief periods of high ind energy. This wind energy cycling does not ecessarily occur annually. Hypolimnion oxygen ntrainment from above would be minimal resultıg in the hypolimnion becoming anoxic at an unrecedented rate under conditions of long duration igh energy winds with few intervening calm eriods. The net hypolimnion water movement is ıe result of the dominant southwest winds causıg the Canadian nearshore areas, east of Pointe elee, to be a potential staging area for profuse gal blooms due to accumulation of nutrient-rich ıoxic water in upwelled areas. Dissolved oxygen epletion rates as determined, confirm the long-rm trend of increasing depletion rate. Measured ypolimnion dissolved oxygen fluctuations solely tributable to algal presence were not detected. ediment oxygen demand might account for the ıeasured hypolimnion rate; however, due to the ariety and complexity of the lake system, it can-ot be assumed that this single parameter can efine a situation. (See also W72-12990) (Jones-/isconsin)
/72-12992

N INVESTIGATION OF DIFFUSION HARACTERISTICS OF THE HYPOLIMNION F LAKE ERIE,
epartment of Energy, Mines and Resources, urlington (Ontario). Canada Centre for Inland /aters.
. R. Murthy.
ı: Project HYPO: Canada Centre for Inland /aters Paper No 6, and Environmental Protection gency Technical Report, TS-05-71-208-24, ebruary 1972, p 39-44. 6 fig, 1 tab.

escriptors: *Lake Erie, *Hypolimnion, *Diffuon, Circulation, Dye dispersion, Thermocline, racking techniques, Rhodamine, Sewage sposal, Mixing.
lentifiers: Submarine outfalls.

A water soluble rhodamine B dye was released in August 1970 to study large scale diffusion characteristics of Lake Erie's hypolimnetic waters. During the 60-hour experiment, the vertical spread of the patch was restricted to the hypolimnion because of the strong thermocline; the horizontal spread was an order of magnitude less, corresponding eddy diffusivity two orders of magnitude less, and the observed peak concentration was two orders of magnitude greater compared to surface layer diffusion for comparable time scales. Results raise an important practical question in regard to the possibility of discharging effluents at lake bottom using offshore submarine outfalls. By discharging the effluents through an offshore outfall placed at the lake bottom, at some distance from shore, the entire water column is available for dispersing the effluents. But during summer the discharge is normally below the thermocline with very little transport and mixing. With shoreward transport of the concentrated submerged effluent field and the possibility of occasional upwellings, very high concentrations may be brought to the surface close to the shoreline. (See also W72-12990) (Auen-Wisconsin)
W72-12993

SEDIMENT OXYGEN DEMAND IN LAKE ERIE'S CENTRAL BASIN, 1970.
Environmental Protection Agency, Cincinnati, Ohio. Div. of Field Investigations.
A. M. Lucas, and N. A. Thomas.
In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 45-50. 3 fig, 1 tab, 2 ref.

Descriptors: *Sediments, *Lake Erie, *Dissolved oxygen, Oxygen demand, Hypolimnion, Aquatic plants, Algae.
Identifiers: Lake Erie Central Basin.

The biochemical and chemical oxygen demand in Lake Erie's Central Basin hypolimnetic waters was too small to explain the oxygen depletion rates; tests indicated that dissolved oxygen depletion was caused primarily by the oxygen demand of bottom sediments. Sediment oxygen demand rates were measured at five locations in June, August, and September 1970. The rates were determined from changes in the dissolved oxygen concentration of water sealed and circulated within black and clear plexiglass chambers imbedded in the lake bottom. Sediment oxygen demand rates recorded in June varied from 1.2 to 2.2 gm oxygen/sq m per day and were indicative of eutrophic conditions. Rates measured in August during daylight hours with a clear chamber were less than those measured at night with the clear chamber or during the day with the black chamber. Oxygen produced by algal photosynthetic activity on the lake bottom offset the sediment oxygen demand during part of the day resulting in daily SOD rates of 0.4 to 0.7 gm oxygen/sq m per day. Rates measured in September with oxygenated surface water trapped and carried to the bottom in the chambers ranged from 1.0 to 2.4 gm oxygen/sq m per day. (See also W72-12990) (Auen-Wisconsin)
W72-12994

BIOLOGICAL STUDIES RELATED TO OXYGEN DEPLETION AND NUTRIENT REGENERATION PROCESSES IN THE LAKE ERIE CENTRAL BASIN,
Environmental Protection Agency, Fairview Park, Ohio.
T. Braidech, P. Gehring, and C. Kleveno.
In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency, Technical Report TS-05-71-208-24, February 1972, p 51-70. 17 fig, 3 plates, 4 ref.

Descriptors: *Oxygen demand, *Anaerobic conditions, *Lake Erie, *Algae, *Benthic fauna, *Bottom sediments, *Hypolimnion, Phytoplankton, Light penetration, Dissolved oxygen, Bacteria, Thermocline, Sediment-water interfaces, Chrysophyta, Chlorophyta, Cyanophyta, Biochemical oxygen demand.
Identifiers: *Lake Erie Central Basin, Tribonema, Oedogonium, Anacystis, Ceratium, Cosmarium.

A comprehensive attempt was made to define phytoplankton conditions throughout the water column and on the sediments of Lake Erie Central Basin. Special techniques were employed to explain presence, origin, and viability of heretofore unobserved, apparently metabolizing algae. Tribonema and Oedogonium, deposited on the bottom, were the major source of organic carbon utilized in consumption of hypolimnetic oxygen as a result of bacterial activity at the water-sediment interface. The algae on the sediments maintain growth after light becomes limiting for other sedimental forms. The mixing of nutrient-rich hypolimnion water into the thermocline and lower epilimnion stimulated algal growth, primarily Anacystis, at these levels, particularly at stations where dissolved oxygen depletion in the hypolimnion had been recorded. From approximately July 21 to August 10 there was maximum photosynthetic activity on the bottom resulting in a reduced sediment oxygen demand. Increasing phytoplankton volumes in the overlying waters and the decreasing photoperiod reduced light on the bottom to biologically limiting levels in mid-August. Algae do contribute oxygen to the hypolimnion for a period of time; however, impact and magnitude of this contribution appears to be masked by a stronger oxygen demanding physical and chemical phenomena. (See also W72-12990) (Jones-Wisconsin)
W72-12995

MICROBIOLOGICAL STUDIES RELATED TO OXYGEN DEPLETION AND NUTRIENT REGENERATION PROCESSES IN THE LAKE ERIE CENTRAL BASIN,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Fairview Park, Ohio. Microbiology Lab.
A. S. Menon, C. V. Marion, and A. N. Miller.
In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 71-84. 10 fig, 4 tab, 17 ref.

Descriptors: *Dissolved oxygen, *Lake Erie, *Bacteria, *Sediment-water interfaces, *Hypolimnion, Nitrification, Algae, Thermocline, Anaerobic bacteria, Aerobic bacteria, Sulfur bacteria, Iron compounds.
Identifiers: *Deoxygenation, *Nutrient regeneration, Lake Erie Central Basin.

This bacteriological study aimed to evaluate distribution of bacterial densities and biotypes at the sediment-water interface and overlying waters in relation to time, chemical, physical, and biological data and to assess their role in overall oxygen depletion and nutrient regeneration processes in the hypolimnion of Lake Erie's Central Basin. Major site of intensive bacterial activity was the sediment-water interface. Organic deposits from algal rains and other sources, accumulated at the bottom, underwent bacterial decomposition resulting in oxygen depletion and formation of reduced products of low molecular weight. The reduced products were subsequently oxidized by chemoautotrophic bacteria at the sediment-water interface, or in the overlying waters, resulting in additional oxygen depletion. This process repeated itself after each algal rain causing further oxygenloss. Precipitation of particulate matter through the hypolimnion from intermittent algal rains was primarily responsible for high bacterial densities in the hypolimnion because phytoplankton constituted a locus for bacterial attachment and produced soluble organic substrates for bacterial growth. A significant correlation was obtained between Desulfovibrio densities and degree of ox-

ygen depletion. These factors strongly suggest that heterotrophic and chemoautotrophic bacteria are the principal factors in depleting oxygen. (See also W72-12990) (Jones-Wisconsin)
W72-12996

OXYGEN-NUTRIENT RELATIONSHIPS WITHIN THE CENTRAL BASIN OF LAKE ERIE,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Fairview Park, Ohio.
N. M. Burns, and C. Ross.
In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 85-119. 19 fig, 13 tab, 3 plates, 10 ref.

Descriptors: *Dissolved oxygen, *Nutrients, *Lake Erie, *Hypolimnion, Mathematical models, Iron, Manganese, Phosphorus, Anaerobic conditions, Chlorophyll, Epilimnion, Sediments, Decomposing organic matter, Bacteria, Chemical properties, Nitrogen, Heat transfer, Phosphates, Alkalinity, Oxygen demand, Heat budget, Algae, Eutrophication.
Identifiers: *Lake Erie Central Basin, Nutrient regeneration, Deoxygenation, Algal sedimentation.

The chemical budget components in Lake Erie's Central Basin were calculated. A large erosion of the hypolimnion during July 1970 seemed the initial factor in starting the algal growth period lasting to October; the first heavy bloom resulted in algal fall-out onto the lake floor at the end of July. For a while these sedimented algae were photosynthetic, ameliorating oxygen depletion but not preventing net oxygen depletion caused by organic decay. Aerobic heterotrophic and sulfate-reducing bacteria increased steadily while the algae on the bottom died and matted down. Loss of oxygen from photosynthesis plus activity of the large bacterial populations caused high oxygen depletion rate with anoxic conditions appearing on August 12th. Another period of algal rains, about August 17th, again diminished the oxygen depletion rate but was insufficient to prevent spread of anoxia which, by August 25th, extended across the hypolimnion area. The anoxic condition caused large scale nutrient regeneration by dissolution of inorganic forms. A massive bloom resulted when these nutrients were mixed with surface water during September. Oxygenated conditions should be maintained in the water as a simple mechanism for ensuring that little of the phosphorus in the sediments returns to the overlying water. (See also W72-12990) (Jones-Wisconsin)
W72-12997

UPTAKE AND METABOLISM OF 2,2-BIS- (P--CHLOROPHENYL)-1,1,1-TRICHLORO ETHANE (DDT) BY MARINE PHYTOPLANKTON AND ITS EFFECT ON GROWTH AND CHLOROPLAST ELECTRON TRANSPORT,
Scripps Institution of Oceanography, La Jolla, Calif.
G. W. Bowes.
Plant Physiology, Vol 49, p 172-176, 1972. 3 fig, 1 tab, 31 ref.

Descriptors: *Oceans, *Matabolism, *Marine algae, *Chlorinated hydrocarbon pesticides, *Cytological studies, Absorption, DDT, Phytoplankton, Plant growth, Chlorophyll, DDE, Inhibition.
Identifiers: *Electron transport, Dunaliella tertiolecta, Cyclotella nana, Thalassiosira fluviatilis, Amphidinium carteri, Coccolithus huxleyi, Porphyridium, Skeletonema costatum.

Marine phytoplankters were studied relative to their interaction with DDT. At 80 ppb DDT, growth of Dunaliella tertiolecta was unaffected, and there was slight, if any, influence on development of Cyclotella nana, Thalassiosira fluviatilis, Amphidinium carteri, Coccolithus huxleyi, and Porphyridium. Skeletonema costatum exhibited a 9-day lag before cell division, growth subsequently being the same as the control. Ability of marine phytoplankton to metabolize DDT varied. DDE was the only significant hexane-soluble metabolite detected. It occurred in cells of S. costatum, C. nana, T. fluviatilis and D. tertiolecta. Maximum degree of conversion was 7.5% and was based on DDT found in cell-water system of 9-day D. tertiolecta cultures. The total recovered from cultures in 2- to 3-week experiments ranged from 63.5% for T. fluviatilis to 90.7% for S. costatum. Amount of DDT found associated with the cells, collected by centrifugation, in the cell-water system ranged from 70.8 to 99.5%. Noncyclic electron flow, measured by ferricyanide reduction was inhibited by DDT and DDE, and could explain growth inhibition. Phytoplankton sensitivity to toxic hydrophobic chlorinated hydrocarbons may be dependent upon penetration of the molecules to active sites within membranes. (Jones-Wisconsin)
W72-12998

AGRICULTURAL WASTES AND ENVIRONMENTAL POLLUTION,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
J. Lunin.
In: Advances in Environmental Science and Technology, Vol 2, p 215-261. Wiley Inter-Science, New York, 1971. 5 fig, 11 tab, 91 ref.

Descriptors: *Agriculture, *Wastes, *Pollutants, *Air pollution, *Water pollution, Salts, Farm wastes, Fertilizers, Pesticides, Watersheds (Basins), Management, Runoff, Soil erosion, Wind erosion, Herbicides, Irrigation, Feed lots, Livestock, Eutrophication, Water quality, Water pollution control, *Treatment facilities.
Identifiers: Processing wastes.

The current status of environmental pollution from agricultural wastes (any by-product or residue from agricultural operations that may affect the quality of the environment either directly or indirectly) is discussed. Air pollutants, products of soil erosion, salinity, animal wastes, agricultural chemicals, fertilizers, and pesticides are considered. Existing management practices should be improved and advances in production developed for efficiency compatible with safeguarding the environmental quality. Curbing runoff and soil loss can solve many problems. Existing erosion control practices, universally adopted, would be effective if constantly modified to meet intensification of agricultural operations. Increasing fertilizer use efficiency would minimize pollution hazards from plant nutrients. The design of facilities for intensive animal production can be improved and technology developed for safer and economical disposal of animal wastes. Alternatives for the use of persistent insecticides are currently being investigated. The increasing use of herbicides calls for safety evaluation of the new compounds developed. Pollution hazards would decrease with new and improved methods for applications. These controls may not be achieved without some cost to the farmer, and those costs may have to be absorbed as part of overall production. (Jones-Wisconsin)
W72-12999

ESTIMATION OF THE BIOMASS OF PLANKTON,
Municipal Waterworks of Amsterdam (Netherlands).
G. P. H. van Heusden.
Hydrobiologia, Vol 39, No 2, p 165-208, 1972. 21 fig, 15 tab, 20 ref.

Descriptors: *Biomass, *Plankton, *Estimating, *Mathematical studies, Volume, Distribution, Estimating equations, Rating curves, Frequency analysis.
Identifiers: Poisson distribution, Gauss distribution.

The many mathematical relations found in the planktonic biocoenosis and in its seasonal and spatial distribution are presented together with a new technique of sampling and counting. A mathematical function is demonstrated in the numbers of individuals of the various species. A similar probability relation is found in the volumes of the individuals of the species as well as in the population biomasses. An approximate hyperbolic function can be derived from the population volumes and with the aid of a simple equation the plankton biomass calculated. A modus operandi is given. The biomasses of the populations in various samples may easily be compared using the hyperbolic or the probability relationship and the plankton biomasses in various habitats can easily be compared in a graphic way. The logarithms of the biomasses follow a probability curve and may be plotted and compared on a cumulative logarithmic probability graph. Sampling at ten places and working with the mean is compulsory. A reliable mean may be calculated using the hyperbolic function which seems to describe their densities. International standardization of the method of estimation of the plankton biomass and the expression of the results is proposed. (Jones-Wisconsin)
W72-13000

SOME ASPECTS OF POLLUTION IN SOUTHAMPTON WATER,
Southampton Univ. (England). Dept. of Oceanography.
J. E. G. Raymont.
Proceedings Royal Society of London, B, Vol 180, p 451-468, 1972. 8 fig, 3 tab, 25 ref.

Descriptors: *Ions, *Water pollution effects, *Estuaries, *Nutrients, Iron, Zinc, Copper, Nickel, Clams, Mercury, Water temperature, Sediment load, Benthos, Powerplants, Organic matter, Phytoplankton, Zooplankton, Salinity.
Identifiers: *Southampton Water (England), Trace metals, Bivalves, Thermal effects, Particulate matter.

Concentrations of primary nutrients and certain metallic ions, in addition to oxygen data, were studied to ascertain the condition of Southampton Water. Concentrations inside the estuary differ from those toward the sea. Iron seems correlated with particulate matter; zinc is doubled; copper and nickel are only somewhat higher; mercury, zinc, and copper are concentrated by Mercenaria and other bivalves. Mud, especially rich in total mercury, may represent an important mercury source for these animals. Primary nutrients--phosphate, nitrate, and ammonium--increase as one proceeds up to the estuary. Surface waters are rich in nitrate and ammonium. Gross pollution seems unlikely in view of low nitrite concentrations and high oxygen values virtually throughout the estuary. Although thermal changes in Southampton Water appear slight, some increase in winter minimal temperatures and in summer maxima have occurred with no evident deleterious effects on organisms. Phytoplankton apparently endure at least 10C rise for short periods without injury. Zooplankton density has not decreased. Increase in Mercenaria population may be associated with the small thermal rise; remarkably high densities are encountered. Spawning appears correlated with summer temperatures exceeding 18-19C. (Jones-Wisconsin)
W72-13001

OBSERVATIONS ON THE NUTRIENT COMPOSITION OF A FRESHWATER LAKE ECOSYSTEM,
North Dakota Univ., Grand Forks. Dept. of Biology; State Univ. Coll., Plattsburgh, N.Y. Dept. of Biological Sciences; and Arizona State Coll., Flagstaff. Dept. of Biology.
M. K. Wali, G. K. Gruendling, and D. W. Blinn.
Archiv fur Microbiologie, Vol 69, No 4, p 452-464, 1972. 1 fig, 5 tab, 29 ref.

Descriptors: *Nutrients, *Water circulation, *Lakes, *Sediments, Productivity, Chemical properties, Rainfall, Cycling nutrients, Ions, Oligotrophy, Absorption, Runoff, Sedimentation rates, Phytoplankton, Mud-water interfaces, Aquatic plants, Organic matter.
Identifiers: *Marion Lake (British Columbia).

Phytoplankton productivity is low in Marion Lake, British Columbia, because of low nutrient content attributable not only to the flushing of the lake, higher rainfall, and the insoluble nature of the granite forming the lake bottom, but also because of the binding of the nutrient ions by organic matter in the sediments. This ion binding and the subsequent weak dissociation of cations from the stable metal-organic matter complexes renders nutrients unavailable for phytoplankton growth in surface waters. Epipelic algal productivity is high because of much higher nutrient concentration at mud-water interface, showing probable involvement of an ion exchange system at the interface. High macrophyte productivity may be directly attributed to higher nutrient content of the sediments. Higher nutrient levels in plant samples and low nutrient level in sediments with a plant cover as compared to open sediments point to ion uptake from the substrate. Higher nutrient content of the sediments of Marion Lake results from the surface runoff and seepage from surrounding, not yet stabilized, forest vegetation. This also explains why the trace metal concentrations are higher in sediments, since coniferous forest soils have a greater content of these ions. Al and Fe ions may also be important in organically binding phosphates. (Jones-Wisconsin)
W72-13002

THE INFLUENCE OF INCREASED NITROGEN FERTILIZATION ON THE NITRATE CONTENT OF GROUND WATER,
For primary bibliographic entry see Field 05B.
W72-13005

THE VALUE OF THE SEED GERMINATION TEST FOR EVALUATING THE TOXIC ACTION OF POLLUTED WATER,
Leipzig Univ. (East Germany). Hygiene-Institut.
For primary bibliographic entry see Field 05A.
W72-13010

DISTRIBUTION OF REDUCED INORGANIC COMPOUNDS AND THEIR OXIDATION IN LAKES,
Ehime Univ., Matsuyama (Japan).
M. Nikaido.
Mem Ehime Univ Nat Sci Ser B Biol. Vol 6, No 3: p 159-172. 1970. Illus. Map.
Identifiers: *Inorganic compounds, Distribution, Japan, *Lakes, *Oxidation.

Distribution, formation and oxidation of reduced inorganic compounds in Lake Suwa and Lake Kojima were studied during the summer of 1969. The reduced inorganic compounds in Lake Suwa consisted mainly of ferrous Fe in the water and large amounts of other ferrous compounds except ferrous sulfide in the mud. Those in Lake Kojima consisted of H2S in the water and ferrous sulfide in the mud. Difference between the reduced inorganic compounds of both the lakes is governed by the presence or absence of sulfate, and these compounds in the lake waters may be mainly supplied from the mud. Appearance of the mixed water layers, where dissolved 02 coexists with sulfide S or ferrous Fe indicates that the 02 consumption in the hypolimnion is caused not only by a microbial reduction process but also by chemical oxidation of the reduced inorganic compounds.--Copyright 1972, Biological Abstracts, Inc.
W72-13012

RESIDUE LEVELS OF DIELDRIN IN AQUATIC INVERTEBRATES AND EFFECT OF PROLONGED EXPOSURE ON POPULATIONS,
Georgia Univ., Athens. Coll. of Agricultural Experiment Stations.
J. B. Wallace, and U. Brady.
Pestic Monit J. Vol 5, No 3, p 295-300. 1971. Map.
Identifiers: *Water pollution effects, Industrial wastes, Aquatic animals, Cheumatopsyche sp, *Dieldrin, Exposure, Hydropsyche sp, Invertebrates, Physa spp, Populations, Residue, Simulium vittatum, South Carolina.

A woolen mill that uses dieldrin as a moth-proofing agent releases 0.2 ppm in the plant's effluent, which in turn empties into a small Piedmont river in South Carolina. The number of species of aquatic invertebrates downstream in this river has been greatly reduced, and population complexes have been altered. In all cases, dieldrin levels in extracts of specimens were higher downstream from the plant's effluent outfall than upstream. In some cases dieldrin residues in the downstream fauna were higher by a thousandfold than levels in the upstream counterparts. Downstream, the dieldrin residue, based on wet weights, was as high as 24 ppm in Simulium vittatum Zett. larvae (Diptera:Simuliidae); 23 ppm in Hydropsyche sp. and 103 ppm in Cheumatopsyche sp. larvae (Trichoptera:Hydropsychidae); and 62 ppm in snails (Physa sp.).--Copyright 1972, Biological Abstracts, Inc.
W72-13014

EUTROPHICATION OF LAKE WATER MICROCOSMS: PHOSPHATE VERSUS NON-PHOSPHATE DETERGENTS,
Monsanto Co., St. Louis, Mo.
D. Mitchell.
Science. Vol 174, No 4011, p 827-829. 1971. Illus.
Identifiers: *Water pollution effects, Algae, *Detergents, Diversity, *Eutrophication, Lakes, Microcosms, Nonphosphates, Phosphates.

The eutrophication potentials of a phosphate-containing detergent and 2 phosphate-free detergents, as determined in oligotrophic algal microcosms after activated sludge treatment, were not significantly different. All activated sludge effluents, including those from detergent-free waste water, lowered the algal diversity of the microcosms to about the same extent below that of the lake water controls.--Copyright 1972, Biological Abstracts, Inc.
W72-13015

PRELIMINARY INVESTIGATIONS ON THE POSSIBILITY OF APPLICATION OF MINING AND INDUSTRIAL WASTE MATERIALS TO FERTILIZATION OF SANDY SOILS: I. INFLUENCE OF WASTE MATERIALS ON THE INITIAL GROWTH OF PLANTS UNDER LABORATORY CON DITIONS, (IN POLISH),
Wyzsza Szkola Rolnicza, Lublin (Poland).
S. Nawrocki, and T. Kesik.
Ann Univ Mariae Curie Sklodowska Sect E A gric. 24: p 125-133. 1969. English summary.
Identifiers: Fertilization, Growth, *Industrial wastes, Laboratory, Materials, *Mine wastes, Plants, *Sandy soils.

The chemical activity of loams, after flotation waste materials from a Cu-mine, and waste materials of colloidal silica neutralized with phosphorites or with B, Mn or Cu was examined. The influence of the examined waste materials on the germination and initial growth of plants varied. A negative effect of the addition of Mn, B and Cu waste materials to those of silica was observed in pure nutrient media. This effect disappeared with the dilution of waste materials in sandy soil. The waste materials of silica with those of Mn and B ones inhibited root growth. The best germination and initial growth of plants was obtained with Turoszow loams, silica waste materials with phosphorites and after-flotation materials.--Copyright 1972, Biological Abstracts, Inc.
W72-13029

RURAL WATER-SUPPLY DEVELOPMENT AND THE RECENT APPEARANCE OF ENDEMIC GOITRE,
East African Inst. for Medical Research, Mwanza (Tanzania).
V. Van Amelsvoort.
Trop Geogr Med. Vol 23, No 3, p 304-305. 1971.
Identifiers: *Endemic, Goiter, *Human diseases, *Nigeria, *Iodine content, Public health.

Estimations of the I content in underground and surface water in a Nigerian village support the hypothesis that a change from the use of river water to the use of well water caused the recent appearance of endemic goiter.--Copyright 1972, Biological Abstracts, Inc.
W72-13032

STUDY OF THE DEGREE OF INFECTIOUSNESS OF THE RED-SPOT DISEASE OF CARPS IN FISH FARMS CURED BY A COMBINED METHOD, (IN RUSSIAN),
S. K. Bol'Shakov, and N. A. Shantarina.
Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 24-28. 1969.
Identifiers: *Carps, *Diseases, Fish, Infectiousness, *Red-Spot disease.

Studies were made on the contagiousness of the red-spot disease on 1 yr old carps raised in the Angelinskiy fish hatcheries and on yearlings imported from healthy fish hatcheries. Three spawning ponds of 0.1 ha and 1 control pond having a surface of 18 ha and with an independent water supply were used. Stocking the pond with fish by a local planting material was done in April, and imported material in May 1967. In imported, clinically healthy carp, signs of red-spot disease were not noted. In early recovered fish hatcheries, a decrease in virulence was noted.--Copyright 1972, Biological Abstracts, Inc.
W72-13033

CURRENT CONDITION AND PROBLEMS OF THE FURTHER STUDY OF INFLAMMATION OF THE SWIM BLADDER, (IN RUSSIAN),
A. I. Kanaev.
Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 19-23. 1969.
Identifiers: *Bladder, *Carps, Fish diseases, Inflammation.

Etiology of the inflammation of the swim bladder (ISB) is not clarified. The pathogenesis was also studied. Hematological, biochemical, histological and histochemical studies were conducted in the course of the disease on carps of all age groups. In carps suffering from this disease, the sedimentation rate is accelerated 1.5-2.5 times, Hb level decreases by 21-42%, number of erythrocytes decreases by 18-42% and the number of leukocytes abruptly increases. Changes of the metabolism and morphostructure in the swim bladder, liver, kidneys and spleen occur. Disinfectants and medicinal preparations used in hot ponds were tested for the control of ISB.--Copyright 1972, Biological Abstracts, Inc.
W72-13036

5D. Waste Treatment Processes

A PLAN FOR WATER AND SEWER.
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.
For primary bibliographic entry see Field 06D.
W72-12406

PWR WATER: VARYING CHEMISTRY AND 'HOT' CONTAMINANTS,
Westinghouse Electric Corp., Pittsburgh, Pa.
W. D. Fletcher.
Industrial Water Engineering, p 18-22, March 1971. 4 fig, 2 tab.

Descriptors: *Water chemistry, Hydrogen ion concentration, *Demineralization, Radioactivity, *Corrosion control, Cobalt radioisotopes, Tritium, *Waste water treatment.
Identifiers: *Pressurized water reactors, Impurities, Neutron poison, Decay, Reactor coolant, Activation.

All raw water for the Reactor Coolant System is purified either by multibed demineralizers or by flash evaporators. Oxygen is eliminated by deaerating the makeup water admitted to the system, and by maintaining excess dissolved hydrogen in the reactor coolant. Reactor coolant pH is controlled by 1 ppm of lithium hydroxide. Boric acid is added as a soluble neutron poison to the coolant for reactivity control to supplement the control rods. As core burn up progresses, the coolant's boron concentration is reduced, at a rate of approximately 100 ppm per month, from an initial value of about 1500 ppm to a level of less than 10 ppm. Advantage is taken of holdup in the system to provide for decay of short-lived fission products so as to reduce the burden on waste disposal systems and the release to the environment. Tritium, which is produced in significant quantities in the fuel is important because of its long half life and because it does not lend itself, when associated with water, to concentration or separation processes as, for example, iodine does. (Upadhyaya-Vanderbilt)
W72-12465

TRANSACTIONS OF THE THERMAL EFFLUENT INFORMATION MEETING.

Transactions of Meeting, July 9, 1970, Boise, Idaho, Idaho Nuclear Energy Commission, Idaho Falls, Idaho, (1970). 82 p, 2 fig, 10 photos, 1 tab, 2 ref.

Descriptors: *Conferences, *Heated water, *Beneficial use, *Thermal pollution, Electric powerplants, *Idaho, Water sources, Air conditioning, Deicers, Aquiculture, Fish management, Nuclear powerplants, Irrigation, Frost protection, *Water reuse.

A summary of how the State of Idaho stands in making meaningful use of warm water from industrial plants is presented. Topics discussed in talks at a conference held in July 1970 include characterization, sources, and disposition of thermal effluents; urban uses of heat such as residential heating and cooling, increasing reaction rates in sewage treatment, de-icing and de-fogging airports, and heating greenhouses; heated water in aquiculture; present uses of thermal groundwater in Idaho; problems of thermal pollution in fish life cycles; constraints in the use of nuclear power plant waste heat; industrial process uses and evaporative effects; and horticultural frost protection, cooling, and irrigation. A great number of possible uses of warm water are presented. It is concluded that thermal water should be used to benefit the immediate area of plant location. Suggestions presented by four study groups are included in an appendix. (See W72-12467 thru W72-12474) (Eagle-Vanderbilt)
W72-12466

THERMAL EFFLUENT-WHAT IT IS, WHERE IT COMES FROM AND WHERE IT GOES,
Idaho State Univ., Pocatello. Dept. of Nuclear Science and Engineering.
For primary bibliographic entry see Field 05b.
W72-12467

UTILIZING WASTE HEAT FOR URBAN SYSTEMS,
Westinghouse Electric Corp., Pittsburgh, Pa.
J. A. Nutant.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970, Idaho Nuclear Energy Commission, Idaho Falls, Idaho, (1970), p 18-23.

Descriptors: *Beneficial use, *Heated water, *Cities, Electric powerplants, Air conditioning, Heating, Deicers, Aeration, Sewage treatment, Greenhouses, *Water reuse, *Thermal pollution.

Some concepts investigated in a program to determine economic and/or social benefits from combinations of urban systems and power plant resources are reviewed. Hot water has proven to be a practical method for residential space heating in Iceland. The problem of finding a use for thermal effluents in the summer could be solved providing residential air conditioning by an ammonia or lithium bromide absorption refrigeration mechanism using an input energy of hot water. A 1000 Mwe nuclear plant could serve a population of about 450,000 with electricity, heating and cooling. A system which would use waste heat only during the summer months is injection of oxygen into condenser water and release into the recipient stream, aerating it. Effluent from a power plant can also be transferred to sewage plants, increasing the temperature of the sewage and thus its rate of reaction. Other uses for waste heat described briefly are de-icing and de-fogging airports and heating greenhouses. (See also W72-12466) (Eagle-Vanderbilt)
W72-12468

HEATED WATER IN AQUICULTURE,
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W72-12469

UTILIZATION OF HOT GROUNDWATER IN ELMORE AND OWYHEE COUNTIES, IDAHO,
Idaho Dept. of Water Administration, Boise.
D. R. Ralston.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 29-34, 1 ref, 1970.

Descriptors: *Beneficial use, *Thermal water, *Irrigation, Temperature, Heated water, *Idaho, Heating, Greenhouses, Recreation facilities, Swimming pools, Hay, Grains (Crops), *Water reuse, *Thermal pollution.

Hot groundwater may be found in many parts of Idaho. The history and present use of the resource provides useful insight into the utilization of thermal effluents. Water from 90 to 185 degrees is piped into greenhouses for heat dissipation and then used for irrigation in Owyhee County. Water ranging from 85 to 100 degrees is piped through hot water lines and heaters in homes for residential heating. Several public swimming facilities in Owyhee County are supplied by water at temperatures less than 140 degrees. Irrigation is the most dominant use for hot groundwater in Elmore and Owyhee Counties. Hot water is applied directly or after cooling in a pond or by a spray and recollection system to hay and grain crops. Yields are approximately equal to those of neighbors using river water for irrigation. Because of the lengthened growing season, the farmers can get an extra cutting of hay. More labor is involved, however, in the use of hot groundwater. (See also W72-12466) (Eagle-Vanderbilt)
W72-12470

THERMAL POLLUTION AND THE AQUATIC ENVIRONMENT,
Idaho Dept. of Fish and Game, Boise.
For primary bibliographic entry see Field 05C.
W72-12471

CONSTRAINTS AND GUIDELINES IN HARNESSING NUCLEAR POWER PLANT WASTE HEAT,
Idaho Nuclear Corp., Idaho Falls.
F. R. Keller, and N. K. Sowards.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 39-46, 2 fig, 1970. AEC AT (10-1)-1230.

Descriptors: *Beneficial use, *Heated water, *Nuclear powerplants, Greenhouses, Irrigation, Temperature, Fish farming, Recreation, *Idaho, Multiple purpose, *Thermal pollution, *Water reuse.
Identifiers: *Cooling ponds.

Sites of nuclear powerplants and local monthly average minimum and maximum temperatures were considered, indicating the difficulty in removing the heat without producing thermal effluent. Drawbacks and possibilities of using heated water for greenhouse heating, irrigation, and fish culture are mentioned. If a larger market for fish were developed, fish culture could reduce problems from both sewage and thermal effluents. Cooling ponds offer possibilities in many locations to use some of the heat value. Cooperative projects are encouraged with one proposed for Southeastern Idaho using heated water for irrigation with excess water going to a cooling pond which could be used as a fish farm or for recreational purposes. (See also W72-12466) (Eagle-Vanderbilt)
W72-12472

THERE'S GOLD IN THEM THAR BTUS,
Washington State Office of Nuclear Energy Development, Olympia.
L. B. Bradley.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 47-57, 1 ref, 1970.

Descriptors: *Beneficial use, *Heated water, *Electric powerplants, Industrial water, *Thermal pollution, Evaporation, Irrigation, Condensers, *Water reuse.

The increasing use of electric power and its concurrent production of heat that must be dissipated were cited indicating a supply of heat energy to be used productively. Industrial process uses and evaporative effects where needed were discussed in detail. Industry should disperse itself before water, air, land and people pollution force it to move. Industries are listed which use fresh water and an example is given of a plant producing magnesium oxide from sea water and its turbid effluent diluted in power plant effluent. Vapor barriers can be formed to give frost and freeze control in agricultural areas near power plants. Vapor from cooling towers could be condensed to provide irrigation or reservoir makeup supply. Technologists are urged to develop new design concepts for condensers and to concentrate research on the full process flow spectrum. (See also W72-12466) (Eagle-Vanderbilt)
W72-12473

HE THERMAL-WATER HORTICULTURAL EMONSTRATION PROJECT AT SPRING-IELD, OREGON,
'itro Corp. of America, Portland, Oreg.
i. Miller.
1: Transactions of the Thermal Effluent Informa-on Meeting - Boise, Idaho, July 9, 1970. Idaho Iuclear Energy Commission, Idaho Falls, Idaho, 58-68, 5 photos, 1970.

escriptors: *Agriculture, *Irrigation, *Heated ater, *Thermal pollution, Temperature, rchards, Meteorological data, On-site investiga-ons, Idaho, *Oregon, Frost protection, Crops, ooling, *Water reuse, *Sprinkler irrigation.

field-demonstration agricultural project was set p to study air-soil-water-plant ecosystem interac-ons. Frost protection by sprinkler application de-ndent on the heat of fusion principle is being sed on orchards. Warm water from sprinklers can ol plants suring warm, dry summer weather. 'arm-water irrigation, normal-water irrigation, id no irrigation are being compared with respect rate and amount of water application, at-ospheric temperatures, humidity, soil moisture id temperature, and crop yield. Crops being ir-gated are orchard crops, walnuts, pole beans, veet corn, tomatoes, bush beans, potatoes and a ariety of graden crops and nursery plants. The imp and line arrangement are described as are e valve controls for individual farmers and the rinkler system. Two weather stations record eteorological conditions on and outside of the oject area. (See also W72-12466) (Eagle-Van-rbilt)
'72-12474

OW TO PLAN A PROGRAM FOR LIQUID EF-LUENT CONTROL,
algon Corp., Pittsburgh, Pa. Water Management iv.
or primary bibliographic entry see Field 05G.
'72-12475

ROVINCE OF ONTARIO'S PROGRAM FOR NANCING, CONSTRUCTING AND OPERAT-IG WATER POLLUTION CONTROL AND ATER SUPPLY FACILITIES,
ornell Univ., Ithaca, N.Y.
. McTavish.
: Proceedings of the Symposium on Social and conomic Aspects of Water Resources Develop-ent, June 21-23, 1971, Ithaca, New York. Amer-n Water Resources Association, Urbana, Il-ois, 1972. p 244-245.

escriptors: *Water supply, *Waste water treat-ent, *Treatment facilities, *Financing, Construc-n, Management, Local governments, Canada, ater treatment.
entifiers: Provincial governments.

ntario's municipalities have three means of ancing water and sewage treatment facilities. ey can finance the project through (1) municipal bentures, (2) the Ontario Water Resources Com-ssion (OWRC) as an OWRC/Municipal project, (3) the Commission as an OWRC/Provincial rks. Under the municipal type of financing, the mmission provides works for the municipality a pay back arrangement. This approach allows ancing over a longer period of time than mu-ipal debentures would provide, and the mu-ipality enjoys the supervision of the Commis-n at no charge. Under the provincial plan, the nicipality is billed on a use basis. A rate for ter or sewage service is agreed upon and the arly bill to the municipality is based upon the w and the rate. In either approach the mu-ipality is not billed for the supervisory services the head office of the Commission. The opera-'s salaries, direct operating costs, and capital st are billed, subject to certain conditions, to the oject. The program's advantages to the mu-nicipality include increased technical expertise, a financial advantage, and improved management efficiency. Disadvantages include possible conflicts between Commission objectives, loss of local control, and potential unresponsiveness to municipal needs. (See also W72-10480) (Settle-Wisconsin)
W72-12480

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W72-12548

THE INFLUENCE OF TEMPERATURE ON THE REACTIONS OF THE ACTIVATED SLUDGE PROCESS,
Research Institute for Water Resources Development, Budapest (Hungary). Water Quality and Technology Dept.
P. Benedek, and P. Farkas.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 164-179. 7 fig, 2 tab, 16 ref, append.

Descriptors: *Waste water treatment, *Temperature, *Sewage treatment, *Activated sludge, Cold regions, Biological treatment, Mathematical models, Physicochemical properties, Kinetics, Oxidation, Metabolism, Municipal wastes, Phenols, Colloids, Industrial wastes.
Identifiers: *Arrhenius law, Casein, Starch, Acetate, Sucrose.

The physico-chemical basis of temperature dependence in activated sludge is discussed. Endogenous metabolism, not metabolism of dissolved substrate follows the Arrhenius law. The adsorptive mechanism of activated sludge also has a temperature dependence, but this amounts to less than 10% of the thermal dependence of biological processes. Value of grams-oxygen consumed per gram substrate oxidized was found practically constant in the range of 0-25C. Temperature dependence of continuously working activated sludge plants is usually less than would be expected from non-steady state measurements. Furthermore, most wastes contain colloids, the removal rate of which does not depend on temperature. A great difference may be encountered in the thermal dependence of treatment efficiency, depending on whether the waste contains colloids or dissolved compounds, in favor of the former. Great importance has to be attributed to heat storage in water bodies underlying biological treatment; a system with long detention time may not be economic, because the thermal reserve--consequently higher removal rate--of a short detention time system may compensate for the long detention time with heat loss in a total oxidation plant. (See also W72-12548) (Jones-Wisconsin)
W72-12558

EVALUATION OF AERATED LAGOONS AS A SEWAGE TREATMENT FACILITY IN THE CANADIAN PRAIRIE PROVINCES,
Metropolitan Corp. of Greater Winnipeg (Manitoba). Water Works and Waste Disposal Div.
R. Pick, G. E. Burns, D. W. Van Es, and R. M. Girling.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 191-212. 13 fig, 3 tab, 6 ref.

Descriptors: *Aerated lagoons, *Sewage treatment, *Sewage lagoons, Domestic wastes, Pilot plants, Cold regions, Nutrients, Temperature, Sludge, Mosquitoes, Suspended solids, Dissolved oxygen, Odor, Scum, Ice, Anaerobic conditions, Foaming, Capital costs, Construction costs, Operating costs, *Waste water treatment.
Identifiers: *Winnipeg (Manitoba), Nutrient removal, Surface aerators.

A two-year study of aerated lagoons was undertaken because there was little documented information on their operation under Canadian prairie conditions. In order to assess the applicability of this process for treatment of domestic wastes, three pilot aerobic-anaerobic aerated lagoons were constructed during the summer and fall of 1967 in the corner of an existing stabilization pond for domestic sewage treatment from a separate system. Aerated lagoons were found to be capable of providing 'secondary equivalent' sewage treatment. Under prairie climatic conditions there is a problem of sludge accumulation leading to declining efficiency of BOD removal and a reduction in the dissolved oxygen concentration during the summer months. The economic feasibility of aerated lagoons is questionable until the extent and cost implications of the sludge problem are fully defined by further research and experience. Use of surface aerators under prairie winter conditions is not practical due to ice build-up. Conclusions are that aerated lagoons are an effective means of providing secondary treatment but some provision must be made for sludge handling. (See also W72-12548) (Jones-Wisconsin)
W72-12560

DESIGN CONSIDERATIONS FOR EXTENDED AERATION IN ALASKA,
Federal Water Quality Administration, College, Alaska. Cold Climate Research Program.
S. E. Clark, H. J. Coutts, and C. Christianson.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 213-236. 11 fig, 7 tab, 35 ref.

Descriptors: *Waste water treatment, *Alaska, *Aeration, *Design, Dissolved oxygen, Ice cover, Sewage treatment, Aeration, Cold regions, Activated sludge, Temperature, Kinetics, Biological treatment, Laboratory studies, Suspended solids, Nutrients, Pilot plants.
Identifiers: *Solids separation.

Extended aeration systems have considerable potential for reliable and economical secondary treatment at large community installations in Alaska. Laboratory and pilot plant studies on activated sludge were mainly limited to extended aeration, and included investigations of low temperature biokinetics, low temperature solids removal, degree of environmental protection required for equipment and processes, aeration requirements, aeration chamber mixing, and waste sludge characteristics and disposal. Feasibility of extended aeration activated sludge process as a relatively economical and effective means of secondary waste treatment was demonstrated. The process requires more consistent operation and maintenance than aerated lagoons--a disadvantage where costs are high and skilled operators are scarce. Cold climate sludge wasting and disposal for the extended aeration process must be given consideration for the following reasons: excess solids production increases with decreasing temperature; shorter detention times to prevent freezing will also increase solids production at a given MLSS level; auto-induced sludge wasting may be expected to be more severe, placing greater potential stress on the receiving water; assimilative capabilities of the receiving water at cold temperatures are retarded. (See also W72-12548) (Jones-Wisconsin)
W72-12561

CHEMICAL TREATMENT OF MECHANICALLY AND BIOLOGICALLY TREATED WASTE WATER,
Norwegian Inst. for Water Research, Oslo.
A. Rosendahl.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 237-251. 4 fig, 4 tab, 9 ref.

Descriptors: *Sewage treatment, *Biological treatment, *Pilot plants, *Treatment facilities, *Waste water treatment, Chemical precipitation, Activated sludge, Sludge, Aeration, Tertiary treatment, Sewage effluents, Coagulation, Flocculation, Sedimentation, Cold regions, Temperature, Flotation, Costs.
Identifiers: Mechanical treatment.

Since Norway has only a few biological treatment plants, a more direct way of phosphorus removal by omitting the biological unit was sought. Although during 1967 some treatment plants were built in Sweden using mechanical/chemical treatment, systematic observational data describing the process were limited. Pilot plant studies were needed giving comparable results between mechanical/chemical and biological/chemical treatment systems, and results and experience that could be translated to full-scale treatment plants. In 1968 a study was started and results from 1-1/2 years' program are reported. Primary treated waste water was used in two plants and secondary treated waste water was used in two other plants. Parameters analyzed for evaluation of quality of the influent, effluent, and kinetics were: organic matter, chemical oxygen demand, biochemical oxygen demand, seven days test; total phosphorus, orthophosphate, nitrogen, Kjeldahl and the sum of nitrite-nitrate nitrogen; turbidity, pH, and aluminum. Experimental results on removal of phosphorus and organic matter indicate that mechanical/chemical treatment should be considered first where eutrophication is the greatest problem in the receiving waters and phosphorus is the most important nutrient to be removed. (See also W72-12548) (Jones-Wisconsin)
W72-12562

BIOLOGICAL AND CHEMICAL WASTE TREATMENT EXPERIMENTS IN FAR NORTHERN SWEDEN,
P. Balmer.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 252-262. 6 fig, 6 tab, 5 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Activated sludge, Temperature, Bacteria, *Aeration, Flocculation, Costs, Cold regions, Chemical precipitation, Phosphorus, Suspended solids, Sludge, Pilot plants, Sewage, Recirculated water, Settling basins, Hydrogen ion concentration, Effluents.
Identifiers: *Kiruna (Sweden), *Chemical treatment.

Laboratory data show that the metabolizing activity of activated sludge is seriously hampered at low temperatures, and BOD reduction data in activated sludge systems at low temperatures are partly contradictory. Pilot plant experiments were conducted with activated sludge and chemical treatment. The activated sludge treatment proved that biological treatment is possible even at very low sewage temperatures. As the metabolizing activity of the activated sludge bacteria is considerably reduced, long aeration periods, 4-5 hours, and large aeration basins, are required. Chemical treatment is much less sensitive to low temperatures and requires only about 0.5 hour detention time in flocculation tanks. Difference in investment costs will in many instances be so large that the increased running costs are justified. If a community has an existing primary treatment plant with a long detention time (more than 2 hours), it may be possible to achieve a substantial increase in treatment efficiency by simply adding flocculating chemicals to the influent. BOD removal with chemical treatment is somewhat inferior to what can be achieved with biological treatment. This drawback, however, is compensated by superior phosphorus removal. (See also W72-12548) (Jones-Wisconsin)
W72-12563

BIOLOGICAL SEWAGE TREATMENT IN A COLD CLIMATE AREA,
Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
S. Terashima, K. Koyama, and Y. Magara.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 263-285. 19 fig, 6 tab, 8 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Sewage treatment, *Cold regions, *Thawing, Temperature, Aeration, Activated sludge, Nitrogen, Nitrification, Biochemical oxygen demand, Drainage, Runoff, Suspended solids.
Identifiers: *Sapporo (Japan), Oxygen transfer coefficient.

Effects of thawing and the effects of low sewage temperature on activated sludge characteristics are considered. Rate of thawing run-off significantly relates to degree-hour. If these correlations are known for a certain drainage area, it is possible to predict the rate of thawing run-off from the highest and lowest atmospheric temperatures of the day. At low temperatures, oxygen transfer coefficient in the aeration tank decreases, but the mass of oxygen transfer increases slightly with lowering of temperature. Sludge volume index increases at low temperatures. It creates a high COD effluent. The value of sludge volume index changes with time after substrate contact with activated sludge. At a low sewage temperature, it is necessary to take sufficiently prolonged aeration time to stabilize the activated sludge which absorbed substrate. The removal ratio of soluble COD is not affected by a sewage temperature decrease but total COD of effluent increases due to an increase of suspended matter. Soluble COD removal rate varies with temperature. Removal of organic and ammonium nitrogen and nitrification rate are formulated. These rates decrease with lower temperatures and temperature coefficients are larger than that of removal of COD, thus effluent of low sewage temperature contains high nitrogen. (See also W72-12548) (Jones-Wisconsin)
W72-12564

MICROBIOLOGIC INDICATORS OF THE EFFICIENCY OF AN AERATED, CONTINUOUS--DISCHARGE, SEWAGE LAGOON IN NORTHERN CLIMATES,
North Dakota Univ., Grand Forks. School of Medicine.
J. W. Vennes, and O. O. Olson.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 286-311. 4 tab, 5 ref, append.

Descriptors: *Sewage bacteria, *Waste water treatment, *Sewage lagoons, *Cold regions, Aerated lagoons, *North Dakota, Biochemical oxygen demand, Bacteria, Temperature, Coliforms, Enteric bacteria, Nitrogen, Vitamins, Suspended solids, Lactobacillus, Chlorella, Sulfur bacteria, Algae, Salmonella, E. coli.
Identifiers: *Continuous discharge lagoon.

The aerated lagoon, a development in biological waste treatment was studied in Harvey, North Dakota. Coliform, fecal coliform, and enterococci were determined as well as BOD, nitrogen, pH, total and suspended solids; and total bacterial populations enumerated. Lagoon efficiency depends on temperature and oxygen; their effect on biologic stabilization is determined and the findings are reflected in relative abundance of several microbial species and in BOD. Coliform fecal coliform, and enterococcal numbers in the secondary lagoon during zero centigrade tempera tures were directly related to BOD and tota nitrogen. During summer temperatures, little cor relation between these organisms and BOD an total nitrogen was noted. There was a correlatio between the total microbial population and BOD a summer temperatures. Since only 1% or less of th total microbial population is represented by the en teric organisms studied, it is apparent that othe organisms must be studied to define better the rol of microbiologic indicators in the efficiency of thi sewage treatment system. A system concerne with production and utilization of the vitamin B biotin, is being studied, since it relates to severa organisms that thrive in sewage oxidation lagoons (See also W72-12548) (Jones-Wisconsin)
W72-12565

DISINFECTION AND TEMPERATURE IN FLUENCES,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Researcl Lab.
C. Chambers, and G. Berg.
In: International Symposium on Water Pollutio Control in Cold Climates, July 22-24, 1970 University of Alaska, College, p 312-328. 10 fig, 3 ref.

Descriptors: *Waste water treatment, *Disinfec tion, *Temperature, *Cold regions, *Alaska, Ef fluents, Coliforms, Enteric bacteria, Viruses Groundwater, Chlorine, Hydrogen ion concentra tion, Iodine, Water pollution sources, Lime, Bac tericides, Ozone, Bromine, Gamma rays, Ul traviolet radiation, Ice cover.
Identifiers: *Pasteurization.

Some conventional and unconventional disinfec tion methods are examined relative to their poter tial strengths and weaknesses for disinfecting ef fluents under cold climatic conditions. They ar discussed according to their effect on bacteria an viruses. Bactericidal and general considerations o chlorine, iodine, excess lime, ozone, bromine pasteurization, gamma radiation, and ultraviole light are considered. Since viruses can be stored a -70C for a decade or more, the normal die-off c viruses experienced in warmer climates does no occur in sewage and water in cold climates. The ef fects of chlorine, iodine, ozone, ultraviolet ligh and gamma radiation on viruses are detailed. A disinfectant research should be planned to provid the best possible basis for determining overa costs for application in various locations. I Alaska, the cost of shipping lime would be prohib tive in some inland locations, and ozone woul require electrical service. A spectrum of prove disinfection processes should be developed fro which the one most applicable to a specific wast disinfection problem can be selected. Onl through such an approach can the waste water di infection needs of Alaska and similar cold climati areas be satisfied. (See also W72-12548) (Jone Wisconsin)
W72-12566

DISTRICT OF COLUMBIA WATER POLLU TION CONTROL PLANT (EXPANSION AN UPGRADING), (DRAFT ENVIRONMENTAL IM PACT STATEMENT).
Environmental Protection Agency, Philadelphi Pa. Region III.

Available from the National Technical Inform tion Service as EIS-DC-72-4478-D, $28.25 in pap copy, $0.95 in microfiche. Report ELR-4478, Ma 8, 1972, 525 p.

Descriptors: *Sanitary engineering, *District Columbia, Sewage, Wastes, Land use, Aesthetic *Treatment facilities, Sewage treatment, Wat quality, Control, Public health.

Identifiers: *Environmental impact statements, *Water pollution control plants.

The proposal is described which would expand from 240 mgd to 809 mgd and upgrade (from secondary to tertiary treatment) the existing District of Columbia Water Pollution Control Facilities. The adverse environmental effects are air quality; potential for spillage during fuel transfer and other unloading operations; and minor long-term effects include noise generation, aesthetic intrusion, and land use changes.
W72-12630

SEWAGE SLUDGE INCINERATION.
Environmental Protection Agency, Washington, D.C.

Available from the National Technical Information Service as PB-211 323, $3.00 in paper copy, $0.95 in microfiche. Environmental Protection Agency Report No. EPA-R2-72-040, August 1972, 89 p, 2 fig, 10 tab, 5 ref, 9 append. EPA Program Element B 12043.

Descriptors: *Incineration, *Ultimate disposal, *Sludge disposal, *Waste treatment, Air pollution effects, *Sludge, Pesticide removal, Heavy metals, Polychlorinated biphenyls.
Identifiers: *Multiple hearth furnaces, *Fluidized bed incinerators, Stack emissions, Ocean disposal, Particulate removal.

A Task Force was established within the Environmental Protection Agency to evaluate sludge incineration as an acceptable alternative to sea disposal. Multiple-hearth and fluidized bed furnaces, containing scrubbing devices for particulate removal, were selected for performance evaluation. The sludge, particulate, stack gas, scrubbing liquid, and ash were sampled and analyzed for heavy metals, pesticides and oxides of nitrogen and sulfur. The results indicated that incinerators are capable of achieving low emission concentrations for the common pollutants. Particulate samples showed a measurable concentration of lead. The ash samples normally showed a higher concentration of the heavy metals when compared with the sludge samples, however, mercury was one of the exceptions and was not detectable in the ash sample and assumed lost to the stack gases. The pesticides and PCB, present in the sludge, were not detectable in either the ash or the scrubbing water, and indicated complete destruction. The study demonstrated that well designed and operated municipal sewage sludge incinerators can meet the most stringent existing particulate emission control regulation. (EPA abstract)
W72-12631

A SYSTEM FOR THE TREATMENT OF POULTRY PLANT WASTES,
University Coll., London (England).
D. G. Kilburn, and P. C. Trussell.
Water and Waste Treatment, p 618-622, March/April 1966. 4 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Water pollution control, Effluents, Water quality control, Sewage lagoons, Aeration, Biochemical oxygen demand, Flocculation, Poultry.
Identifiers: *Poultry evisceration wastes, Alum treatment.

The problem of wastewater disposal in the poultry eviscerating industry has become acute with the increased quality of effluent demand by pollution control authorities. The waste treatment system designed for Panco Poultry Ltd. is discussed as one solution to the problem. The system shows that a fairly inexpensive treatment plant consisting of unlined lagoons with a minimum of aeration equipment can provide effective results. (Svensson-Washington)
W72-12678

ALGAL GROWTH POTENTIAL TEST IMPROVES SEWAGE EFFLUENT CONTROL,
Uppsala Univ., (Sweden). Inst. of Physiological Botany.
For primary bibliographic entry see Field 05C.
W72-12728

FLOC STRENGTH AND FILTERABILITY OF PRETREATED WATER.
Ludwig Engineering and Science Research Foundation, Arcadia, Calif.
For primary bibliographic entry see Field 05F.
W72-12794

AUTOMATIC CONTROL OF AN ACTIVATED SLUDGE REACTOR.
Connecticut Univ., Storrs.

Available from the National Technical Information Service as PB-211 334, $3.00 in paper copy, $0.95 in microfiche. Final report, February 11, 1971, 23 p, 16 fig. FWQA Grant No. 17050 EVF 02/71.

Descriptors: *Activated sludge, *Automatic control, *Pilot plants, *Waste water treatment, *Control systems, Water pollution control, Treatment facilities, Effluents, Municipal wastes.

A feed forward control scheme was constructed and demonstrated on a pilot activated sludge reactor using as feed the primary effluent from a municipal treatment plant. The control scheme can be used to control both the air and recycle solids rates to the reactor to compensate for the increased carbon level in the feed stream. At normal detention times an improvement in process efficiency was observed with the control scheme. (EPA abstract)
W72-12795

FINDINGS AND RECOMMENDATIONS ON UNDERGROUND WASTE DISPOSAL.
American Water Works Association, New York. Committee on Underground Waste Disposal and Control.

Journal of the American Water Works Association, Vol 45, No 12, p 1295-1297, December, 1953. 1 ref.

Descriptors: *Water pollution, *Industrial wastes, *Underground waste disposal, Hydraulic gadient, Legal aspects, Flow, Permits, Time.
Identifiers: Flow time.

Considerations are enumerated for industrial waste disposal in underground sources. Industrial groundwater pollution is nationwide. Waste types are natural-artificial brines, phenolic compounds, heavy metal salts, cleaning fluids, picric acid, gasoline-petroleum products, pickling liquors, fruit and vegetable cannery wastes, milk wheys, and cooling water. Pollutant flow is smooth and laminar with velocities of inches or feet/day. Hydraulic gradients influence route and flow times. Industrial water requirements are growing. Groundwater disposal is attractive. Some wastes are toxic. Geologists must appraise aquifer contamination. Preventive pollution measures are needed. Legal considerations are required. Groundwater will provide future needs. Recommendations include identification of areas where groundwater disposal is not possible; permit systems for agencies to control industrial wastes; and provisions for recourse to courts, if needed, to end industrial underground waste disposal. (Nardozzi - AWWA)
W72-12796

CHARACTERIZATION OF CHEMICAL SLUDGES,
Missouri Univ., Columbia.
R. J. Calkins.

Paper presented at American Water Works Association Meeting, June 7, 1972, Chicago, Illinois. 28 p, 10 fig, 5 tab, 6 ref.

Descriptors: *Filtration, *Sludge, *Water purification, *Water softening, Water treatment, Magnesium, *Waste water treatment.
Identifiers: Settled solids, Cake solids, Specific resistance, Sludge compaction, Backwash solids.

Twenty-five water purification, softening, and combined sludges were studied in relation to settled solids concentration, filtration rate, and cake solids. Iron coagulants provided more compact sludge than aluminum coagulants; a catfloc sludge was the heaviest. Increasing magnesium content adversely affects settleability and sludge compaction for iron and aluminum coagulant sludges. Sludges from turbid water attain higher settled solids concentrations than sludges from low turbidity raw water. Specific resistance and filter loadings are determined. Combined softening-purification sludges filter more readily than do pure coagulants. Sludge with specific resistance $<10 \times 10^7$ sec 2/g filter well. Filter backwash sludges exhibited poor filtering quality. Sludge can be characterized by volumetric techniques by evaluating settled solids in a graduated cylinder. Consideration should be given to combined softening and coagulation processes. Low magnesium softening sludges rapidly reach 60% solids concentration in lagoons. (Nardozzi-AWWA)
W72-12798

THE INVESTIGATION OF PRECOAT VACUUM FILTRATION AND NATURAL FREEZING AS A MEANS TO DEWATER ALUM SLUDGE,
Smith and Mahoney, Albany, N.Y.
P. F. Mahoney, and W. J. Duensing.
Paper presented at American Water Works Association Meeting, Chicago, Illinois, June 6, 1972. 12 p, 1 fig, 2 tab.

Descriptors: *Dewatering, *Sludge treatment, *Freezing, Landfills, Costs, *Filtration, Sludge, Separation techniques, Waste disposal, *Waste water treatment.
Identifiers: *Rotary vacuum precoat filtration, Aluminum hydroxide sludge, Operating parameters, Filtrate quality, Cake solids.

A testing program is described to determine critical parameters to dewater gelatinous aluminum hydroxide sludge economically. The Environmental Protection Agency provided funds for a pilot facility to: demonstrate the technical feasibility of dewatering alum sludge by rotary vacuum precoat filtration; determine optimum operating conditions; develop plant scale cost estimates; describe the effect of natural freezing on dewatering of dilute and concentrated sludge mixtures; and determine the optimum maximum layer thickness to be frozen. The rotary vacuum precoat filtration operation is described. The variables studied included sludge solids cake, filter aids, drumspeeds, knife advance rate, filter drum submergence, filter rate, cake moisture, and filtrate quality. Sludge was pumped from the settling basins to a constantly agitated feed tank, then to a filter bowl. A 20% cake solids with filtrate quality < 5 JTU was achieved at 5 gal/ft2/hr. The cake can be used as landfill. Polymer conditioning was not beneficial at Albany. Sludge treatment costs are estimated at $6.05/mg treated water and $9.25/1000 gal of sludge. A 4 ft. sludge depth was frozen in layers. Good liquid-solids separation was obtained following thawing. (Nardozzi-AWWA)
W72-12799

WATER TREATMENT PLANT WASTE DISPOSAL - ACTION NOW,
American Water Works Association Research Foundation, New York.
H. A. Faber, and A. D. Nardozzi.

Paper presented at the Pennsylvania Section, American Water Works Association Meeting, May 22, 1972, Bushkill, Pennsylvania. 24 p, 11 fig, 3 ref.

Descriptors: *Sludge treatment, *Water treatment, Water purification, Water softening, Pumping, Dewatering, *Pennsylvania, Sludge, Wastes, Byproducts, *Waste water treatment.
Identifiers: *Unit processes, Filter washwater, Ion exchange regenerant, By-product recovery.

Sludge and filter washwater treatment considerations for wastes from water purification and softening facilities are discussed. Sludge production and handling were related to sludge types, suspended and dissolved solids removal chemistry, raw water quality, qualitative and quantitative physical-chemical constituents, treatment plant efficiency, and sludge withdrawal methods. Methods to determine solids in filter backwash and total dissolved solids in ion exchange regenerant streams are presented. Potential correlations of raw and treated water parameters to sludge production are given. Other considerations include problems in pumping and gravity flow; unit processes or process sequences under development to dewater or recover by-products; and the work of Pennsylvania water utilities to solve their problems. Two phases of work are described to establish uniform sampling, analysis, and categorization techniques for all types of water treatment plant wastes and evaluate polyelectrolytes for use as primary coagulants, coagulant aids, and sludge conditioning agents. Future research needs, recommendations, and conclusions are enumerated. (Nardozzi-AWWA)
W72-12800

CONSIDERATIONS IN LARGE WATER-PLANT DESIGN,
Detroit Metro Water Dept., Mich.
For primary bibliographic entry see Field 05F.
W72-12801

UNDERGROUND WASTE DISPOSAL,
Underground Surveys, Inc., Rockford, Ill.
W. B. Black.
Sewage and Industrial Waste, Vol 30, No 5, p 669-672, May, 1958. 1 fig.

Descriptors: *Deep wells, *Injection wells, *Industrial wastes, Injection, Testing procedures, Test wells, Costs, *Waste disposal, *Michigan, Statigraphy.
Identifiers: *Rock strata, Waste compatibility, Fracturing techniques.

The injection of industrial wastes into deep wells is discussed. Porous sandstone formations in Michigan are satisfactory for industrial waste disposal. States have allowed oil refineries, chemical plants, and pharmaceutical plants to use these strata for pumping inorganic and organic industrial wastes. Rock strata testing is urged to measure waste control, prevent contamination of fresh water, and study effect on surroundings. Testing steps include: Fact-finding study of the industrial plant waste; study of underground formation; laboratory compatibility of reaction between waste and receiving strata; drilling of test wells to determine possible reservoirs and barrier effectiveness; and capacity, injection rate, and flow character of wastes. These data give daily capacity, pump pressures needed, extent of waste travel, and safety factors. Systems economics, construction cost, daily maintenance, and depreciation cost can be estimated. Fracturing techniques give an estimated 40 million gallon/acre total storage capacity. Cost data are given. Potential underground uses are radioactive wastes, municipal sewage effluent, and fresh water storage. (Nardozzi-AWWA)
W72-12802

RECYCLING AND REUSE OF FILTER BACKWASH WATER CONTAINING ALUM SLUDGE,
Hackensack Water Co., Weehawken, N.J.
P. E. Pallo, B. J. Schwartz, and L. K. Wang.
Water and Sewage Works, Vol 119, No 5, p 123-125, May, 1972. 8 tab, 8 ref.

Descriptors: *Water reuse, *Filtration, *Recycling, Water purification, Filters, Cleaning, Coagulation, Sludge, Flocculation, *Waste water treatment.
Identifiers: *Filter washwater, Coagulant aid, Alum dosage reduction, Jar test, Flow equalization, Dense floc.

The feasibility of directly recycling filter washwater together with alum sludge to the flash mixer of a conventional water treatment plant, and the possible effects of recycle on effluent quality and sedimentation operation were investigated. Standard jar tests were run on composite samples of filter backwash. Physical and chemical parameters were determined by Standard Methods and listed. A holding basin was used to equalize the filter backwash water before the washwater with alum sludge was returned to the flash mixer. Backwash water is an effective coagulant aid up to 40% recycle in reducing color and turbidity. A pH drop caused by recycling aided alum coagulaltion. A 2% recycle reduced alum dosage requirements from 1.2 to 1.0 grains/gallon while maintaining efficiency. Recycling yielded a denser and smaller floc settling at a faster rate. Based on Imhoff cones, 95% of the sludge was precipitated in 20 minutes by recycling compared to 35 minutes without recycling. Recycling backwash avoids stream pollution and reclaims water for reuse. (Nardozzi-AWWA)
W72-12805

CRYSTAL-SEED CONDITIONING OF LIME--SOFTENING SLUDGE,
Auburn Univ., Ala. Dept. of Civil Engineering.
R. H. Wynne, Jr.
Journal of the American Water Works Association, Vol 64, No 5, p 306-309, May, 1972. 4 fig, 2 tab, 8 ref.

Descriptors: *Water treatment, Mixing, Optimization, *Filtration, *Sludge treatment, Sludge, *Waste water treatment.
Identifiers: *Filterability, *Settleability, *Crystal-seeding, Lime-softening, Sludge Volume Index, Specific resistance, Return sludge.

The filterability of sludge produced by softening laboratory-hardened water and the effect of crystal-seeding on the settleability and filterability of this sludge were investigated. The methodologies of synthesizing the hard water and performing jar tests and settleability and filterability evaluations are described. Important variables are crystal-seed dosage, mixing rate, and return-sludge recycle. Sludge filterability was measured by the specific resistance and settleability by the sludge volume index. A 200 rpm mixing rate was optimum in reducing specific resistance and a 300 rpm rate optimum in reducing the sludge volume index. A 50% return-sludge dosage improved filterability while a 25% return was best for improving settleability. Recycling was beneficial. The specific resistance of the sludge produced ranged from 4.38 x 10 10 - 41.9 x 10 10 m/kg. (Nardozzi-AWWA
W72-12806

RAISING AND WATERING A CITY,
Loyola Univ. Chicago, Ill.
L. P. Cain.
In: Technology and Culture, vol. 13, no. 3, p. 353-372, July, 1972.

Descriptors: *Sewerage, *Water supply, *Interceptor sewers, *History, *Illinois, *Lake Michigan.
Identifiers: *Chicago, *Technological history, *Early engineering.

Few people are aware of the men who pioneered the sanitation systems which were so crucial to urbanization in the U.S. Ellis Sylvester Chesbrough, a man without any formal education or engineering training, became Chief Engineer of the Chicago Board of Public Works and was responsible for the unique character of the Chicago sanitation system which made possible major urban growth in spite of unfavorable natural topography. In 1855 he prepared the first plan for a comprehenisve sewerage system to be undertaken by a major city in the U.S.; a plan which called for an intercepting sewer system emptying into the Chicago River. This plan which required raising the city's building foundations and street levels to secure grade for proper drainage took years to accomplish and cost more than 10,000,000 dollars. In 1863 Chesbrough proposed his water supply tunnel plan which involved a two mile tunnel out into Lake Michigan sixty-nine feet below lake bottom and with a slope of two feet per mile from the lake end to the shore. Chesbrough's engineering competence in combination with a sense of economic reality insured his success in meeting both the water supply and sanitation needs of Chicago. Ironically, today's problems are probably due in part to these techniques which appeared so dramatically innovative that their declining effectiveness has only recently become evident under current pollution loads. (Cowgill-OWRR)
W72-12809

PRIMARY CONSIDERATIONS IN REGIONAL WASTEWATER TREATEMENT PLANNING,
Mississippi State Univ., State College. Water Resources Research Inst.
A. Shindala.
Available from the National Technical Information Service as PB-211 465, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Mississippi Water Resources Research Institute, State College, June 1972, 37 p, 3 fig, 10 ref. OWRR A-056-MISS (1).

Descriptors: Waste water treatment, Waste water disposal, *Regional analysis, Systems analysis, *Planning, Optimization, *Management, Treatment facilities, *Water quality control, *Optimum development plans, *Cost analysis.

The concept of regionalization of waste water treatment has been suggested as an effective mean of meeting the water quality goals at a minimum cost. Although economy of scale provides the primary incentive for regionalization, other advantages may be gained. Such advantages may include flexibility in operation, more qualified personnel, and high degree of automation. The selection of an optimal regional plan requires a considerable variety and quantity of information, a great expenditure of time and money and a wide diversity of expertise. The optimal plan provides the least cost system of collection, treatment and disposal of waste water within a region. In this study, the scope of the regional planning problem is defined. Critical factors influencing the selection of the optimal plan are identified and discussed. Several optimization techniques used in selecting the least cost plan are presented. Data needs are described.
W72-12821

ROTATING DISKS WITH BIOLOGICAL GROWTHS PREPARE WASTEWATER FOR DISPOSAL OR REUSE,
Rutgers - The State Univ., New Brunswick, N.J Dept. of Environmental Sciences.
W. N. Torpey, H. Heukelekian, A. Kaplovsky, and R. Epstein.
J Water Pollut Control Fed. Vol 43, No 11, p 2181-2188. 1971. Illus.
Identifiers: Water reuse, *Waste water treatment *Biological treatment, Algae, Biochemical oxyger

demand, Disks, Waste water disposal, Nitrogen, Oxygen, Phosphorus,.

Wastewater is treated sequentially on a series of rotating disks with attached biological growths, on a series of rotating illuminated disks with attached algae growths and by activated carbon if desired. Treating primary effluent by these means resulted in the removal of 95% of the carbonaceous biochemical oxygen demand and oxidation of NH3 to NO3. Further work was done on N and P removal from the effluent by this treatment scheme; this involves promoting growth of attached filamentous algae on illuminated rotating disks. The disks are made of aluminum.--Copyright 1972, Biological Abstracts, Inc.
W72-12910

FULL SCALE CONVERSION OF ANAEROBIC DIGESTERS TO HEATED AEROBIC DIGESTERS.
Hamilton Waste Water Treatment Plant, Ohio.

Available from the National Technical Information Service as PB-211 448, $3.00 in paper copy, $0.95 in microfiche. Environmental Protection Agency Report No. EPA-R2-72-050- (August 1972), June 1972, 58 p, 5 fig, 3 tab, 4 ref, 3 append. EPA Program 17070 DIW WPRD 187-01-68.

Descriptors: *Waste water treatment, *Anaerobic digestion, *Odor, Pilot plant, Sludge treatment, *Ohio, *Aerobic treatment, *Sludge digestion, *Heat treatment.
Identifiers: *Thermophilic digestion, Nuisance odor, *Hamilton (Ohio).

Full plant scale experiments were made to determine the effect of heated aerobic digesters on digestion of waste water treatment plant sludge. Existing heated, floating cover equipped, anaerobic digesters, which had failed under excessive paper mill waste discharge, were converted to this purpose by addition of blower supplied air. The program contemplated phase experiments over a wide range of varying time, loading, air rate, and temperature conditions. Excessive odor production as temperatures increased prevented conclusion of the total program or any single phase. No practical method for control of temperature resultant from bacterial energy exerted in volatile reduction could be devised. The experiment was beneficial in determing the extent of practical application, and in establishing that thermophilic digestion temperature ranges could have produced significant volatile reduction. Determinations made also afford a measure of energy (heat) generated by aerobic bacteria in destruction of waste. Cost analysis is not available from limited scope (excepting conversion contract price), but initial installation appears unattractive. Conversion of existing facilities, however, could reflect savings. (EPA abstract)
W72-12922

THE VORTEX CHAMBER AS A GRIT REMOVAL DEVICE FOR WATER TREATMENT,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 05F.
W72-12946

NEW PROCESS CONVERTS CATTLE RUMEN TO FEEDSTUFF,
D. Natz.
Feedstuffs, Vol 43, No 28, July 10, 1971. 1 fig.

Descriptors: *Farm wastes, Cattle, Suspended solids, *Waste treatment, *Feeds.
Identifiers: Feeding trials.

A practical means of turning rumen content (paunch) of slaughtered cattle into a valuable feed ingredient is claimed by Dr. Paul A. Stahler, a Minnesota medical doctor. The patented 'Stahler Conversion Process' actually converts the paunch material into two usable feed ingredients. One is a concentrated liquid fed to hogs as a top dressing over grain. The other is a dehydrated product which is fed to cattle much like silage. Stahler's process first separates the liquids and solids by suction, then compresses the high moisture solids to extract more liquid. The liquids then go into a holding for sterilization and processing. The solids move into a revolving drum-type heating and drying unit where they are exposed to 2000 to 3000F temperatures. The solids can then be pelleted if desired. Stahler reported that the paunch, when processed according to the prescribed methods, will provide a minimum of 75% of the commonly accepted nutritive requirements of beef cattle during the finishing phase. He said that it has even more potential as a pre-finishing ration - from about 400 to 800 pounds. The cost to produce this material in 1960 was about $17.04 per ton. During feeding trials conducted by Stahler, cattle gained an average of 2.5 pounds per day on a ration of which a major part was paunch products. Stahler predicted that beef production nationally could be increased by 25% by utilizing the rumen content of animals as a feed product. (Wallin-Iowa State)
W72-12947

MANAGEMENT PRINCIPLES APPLICATION TO THE DISPOSAL OF CATTLE MANURE TO PREVENT POLLUTION,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
D. E. Proctor.
Paper presented at the Eighth Texas Industrial Water and Wastewater Conference, Lubbock, Texas, June 6, 1968. 13 p, 1 fig.

Descriptors: *Farm wastes, Dairy industry, *Waste disposal, Confinement pens, Runoff, *Washington, Aerobic treatment, Lagoons.
Identifiers: Anaerobic lagoons, *Monroe (Wash).

The Sanitary Engineering Section of the College of Engineering Research Division was asked to consider the manure problem at a dairy and milk processing plant near Monroe, Washington. Winter flooding and cost were two problems that influenced the systems set up for the 230 to 240 cows. The final system consisted of scraping and flushing the manure into a central slurry sump. From here the manure can either be pumped to the fields for disposal through a manure 'gun' or pumped to one of three storage lagoons. Each lagoon measures 115 feet by 115 feet by 18 feet and all three can hold about 430,000 cubic feet of material. (Wallin-Iowa State)
W72-12948

WASTE WATERS FROM FARMS.

Department of Scientific and Industrial Research, Notes on Water Pollution No. 17, June, 1962, 4 p, 11 ref.

Descriptors: *Farm wastes, Irrigation, *Waste disposal, Biochemical oxygen demand, Nitrogen, Biological treatment, *Waste water treatment.
Identifiers: *Soakaways.

Disposal of waste waters from farms has become a major problem as farmers have turned away from bedding down animals. Methods of disposal suggested include irrigation on land, soakaways, discharge to a sewer, and biological treatment and discharge to a stream. Silage liquor, herbicides, and pesticides all create a disposal problem. Consulting the local water quality authorities is usually the best procedure before attempting to dispose of liquors capable of water pollution. (Wallin-Iowa State)
W72-12949

DISPOSING OF ANIMAL WASTES,
Washington State Univ., Pullman.
D. O. Turner.
Crops and Soils Magazine, p 10-11, February 1971.

Descriptors: Farm wastes, Dairy industry, Lagoons, Fertilizers, Runoff, *Waste disposal, *Washington, *Waste treatment, Water reuse.
Identifiers: Urban expansion.

Handling wastes from dairy and beef operations is difficult. In Washington, a system was designed to handle the wastes from approximately 400 dairy cattle. The location was an alluvial flood plain which was subject to frequent and severe winter flooding. The wastes from the herd were scraped and flushed to a transfer pump where they could go directly to the fields or to the two winter storage lagoons, each of which have a capacity of one million gallons. Waste material from the lagoon was transported through a pipeline and applied to silage corn and ryegrass with a sprinkler. Application was limited because of a thatch from by the fiber content of the manure which allowed surface runoff. Current recommendations are that dairymen should have one acre of disposal land for every two cows. (Bundy-Iowa State)
W72-12950

WASTEWATER TREATMENT FACILITIES FOR A POLYVINYL CHLORIDE PRODUCTION PLANT.
Goodrich (B. F.) Chemical Co., Cleveland, Ohio. Environmental Control Dept.

Copy available from GPO Sup Doc EP 2.10:12020 DJI 06/71, $1.00; microfiche from NTIS as PB-211 464, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, June 1971, 73 p, 9 fig, 24 tab, 12 ref. EPA Program 12020 DJI 06/71.

Descriptors: *Industrial wastes, *Chemical wastes, *Activated sludge, *Treatment facilities, *Waste water treatment, Equalization, Reservoirs, Flocculation, Sedimentation, Nutrient requirements, Sludge treatment, Centrifugation, Automatic control laboratory tests, Pilot plants, *Water reuse.
Identifiers: *Polyvinyl chloride, Process monitoring, Mechanical aeration, Sludge thickening.

B. F. Goodrich Chemical Company has completed construction and has begun operation of a new polyvinyl chloride (PVC) production plant that includes emulsion, suspension, and bulk polymerization processes. The wastewater treatment system for this plant was designed to meet the stringent discharge requirements of both the State of New Jersey and the Delaware River Basin Commission. The wastewater treatment system consists of a primary-secondary completed mixed activated sludge process including equalization, flocculation, clarification, mechanical aeration, nutrient addition, sludge thickening and centrifugation, and automatic process monitoring. Although the company operates several PVC production plants in the United States, none of these plants could be considered to be a duplicate of the proposed production plant. Therefore, it was necessary to simulate the anticipated production plant wastes by selective sampling of the laboratory and pilot plant studies and a complete and detailed description of the full-scale wastewater treatment system was constructed. Actual operating data of the system was included and supplemented by discussion of individual unit operations and unit process performance. Evaluation of a full-scale wastewater recycle and reuse system was included. (Galwardi-Texas)
W72-12958

APPLICATION OF ROTATING DISC PROCESS TO MUNICIPAL WASTEWATER TREATMENT,
Autotrol Corp., Milwaukee, Wis. Bio-Systems Div.

R. L. Antonie, and F. J. Koehler.
Copy available from GPO Sup Doc EP 2.10:17050 DAM 11/71, $0.75; microfiche from NTIS as PB-211 463, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, November 1971, 74 p, 29 fig, 7 tab, 12 ref. EPA Program 17050 DAM 11/71.

Descriptors: *Waste water treatment, *Biological treatment, *Municipal wastes, Biochemical oxygen demand, Performance, Nitrification, Ammonia, Sedimentation, Temperature, *Wisconsin, Suspended solids.
Identifiers: *Rotating disc process, Rotating biological contactor, Sludge recycle, *Pewaukee (Wis).

A prototype package plant incorporating the rotating disc wastewater treatment process was tested on municipal wastewater at the Village of Pewaukee, Wisconsin, to evaluate its treatment capabilities and establish guidelines for operation and testing of a full-scale rotating disc demonstration plant soon to be put into operation at Pewaukee. The package plant included a rotating bucket feed mechanism, ninety-one 1.75 meter diameter discs divided into two stages, and a secondary clarifier with a sludge-removal mechanism. Variables tested included hydraulic loading, rotational disc speed, sludge recycle, and wastewater treatment as it varied with climatic conditions. At a hydraulic loading of 1.5 gpd/ft2 of disc surface, the package plant achieved 87% removal of BOD and 80% removal of suspended solids to yield an effluent of 20 mg/l BOD and suspended solids when treating effluent from the existing primary clarifier. At the same loading, 85% removal of ammonia nitrogen was obtained to yield an effluent of 3.5 mg/l. (Galwardi-Texas)
W72-12959

INVESTIGATION OF RESPONSE SURFACES OF THE MICROSCREEN PROCESS,
Engineering-Science, Inc., Cincinnati, Ohio.
T. G. Shea, and R. M. Males.
Copy available from GPO Sup Doc EP 2.10:17090 EEM 12/71, $1.25; microfiche from NTIS as PB-211 451, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971, 142 p, 29 fig, 30 tab, 6 ref, 4 append. EPA Program 17090 EEM 12/71. Contract 14-12-819.

Descriptors: *Tertiary treatment, *Filters, *Pilot plants, *Computer models, Computer programs, Design data, Activated sludge, Trickling filters, Oxidation lagoons, Effluents, Performance, *Waste water treatment, *Particle size.
Identifiers: *Microscreens, Microstrainers, Screen sizes, Screen types, Particle size distribution, Backwash system.

Field, laboratory, theoretical, and state-of-the-art studies were conducted with regard to utilization of microscreens for tertiary treatment applications. Field studies were conducted with two pilot microscreen units, using a variety of screen sizes and types, for activated sludge, trickling filter, and oxidation pond effluents. Particle size distribution of the effluents (microscreen influents) were found to be the key characterizing parameter in determination of treatment effectiveness. Overall effectiveness of solids removal was low, and was ascribed to deficiencies in microscreen design practice for the transfer of screened solids from the screen to the backwash system and out of the microscreen unit. A computer model of the process was developed in a format compatible with the EPA Executive Program for Optimization of Treatment Systems. (Galwardi-Texas)
W72-12960

PHYSICAL-CHEMICAL TREATMENT OF MUNICIPAL WASTEWATER,
Environmental Protection Agency, Washington, D.C.
D. F. Bishop, T. P. O'Farrell, and J. B. Stamberg.
Water Pollution Control Federation Journal, Vol 44, No 3, March 1972, p 361-371, 3 fig, 8 tab, 22 ref.

Descriptors: *Lime, *Chemical precipitation, *Activated carbon adsorption, Filtration, Ion exchange, Municipal wastes, *Waste water treatment, Efficiencies, Nitrogen, Organic matter, Phosphorus, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Estimated costs, Pilot plants, Tertiary treatment.
Identifiers: Total organic carbon, *Combined treatment.

Physical-chemical treatment consisting of two-stage lime precipitation with intermediate recarbonation, filtration, pH control, selective ion exchange, and carbon adsorption removed approximately 95% of the TOC, BOD, and COD, 97% of suspended solids, 98% of total phosphorus, and 78% of total nitrogen from District of Columbia raw wastewater in pilot plant studies recently completed. Residuals averaged 6 mg/l TOC, 5 mg/l BOD, 13 mg/l COD, 5 mg/l suspended solids, 0.15 mg/l phosphorus and 4.6 mg/l nitrogen. Lime precipitation removed about 80% of the organics, 91% of the suspended solids, 97% of phosphorus, and 31% of the nitrogen. Ion exchange and adsorption were helpful in removing ammonia nitrogen and organics, respectively. However, filtration increased removals only slightly. The estimated water costs for physical-chemical treatment with solids disposal in a 300 mgd plant was $0.32/1000 gallons. (Galwardi-Texas)
W72-12961

SEWAGE EFFLUENT TREATMENT FOR WATER RECOVERY,
J. G. Slack.
Effluent and Water Treatment Journal, Vol 9, No 5, May 1969, p 257-261, 8 tab, 5 ref.

Descriptors: *Reclaimed water, *Sewage effluent, *Organic matter, *Phosphates, *Chemical precipitation, Nitrates, *Activated carbon, Chemical oxygen demand, Total costs, *Sludge treatment, Vacuum drying, *Waste water treatment.
Identifiers: Alum, Powdered activated carbon, *United Kingdom.

The treatment of sewage effluent to a standard comparable to that of the River Chelmer water at summer flows, in terms of dissolved organic matter and phosphate is described. The treated effluent would be used to augment the flow of water in the River Chelmer during summer months, when the flow can be as low as 5 mgd. A fractional increase of sulfate anc chloride levels in the river water would result. However, the volume of effluent discharged would need to be controlled in relation to river flow to ensure that the nitrate content did not exceed a predetermined level. Reduction in phosphate concentrations from 17.25 ppm as PO4 to less than 2 ppm PO4 would be required along with the reduction of COD to less than 15 ppm. These reductions were accomplished by coagulation with 100 to 150 ppm of alum in the presence of 250 ppm of activated carbon powder. Alum coagulation was improved by the presence of the carbon and there was no loss of the adsorptive capacity of the carbon in the presence of the aluminum hydroxide. The presence of carbon did not interfere with phosphate precipitation by alum and there was no residual aluminum in the recovered water. The sludge produced was readily dewatered by vacuum filtration. Total costs were estimated at 25 d per 1000 gallons. (Galwardi-Texas)
W72-12962

WATER IN AGRICULTURE - ITS USE AND REUSE,
E. G. Coker.
Effluent and Water Treatment Journal, Vol 9, No 10, October 1969, p 553-557, 1 tab, 27 ref.

Descriptors: *Water reuse, *Irrigation water, *Sewage effluent, Agriculture, Sodium, Heavy metals, Hardness (Water), Nutrients, Livestock, Liquid wastes, Fertilizers, Sludge digestion, *Sludge disposal, Waste disposal.
Identifiers: Liquid manure, Liquid digested sludge, *United Kingdom.

The present irrigation practices and the limit of irrigation development in the United Kingdom were discussed. It was estimated that 160,000 acres were irrigated and that up to 1.5 million acres could eventually be irrigated. The use of sewage effluents in agriculture was reviewed. The mineral contamination of the water is the most important factor which limits the reuse value of sewage effluents. The safe concentration of sodium in sewage effluents used for crop irrigation depends on the total hardness of the water for if sodium forms more than 10-12% of the attached ions, the soil becomes difficult to work. Results from questionnaires showing average effluent analyses of nutrients, hardness and heavy metals were arranged in tabular form. The amount of water used by farm animals was estimated at 200 mgd. The production of liquid manures has increased greatly and the use of these manures to replace conventional soluble inorganic fertilizers was discussed. Also, the use of liquid digested sludge as a fertilizer was compared to the use of air-dried sludge. (Galwardi-Texas)
W72-12964

FREEZING AND THAWING AS A TECHNIQUE FOR IMPROVING THE DEWATERABILITY OF AQUEOUS SUSPENSIONS,
Water Pollution Research Lab., Stevenage (England).
R. C. Baskerville.
Filtration and Separation, March/April 1971, (Water Pollution Research Laboratory Reprint No. 616), 4 p, 10 fig, 2 tab, 5 ref.

Descriptors: *Sludge treatment, *Dewatering, *Freeze-thaw tests, *Filtration, Resistivity, Laboratory tests, Shear, Dissolved solids, Chemical properties, *Waste water treatment.
Identifiers: Organic sludges, Inorganic sludges, *United Kingdom.

Freezing and thawing as a technique for conditioning sludge prior to dewatering has been practiced in the United Kingdom to a limited degree. The effectiveness of this process has been evaluated in the laboratory for a range of sludge types by measuring the improvement in filterability and resistance of the conditioned sludge to shear forces. The process is not very suitable for conditioning organic sludges as the sludge flocs are very fragile unless an inorganic conditioner is also used. For inorganic sludges (the hydroxides or oxides of aluminum, iron and titanium) this technique is admirable, provided the dissolved solids content of the liquor is low. There is some indication that the effectiveness of this technique may also be dependent upon the chemical composition of the suspension. (Goessling-Texas)
W72-12965

USE OF ALGAL ASSAYS IN STUDYING EUTROPHICATION PROBLEMS,
National Environmental Research Center, Corvallis, Oreg. National Eutrophication Research Program.
For primary bibliographic entry see Field 05C.
W72-12966

CHLORINATION - A HISTORICAL SURVEY,
For primary bibliographic entry see Field 05F.
W72-12967

INACTIVATION OF VIRUSES,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
For primary bibliographic entry see Field 05F.
W72-12968

CANNERY WASTE DISPOSAL ON LAND,
Guelph Univ. (Ontario). Dept. of Soil Science.
R. T. Heywood, T. Stevens, and L. R. Webber.
Canadian Journal of Soil Science, Vol 49, p 211-218, 1969, 3 fig, 4 tab, 13 ref.

Descriptors: *Industrial wastes, *Canneries, *Spraying, *Irrigation, Efficiency, *Chemical oxygen demand, Organic loading, Loam, Silts, Soil moisture, Moisture tension, Effluents, Performance, Laboratory tests, *Waste disposal, *Waste water treatment.
Identifiers: *Corn wastes, Canada, Field tests.

Field and laboratory trials were used in attempts to relate soil moisture tension and the efficiency of a silt loam soil to oxidize the organic material in cannery corn waste. The organic loading in the waste was expressed as chemical oxygen demand. With a daily loading at the rate of 360 kg COD/ha, the effluent showed an 87% loss in COD compared with an 80% reduction at a rate of 490 kg COD/ha. However, evidence indicated that the backfill over the field tiles had not settled adequately and the waste was not retained long enough by the soil to facilitate oxidation. With laboratory trials using the miscible displacement technique, 97% of the COD was removed at soil moisture tensions of 45 and 100 cm of water. (Galwardi-Texas)
W72-12969

LOW COST METHODS OF WASTEWATER TREATMENT,
Water Science Labs., Melbourne (Australia).
C. D. Parker.
Preprint, presented at 6th International Water Pollution Research Conference, Session 3, Hall B, Paper No. 5, June 20, 1972, 8 p, 1 tab, 17 ref.

Descriptors: *Waste water treatment, *Irrigation, Lagoons, *Ditches, *Oxidation lagoons, Municipal wastes, Industrial wastes, Design criteria, Performances, Coliforms, Public health, Costs.
Identifiers: *Pasveer oxidation ditch, Anaerobic lagoons, Facultative lagoons, Aerobic lagoons, Maturation ponds, *Australia.

Three low cost methods of wastewater treatment, irrigation, lagoons, and oxidation ditches were discussed. The largest existing irrigation scheme for the treatment and disposal of sewage, located at Werribee in Victoria, Australia, consists of 7,000 acres which is used to purify the sewage from the City of Melbourne which has a population of 2.3 million. An analysis of drainage water compared with the irrigated raw sewage was presented in tabular form. Design criteria and performance of various types of lagoons, anaerobic, facultative and aerobic were presented. In order to achieve reduction in the faecal coliform count, a retention time of 7-10 days was suggested for maturation ponds. The Pasveer oxidation ditch was an effective low-cost means of applying the activated sludge process where moderate areas of land are available and structural appearance is not important. Most of these low-cost treatments by proper consideration of microbiological nutrition and physiology can be adapted to the treatment of a wide variety of organic industrial wastewater. (Galwardi-Texas)
W72-12971

EFFLUENT PRETREATMENT FOR COASTAL DISCHARGE,
H. W. Askew.
Effluent and Water Treatment Journal, Vol 10, No. 4, April 1970, p 193-202, 4 fig, 13 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Trickling filters, Settling basins, Estuaries, Estimated costs, Plastics, Flow rates, Fluctuations, Population, Organic loadings, Biochemical oxygen demand, Suspended solids, *Waste disposal.
Identifiers: *Effluent pretreatment, *Coastal discharge, Filter media, Flocor, *United Kingdom.

Comparatively little attention has been paid to estuarial and coastal pollution, despite the fact that 10% of all domestic sewage, some 250 mgd has been discharged untreated to such waters of the United Kingdom. The pollution of beaches and inshore waters by sewage solids has been most obvious in the popular holiday resorts, where sewage disposal systems, often barely adequate for the resident population, have become severely strained. Two wastewater treatment facilities utilizing high-rate biofiltration schemes were described. Biological filters using a plastic media, Flocor, have been shown to be capable of handling load variations originating from seasonal population fluctuations. Design loadings were 6 to 7 lb BOD/y3/day and BOD and suspended solids limitations of 80 mg/1 have been met. Estimated costs for a design population of 300,000 at a flow of 50 gphpd using biofilters and sedimentation would be some 550,000 pounds. (Galwardi-Texas)
W72-12972

PLANT CUTS WATER USE, EASES POLLUTION.

Environmental Science and Technology, Vol 6, No. 7, July 1972, p 594-595.

Descriptors: *Pollution abatement, *Industrial wastes, *Water reuse, *Recirculated water, Settling basins, Sedimentation, Hydrogen ion concentration, Neutralization, Aeration, Sulfides, *Missouri, *Waste water treatment, *Tannery wastes.
Identifiers: Tanning industry, *St. Joseph (Mo).

The Blueside Co. at St. Joseph, Missouri, the newest plant in the tanning industry is designed to be pollution-free and is equipped with the best available pollution control technology. Both unhairing and tanning processes are performed at the plant. The new plant uses only 1.0-1.5 gallons of water per pound of hide compared to some older tanneries which may use 40-50 gallons of water per pound of hide. The wastewater treatment system consists of a 60 ft. diameter holding tank from which solids are removed from both the top and bottom. The effluent is neutralized from a pH of 9.0 down to a pH of 5.5 and aerated to remove sulfides. The sulfide-laden airstream is further treated with caustic to recover the sulfide as sodium sulfide for reuse in the unhairing process. In addition all wastewater streams are available for individual recycling. (Galwardi-Texas)
W72-12973

TREATMENT OF AGRICULTURAL WASTES,
E. R. E. Briscoe.
Effluent and Water Treatment Journal, Vol 9, No. 8, p 439-446, August 1969, 3 tab, 10 ref.

Descriptors: *Waste water treatment, Agriculture, *Livestock, *Crop production, *Oxidation, Laggoons, Ditches, Irrigation, Biochemical oxygen demand, Efficiencies, Hydrogen ion concentration, Suspended solids.
Oxidation ditches, Vegetable washing, United Kingdom, Spray irrigation.

Various methods for the treatment of agricultural wastes were reviewed. The agricultural industry was divided into two main sections, livestock, and crop production, and the approximate proportions of main agricultural products expressed as a percentage of the total industry were presented in tabular form. Results of analysis of samples from an oxidation ditch followed by liquors for treating livestock wastes were also arranged in tabular form. Results showed over 90% removal of both BOD and suspended solids. A table which showed approximate vlaues of biochemical oxygen demand and suspended solids expressed in lb/ton of processed product, and the pH of wastes from vegetable washing was also presented. The use of irrigation in connection with slurry disposal has had limited application in the United Kingdom and requires up to as much as 6 acres per 1,000 gallons/day if the soil structure is not to be permanently damaged. (Galwardi-Texas)
W72-12974

RAYCYCLE CUTS SULFITE PULP POLLUTION.

Environmental Science and Technology, Vol 6, No. 7, July 1972, p 596-597, 1 fig.

Descriptors: *Industrial wastes, Pulp and paper industry, *Pulp wastes, *Pollution abatement, *Waste water treatment, Incineration, Biochemical oxygen demand, Chemical oxygen demand, Foaming, Efficiencies, Total costs, Estimated costs, Laboratory tests, *Water reuse.
Identifiers: *Chemical recovery, Soda-base cycle, Total organic carbon.

ITT Rayonier has developed a process that will reduce the BOD load from 1100 lb/ton to 120 lb/ton of air dried product at its Fernandina Beach, Florida sulfite pulp mill. The process change involved switching from an ammonia-based cooking cycle to a soda-based cycle. The washing step between digestion and the hot caustic bleaching stage was eliminated at a savings of 3-5 mgd depending on the type of pulp. Thus wastes from both the digestion stage and bleaching stage can be combined, concentrated and incinerated with chemical recovery of the ash. The process has been successfully tested under laboratory conditions. Reductions of 95% were reported for TOC and COD and 90% for color. Also, foaming from mill effluent was eliminated as the foam causing materials will be burned in the recovery furnace. Total cost of the process was estimated at $38 million. (Galwardi-Texas)
W72-12977

SEWAGE DISPOSAL IN REFORMED LOCAL GOVERNMENT,
For primary bibliographic entry see Field 05G.
W72-12978

BIOFILTRATION TECHNOLOGY - PART I.
M. W. Askew.
Effluent and Water Treatment Journal, Vol 9, No. 10, p 547-552, October, 1969, 2 fig, 1 tab, 13 ref.

Descriptors: *Trickling filters, *Biological treatment, *Plastics, Organic loadings, Flow rates, Biochemical oxygen demand, Design criteria, Dewatering, Pathogenic bacteria, Capital costs, Efficiencies, *Waste water treatment.
Identifiers: *Biofiltration, Plastic packings, Flocor, United Kingdom, Settling characteristics.

The role of plastic as packings in the high-rate biofiltration process in the United Kingdom was discussed. The minimum rate of irrigation for uniform wetting of the available surfaces of Flocor was stated to be 0.5 gallons/ft2 cross-section/minute. The maximum operating weight of a Flocor system was taken for design purposes as being 15 lb/ft3 compared with the dry weight of the packing of 2.2 lb/ft3. The system has been shown to be independent of bed depth at given loads of BOD/unit volume. Flocor systems have been found to show a BOD removal/sludge conversion of the order of 20 to 30% for both soluble and insoluble substrates. BOD loads of 5 lb/yd3/day for high-rate biofilters compared with 0.15 - 0.2 lb/yd3/day for conventional percolating filters

have greatly reduced spacial requirements. High-rate biofiltration systems were reported as having capital costs of the order of 2 pounds per head of population served compared to 10-33 pounds per head for conventional plants. Results showing reductions of pathogen indicator organisms were presented in tabular form. (See also W72-12981) (Galwardi-Texas)
W72-12980

BIOFILTRATION TECHNOLOGY-CONCLUSION,
M. W. Askew.
Effluent and Water Treatment Journal, Vol 9, No. 11, p 611-617, 2 fig, 1 tab, 1 ref, November 1969.

Descriptors: *Biological treatment, *Trickling filters, *Industrial wastes, *Plastics, Performance, Biochemical oxygen demand, Efficiencies, Milk, Textiles, Settling basins, Pretreatment, Hydrogen ion concentration, Nutrients, Cost comparisons, *Waste water treatment.
Identifiers: *Biofiltration, Plastic packings, Flocor, *United Kingdom, Distillery wastes, Fruit and vegetable processing wastes.

Several industrial applications of high-rate biofiltration were presented. More than 60 industrial high-rate biofilter plants of various sizes have been constructed in the United Kingdom during the past 5 years. The wide diversity of application of the system was exemplified by the duties of those plants, which ranged from treatment of very strong wastes to 850 mg/1 BOD prior to discharge to municipal sewers, to the recovery of water of sufficiently high quality for re-use in the food industry. The performances of some existing plants treating distillery, fruit and vegetable, milk processing and textile industry wastes were presented. Pretreatment including solids sedimentation, pH and nutrient balance adjustment may be required depending on the industrial application. Greater than 90% removal of BOD was reported in most cases. A cost comparison, showing a savings of $143,000, between high-rate biofiltration and conventional percolating filtration was presented in tabular form. (See also W72-12980) (Galwardi-Texas)
W72-12981

USE AND RE-USE OF WATER AND EFFLUENTS IN THE MOTOR INDUSTRY-PART ONE,
V. H. Lewin.
Effluent and Water Treatment Journal, Vol 9, No. 12, p 655-659, December 1969, 2 fig, 1 tab, 2 ref.

Descriptors: *Water conservation, *Water reuse, *Effluents, *Industrial wastes, Cooling water, Domestic water, Performance, Water costs, *Waste water treatment.
Identifiers: Automobile industry, England, Process water.

Water usage, re-use and effluents from motor assembly and the metal finishing processes in the motor industry were discussed. Water usage and associated trade effluents in relation to car production were illustrated. Several examples of water conservation practices for cooling waters, domestic water and process waters were presented. These included introduction of closed-circuit cooling systems, private cooling towers, or even heat exchange with refrigeration. Also, water used for filling radiators and tank testing were diverted as make-up water for such systems instead of being wasted. Savings in domestic water consumption can be realized by retiming of automatic flushing systems, introduction of spring-loaded taps and the introduction of Consta-flow restrictors on main feeds to regulate the high pressures which accrue when other processes are shut down. Reductions of 40-80% of process waters were reported by elimination of flows not required during non-production hours and the introduction of counter-current rinsing. (See also W72-12983) (Galwardi-Texas)
W72-12982

USE AND RE-USE OF WATER AND EFFLUENTS IN THE MOTOR INDUSTRY-CONCLUSION,
V. H. Lewin.
Effluent and Water Treatment Journal, Vol 10, No. 1, p 39-45, January 1970, 3 fig, 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Water resue, *Ion-exchange, *Industrial wastes, Solvents, Water conservation, Treatment facilities, Operating costs.
Identifiers: Automobile industry, Electroplating processes, Painting processes, Cutting oils, Boiler blowdown, Chlorinated hydrocarbon solvents, Oxford, England.

Treatment methods for wastewater effleunts associated with the motor industry were discussed. An example of treatment of wastewater from electroplating processes by ion-exchange was presented. The system included a cation exchange resin bed followed by a mixed resin bed with the treated water being recirculated. Water consumption was reduced from 125,000 gallons per day to 10,000 gallons per day. Typical analyses of the effluent from the treatment plant were presented in tabular form. Two flow diagrams illustrating water consumption and effleunt production associated with painting were also presented. Other effleunts discussed included cutting oils which form water-based emulsions, boiler blow down, and chlorinated hydrocarbon solvents. Operating costs of ion-exchange systems were reported at 11s 2d per 1000 gallons while sewage treatment costs at Oxford were reported to be 1s 9d per 1000 gallons with charges being based on a modified Mogden type formula. (See also W72-12982) (Galwardi-Texas)
W72-12983

SEWAGE FROM THE TAP-PART I,
Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
J. A. Pickford.
Effluent and Water Treatment Journal, Vol 9, No. 9, p 501-505, September 1969.

Descriptors: *Water resue, *Sewage treatment, *Effluents, *Costs, Industrial water, Agriculture, Nitrates, Groundwater recharge, Water costs, Water consumption, *Waste water treatment.
Identifiers: Great Britain.

Papers and related discussions presented at the second Public Health Conference at Loughborough University of Technology were reviewed and summarized. The main topic of the conference was tertiary sewage treatment and water reuse. Related topics included: discharges and the receiving river, nitrate concentrations, quantity of water resue, water reuse in industry and agriculture, groundwater recharge and water reuse costs. Over 25% of the population of Britain derives its drinking water from raw waters to which sewage effluents have been discharged. The cost of water for industrial reuse was stated at 9d per thousand gallons and even if treatment costing 6d per 1000 gallons was required the total cost would be about one third the cost of water from public water supply systems. (See also W72-12985) (Galwardi-Texas)
W72-12984

SEWAGE FROM THE TAP-CONCLUSION,
Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
J. A. Pickford.
Effluent and Water Treatment Journal, Vol 9, No. 10, p 559-562, October, 1969, 1 fig, 7 ref.

Descriptors: *Tertiary treatment, *Sedimentation, *Biochemical oxygen demand, Lagoons, *Filtration, Efficiencies, Performance, Flow rates, Bacteria, Effluents, Estimated costs, *Waste water treatment, Suspended solids.
Identifiers: *Great Britain, Microstrainers, Sand filtration, Loading rates, Pebble-bed clarifiers.

Papers and related discussions presented at the second Public Health Conference at Loughborough University of Technology were reviewed and summarized. Tertiary treatment processes in Britain have been designed for the removal of suspended solids and their associated BOD. Unit processes utilized have been settlement in lagoons, static filtration as in sand filters and mechanical filtration as in microstrainers. Grass plots in which a combination of settlement and filtration takes place have also been used. Lagoons with a retention time of 17 days gave a final discharge containing only 3 mg/1 suspended solids. Grass plots when loaded at 1 m3/m2/day removed 76% of the suspended solids and 55% of the BOD. Rapid sand filters have yielded 70-80% removal of suspended solids at flow rates ranging between 118 and 235 m3/m2/day. Two new types of rapid sand filters were discussed, the Immedium and the Simater filters. The Immedium has dealt with flows up to 470 m3/m2/day reducing a suspended solids concentration of 17 mg/1 to 9 mg/1. At a rate of 300 m3/m2/ day the 17 mg/1 concentration was reduced to 5 mg/1. Reduction of 50-60% of the suspended solids was accomplished by a pebble-bed clarifier using 5-10 mm medium and a flow rate of 24 m3/m2/day. Bacterial reductions from secondary effluents in the above methods were also reported. Estimated costs for tertiary treatment ranged from 6 to 20% of conventional primary and secondary treatment. (See also W72-12984) (Galwardi-Texas)
W72-12985

PERMASEP PERMEATORS IN INDUSTRIAL WASTE STREAM SEPARATIONS,
Du Pont de Nemours (E.I.) and Co., Wilmington Del.
W. P. Cooke.
Effluent and Water Treatment Journal, Vol 10 No. 2, p 89-96, February 1970, 6 fig, 4 tab.

Descriptors: *Reverse osmosis, *Industrial wastes, *Pulp wastes, Design criteria, Design data, Pressure, Temperature, Selectivity, Pulp and paper industry, Performance, Efficiencies, Hydrogen ion concentration, *Waste water treatment.
Identifiers: Hollow fiber membrane, Nylon, Undissolved solids, Sugar molasses, Whey processing.

The use and advantages of hollow fibers as semipermeable membranes were reviewed. A specially developed nylon by DuPont was the first hollow fiber ready for permeator commercialization in the field of aqueous separations because of its exceptional strength and its durability in saline solutions. Permeator design and specifications were outlined. Performance parameters such as pressure, temperature, undissolved solids, conversion and pH were discussed. A practical upper limit of 400 at 600 psig feed pressure, was dictated by the epoxy tube sheet. By variations in their manufacturing process, DuPont was able to produce hollow fibers with a range of permeation characteristics. However, increased capacity was gained only at the expense of selectivity. Several industrial waste applications including whey processing, pulp mill waste stream processing and sugar refinery molasses processing were illustrated. Test results weee arranged in tabular form. It was noted that the treatment of concentrated salts having high osmotic pressure was beyond the capability of the hollow nylon fibers. (Galwardi-Texas)
W72-12986

THE BIO-FOULING MENACE IN COOLING SYSTEMS,
A. Mennie, and E. Tehle.
Effluent and Water Treatment Journal, Vol 9, No. 9, p 493-499, September 1969, 4 fig.

Descriptors: *Cooling water, *Biomass, *Slime, Algae, Fungi, Bacteria, Bactericides, Chlorine, Costs, *Waste water treatment.
Identifiers: Biocides, Production loss, Quaternary ammonium compounds, Phenolic compounds, Organo-metallic compounds, Amines, England.

The development of biological growths in industrial cooling systems has produced difficult and serious problems, and steps must be taken to control or eliminate biofouling. Excessive growth and development of algae, fungi and bacteria have resulted in biological fouling in cooling water systems. Two case-histories illustrating how biolological fouling can accumulate to shut down essential production processes were presented. One concerning a recirculating cooling system in a pharmaceutical plant where the cost of each shutdown was about 1,000 pounds per hour, and the annual loss of production about 12 hours. Treatment included the use of a synthetic antifoulant which broke up the growth debris, dispersing it into a harmless and easily removed cloud of fine particles. The second case involved a recirculating cooling system of a chemical by-products complex of a steelworks coke producing plant. The cost of a complete clean-up to restore full operating efficiencies was assessed at 3,000 pounds, of which half was loss of production. Types of biocides used include quarternary ammonium compounds, phenolic compounds, organo-metallic compounds and amines. One common method of inhibiting algal and fungal growth in large cooling systems makes effective use of chlorine as a oxidizing biocide. However, the use of chlorine and related control equipment was shown to be expensive whereas non-oxidizing biocides can be introduced to the largest of systems at much lower cost by direct addition to the cooling tower sump. (Galwardi-Texas)
W72-12987

REMOVAL OF CHROMATES FROM PICKLING LIQUORS BY ADSORPTION OF HYDROUS FERRIC OXIDE,
Louvain Univ. (Belgium). Water Pollution Div.
D. A. Wilms, F. F. Notebaert, and A. A. Van Haute.
Preprint, presented at 6th International Water Pollution Research Conference, Session 2, Hall B, Paper No. 4, June 19, 1972, 9 p, 6 fig, 5 ref.

Descriptors: *Adsorption, *Chemical precipitation, *Chromium, *Iron oxides, Optimization, Hydrogen ion concentration, Performance, Calcium hydroxide, Sedimentation, Flocculation, Neutralization, *Waste water treatment, Sludge.
Identifiers: *Pickling liquors, Praestol 2700, Sludge production.

Experiments on the adsorption of Cr+6 on flocs of Fe (OH)3 showed that adsorption was optimum at a pH=6, at a high Fe+3/Cr+6 ratio, but not higher than 20 and at the highest possible Cr+6 concentration. Depending on the pH and the iron content of the acid effluents, mixing with the alkaline chromate wastewaters would be required until the desired pH=6 was reached, or until the desired Fe+3/Cr+6 ratio was reached, which may require the addition of Ca (OH)2. Optimum separation of the precipitate was found to occur with the use of 0.6 ppm of Praestol 2700 flocculant. The remaining Cr+6 in the supernatant liquid was reduced at pH=6 with an adequate amount of FeSO4 and the pH raised to 8 with Ca (OH)2 in order to precipitate the Cr+3 completely. This secondary sludge of Fe (OH)3 +Cr (OH)3 was separated by decantation and could be used for further adsorption of Cr+6 in the first stage of treatment. Such a procedure has the advantage that for the removal of chromates a minute quantity of neutralizing agent was required and also that there was a minimum production of waste sludge. (Galwardi-Texas)
W72-12988

DEVELOPMENT OF MINIMUM FLUSH TOILETS/FLUID BED INCINERATION SYSTEMS FOR BARE BASE LATRINE FACILITY,
Whirlpool Corp., St. Joseph, Mich. Life Support Dept.
W. J. Martin.
Available from the National Technical Information Service as AD-739 231, $3.00 in paper copy, $0.95 in microfiche. Technical Report PREC-TR-71-2, October 1971, 53 p, 17 fig, 1 tab.

Descriptors: *Sewage disposal, *Sewage treatment, Water utilization, *Incineration, *Waste water treatment.
Identifiers: *Fluid bed incineration, Water collection, Minimum flush toilets, *Toilets.

The work and results are described in developing a minimum flush toilet and fluid bed incineration system usable with a Bare Base Program Latrine Facility. The configuration evolution of major components is included. Design drawings for a prototype incinerator device suitably sized for the Latrine Facility application and the proposal of a system to integrate this device with the Latrine Facility resulted from the investigation. The minimum flush toilet was shown to operate with only one to two quarts of fresh water per use without requiring chemical additives in the holding tank. (Galwardi-Texas)
W72-12989

PRELIMINARY INVESTIGATIONS ON THE POSSIBILITY OF APPLICATION OF MINING AND INDUSTRIAL WASTE MATERIALS TO FERTILIZATION OF SANDY SOILS: I. INFLUENCE OF WASTE MATERIALS ON THE INITIAL GROWTH OF PLANTS UNDER LABORATORY CON DITIONS, (IN POLISH),
Wyzsza Szkola Rolnicza, Lublin (Poland).
For primary bibliographic entry see Field 05C.
W72-13029

5E. Ultimate Disposal of Wastes

LIQUID-WASTE DISPOSAL AT THE LINFIELD DISPOSAL SITE, DALLAS, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05B.
W72-12414

SEWAGE SLUDGE INCINERATION.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-12631

COMPATIBILITY OF SUBSURFACE RESERVOIRS WITH INJECTED LIQUID WASTES,
Alabama Univ., University. Natural Resources Center.
For primary bibliographic entry see Field 05B.
W72-12656

FINDINGS AND RECOMMENDATIONS ON UNDERGROUND WASTE DISPOSAL.
American Water Works Association, New York. Committee on Underground Waste Disposal and Control.
For primary bibliographic entry see Field 05D.
W72-12796

GROUND-WATER POLLUTION IN MICHIGAN,
Michigan State Geological Survey, Lansing. Dept. of Conservation.
For primary bibliographic entry see Field 05B.
W72-12797

THE INVESTIGATION OF PRECOAT VACUUM FILTRATION AND NATURAL FREEZING AS A MEANS TO DEWATER ALUM SLUDGE,
Smith and Mahoney, Albany, N.Y.
For primary bibliographic entry see Field 05D.
W72-12799

UNDERGROUND WASTE DISPOSAL,
Underground Surveys, Inc., Rockford, Ill.
For primary bibliographic entry see Field 05D.
W72-12802

BASIC DATA FOR CHEMICAL WASTE DISPOSAL,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Engineering Dept.
For primary bibliographic entry see Field 05G.
W72-12803

SUBSURFACE HYDROLOGY AT WASTE DISPOSAL SITES,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 05B.
W72-12864

THE DISPOSAL OF INTRACTABLE INDUSTRIAL AND AGRICULTURAL WASTES (CONCLUSION).

Effluent and Water Treatment Journal, Vol 10, No. 3, March 1970, p 147-149.

Descriptors: *Industrial wastes, *Liquid wastes, *Landfills, *Soil types, Clays, Gravels, Marshes, Land management, Impervious soils, Solid wastes, Waste treatment, Economic feasibility, *Waste disposal.
Identifiers: Agricultural wastes, England.

The most economical and effective method of disposal of intractable wastes in the foreseeable future will continue to be by land disposal. The contractor should have available at least two sites for waste disposal; one in use and one approved for future use. The types of sites recommended, in order of preference, were marshland founded on impervious soil, clay pits and dry gravel pits with impervious bottoms which can be effectively sealed at the sides if necessary. Sites which have already been tipped with domestic refuse would be greatly advantageous. If no new sites of the required character can be located, consideration should be given to creating such sites on marshes, saltings or in clay areas. Treatment of wastes will not be generally economic in the immediate future. However, the drying of animal manure slurries to produce a powdered fertilizer and the distillation and incineration of wastes, where an adequate supply of combustible waste oil is available, would be economically feasible. (Galwardi-Texas)
W72-12979

5F. Water Treatment and Quality Alteration

PROVINCE OF ONTARIO'S PROGRAM FOR FINANCING, CONSTRUCTING AND OPERATING WATER POLLUTION CONTROL AND WATER SUPPLY FACILITIES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 05D.
W72-12480

FLOC STRENGTH AND FILTERABILITY OF PRETREATED WATER.
Ludwig Engineering and Science Research Foundation, Arcadia, Calif.

Available from the National Technical Information Service as PB-211 374, 3.00 in paper copy, 0.95 in microfiche. Federal Water Pollution Control Administration, October 1968. 69 p, 29 fig, 5 tab, 16 ref, append. FWDCA Program 17030--10/68, Research Grant WP-00813-02 and 0281.

Descriptors: Water purification, Pre-treatment-Water, Flocculation, Filtration, Filters, Sedimentation, Polyelectrolytes, Pilot plants, Suspended solids, Water treatment, Waste water treatment.
Identifiers: Dual media filters.

An experimental study of the interrelationships between filter operation, floc properties, and filter performance was conducted. A laboratory scale pilot plant water clarification unit including rapid mixing, flocculation, sedimentation, and filtration was used for the study. Two different clarification systems were investigated. One system had flocculation and sedimentation ahead of the filters. In the other clarification system, the pretreatment consisted of chemical addition and a brief period of rapid mixing; thus, in essence, raw water was applied directly to the filters. When operated in this latter manner, the filters were actually serving as contact flocculators. The experimental results show that an effective filtration system is combined of properly matched filter media and floc properties. Weak and non-sticky flocs, for instance, are desirable for a fine media filter; whereas, the opposite type of floc are essential for successful operation of a coarse media filter. Also, the study has demonstrated quite adequately the superior performance of a dual media filter bed as compared to that of a single media and filter.
W72-12794

CHARACTERIZATION OF CHEMICAL SLUDGES,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 05D.
W72-12798

WATER TREATMENT PLANT WASTE DISPOSAL - ACTION NOW,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05D.
W72-12800

CONSIDERATIONS IN LARGE WATER-PLANT DESIGN,
Detroit Metro Water Dept., Mich.
E. Cedroni.
Journal of the American Water Works Association, Vol 64, No 5, p 299-303, May, 1972. 1 tab.

Descriptors: *Water treatment, *Treatment facilities, *Design criteria, Waste disposal, Recirculated water, Drying, Control systems, Cleaning.
Identifiers: *Central control panel, Washwater, Clarification, Drying beds.

Design criteria are reviewed for a water treatment plant utilizing a functional central control panel and providing waste disposal. Construction details are given for the submerged timber intake crib. Initial problems and solutions in constructing the intake shaft and surveying the raw-water tunnel are described. Details are provided for the low-lift plant, high-lift plant, chemical handling and storage facilities, settling tanks, and filtration plant. Sanitary wastes are disposed in septic tanks. Filter washwater is recirculated. Sludge from the settling basins is clarified with the supernatant overflow recirculated. The condensed sludge is discharged to drying beds. A central control panel is explained. The only information on the board is that needed by the operator to make decisions within the plant. (Nardozzi-AWWA)
W72-12801

RECYCLING AND REUSE OF FILTER BACKWASH WATER CONTAINING ALUM SLUDGE,
Hackensack Water Co., Weehawken, N.J.
For primary bibliographic entry see Field 05D.
W72-12805

CRYSTAL-SEED CONDITIONING OF LIME--SOFTENING SLUDGE,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-12806

RAISING AND WATERING A CITY,
Loyola Univ. Chicago, Ill.
For primary bibliographic entry see Field 05D.
W72-12809

THE VORTEX CHAMBER AS A GRIT REMOVAL DEVICE FOR WATER TREATMENT,
Clemson Univ., S.C. Water Resources Research Inst.
P. B. Zielinski.
Available from the National Technical Information Service as PB-211 449, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 30, 1972. 58 p, 23 fig, 2 tab, 11 ref, 12 append. OWRR A-019-SC (1).

Descriptors: Waste treatment, Storm water, *Water treatment, *Waste water treatment, *Settling basins, Settling velocity.
Identifiers: *Vortex flows, Liquid-solid separators, *Grit chambers.

Efficiency studies on the vortex grit chamber show that the unit is effective in removing grit particles greater in size than ASTM sieve number 60 grit. The grit particles used in these tests ranged in size from 16 sieve to 200 sieve, and had a specific gravity of 2.65. The injection rates of dropping the grit into the flow varied from approximately 2 to 25 pounds per minute. Tests with organic materials showed that organic materials such as whole peas and whole kernel corn were completely removed in average flow conditions while only a trace remained in the chamber during the low flow tests. In flows which varied from high rates to low rates and then reversed, there was complete removal of organic material. The flow rates were changed from approximately 0.1 cfs to 1.3 cfs, while the depth of flow varied from 0.3 feet to 2.1 feet for a differing arrangement of the number of inner boundary vanes as well as angle of inclination of the vanes. A theory was developed to predict the location of particle settlement, which can be used for particles ranging in size from number 16 sieve to number 100 sieve. Graphs showing the correlation between the measured position of settlement and the predicted position are given.
W72-12946

CHLORINATION - A HISTORICAL SURVEY,
D. F. Brown.
Effluent and Water Treatment Journal, Vol 9, No 4, April 1969, p 203-209, 6 fig.

Descriptors: *Chlorination, *History, *Surveys, Public health, Application methods, *Water supply, *Sewage treatment, Power system operations, Industrial wastes, Foods, Swimming pools, Automatic control, *Water treatment.
Identifiers: Gas-chlorinator, Modular system, *United Kingdom.

A historical survey of the development of chlorination was presented. The first practical use of chlorination for the treatment of a public water supply was attributed to Woodhead who employed a solution of bleaching powder to flush out water mains subsequent to an outbreak of enteric fever in Maidstone in 1897. The development of the gas chlorinator was traced from the first commercially-produced gas chlorinator built by Wallace and Tierman in 1913 to the introduction of module chlorination into the United Kingdom in 1969. The module system allowed for complete automatic programming, telemetering, quality, quantity and remote control with a savings of up to 40% on the space required by non-modular systems. The use of chlorination outside the water supply industry was also discussed. Applications included: swimming pools, power generation, sewage treatment, industrial effluents and food processing. (Galwardi-Texas)
W72-12967

INACTIVATION OF VIRUSES,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
E. Lund.

Descriptors: *Viruses, *Oxidation, *Halogens, Oxidation-reduction potential, Chemical precipitation, Activated sludge, Sea water, Temperature, Waste water treatment, Disinfection, Chlorination, *Water treatment.
Identifiers: Enteroviruses, Adenoviruses, Reoviruses, Inactivation.

The viruses of most specific interest in drinking water supplies include enteroviruses, adenoviruses, reoviruses and the unidentified hepatitis virus. Despite considerable investigation, the actual mechanisms of virus inactivation have not been identified. Studies of viral inactivation by both sea water and activated sludge have not yielded satisfactory results. Chemical inactivation of viruses has been accomplished only by oxidation, especially with the halogens. Results from studies on the oxidative inactivation of interoviruses and adenoviruses showed that the rate of inactivation was dependent on the oxidation potential according to log K = C, E + C2. (Galwardi-Texas)
W72-12968

THE BIO-FOULING MENACE IN COOLING SYSTEMS,
For primary bibliographic entry see Field 05D.
W72-12987

RURAL WATER-SUPPLY DEVELOPMENT AND THE RECENT APPEARANCE OF ENDEMIC GOITRE,
East African Inst. for Medical Research, Mwanza (Tanzania).
For primary bibliographic entry see Field 05C.
W72-13032

5G. Water Quality Control

SEWER BEDDING AND INFILTRATION, GULF COAST AREA,
Tulane Univ., New Orleans, La.
For primary bibliographic entry see Field 08A.
W72-12394

METROPOLITAN DEVELOPMENT GUIDE -SANITARY SEWERS-POLICIES, SYSTEM PLAN, PROGRAM.
Metropolitan Council of the Twin Cities, Minn.

January 1970. 37 p.

Descriptors: *Sewerage, *Sewers, *Cities, *Minnesota, *Comprehensive planning, Design criteria, Sewage treatment, Water quality, Combined sewers, Sanitary engineering, Regional analysis

rbanization, Regional development, Water pol-
y, Interceptor sewers, Treatment facilities.
lentifiers: *Minneapolis (Minn), *St. Paul (Minn).

his is the first part of a comprehensive guide,
:veloped for the Minneapolis-St. Paul
etropolitan area. Part One contains long-range
)licies as general guidelines for the proper
anning, design, and operation of a sewer system
the Metropolitan Area. The purpose is to begin
correct the area's increasing water pollution
oblems, provide the best long-range uses of
'ers and lakes, and guide future development.
irt Two contains the system plan for the
etropolitan sewer system designed for the year
000. It includes descriptions of the general loca-
)n of interceptors and treatment works and alter-
tive interceptor routes and treatment plant loca-
)ns that are still under study. Part Three contains
e development program and the timetable for the
plementation of the sewer plan. It shows which
:erceptors and treatment plants will be designed
d built within the next year (1971). The sewer
licies contained in the Developmental Guide are
plicable, according to law, throughout the
ven-county metropolitan area. (Poertner)
72-12399

:COMMENDATIONS ON THERMAL OBJEC-
VES FOR WATER QUALITY CONTROL
)LICIES ON THE INTERSTATE WATERS OF
ALIFORNIA.
lifornia State Dept. of Fish and Games, Sacra-
nto. Water Projects Branch.

igust 1968. 155 p, 1 fig, 21 tab, 360 ref.

scriptors: *California, *Interstate rivers,
'ater quality standards, *Planning, *Thermal
llution, *Geothermal studies, Thermal stratifi-
ion, Thermal water, Tidal marshes, Water tem-
rature, Oceans, Bays, Estuaries, Rivers,
uatic habitats, Temperature control.
entifiers: *Temperature requirements.

guide is provided for the establishment of
:cific thermal objectives in the water quality
ntrol policies. Various policies have previously
:n adopted by the State Water Resources Board
the interstate and coastal waters of California.
e need for thermal objectives is a result of the
creasing development, use and reuse of water.
tually every major stream and lake in Califor-
is subject to additional development which
y further change the pattern of both flows and
mperatures. The coastal waters may also receive
charges of domestic and industrial waste, or
ste cooling water from thermal electric generat-
g plants. These could add heat to the inshore
an environment. As each new development is
posed it will be evaluated on its merits and ef-
ct to the environment. In view of studies relating
thermal requirements of aquatic life and historic
water temperatures in the interstate streams
lakes of California, temperature limits have
en adopted as thermal objectives for water
lity control policies. These have been, or will
adopted for the interstate waters of California.
recommendations contained in the study are to
used in evaluating the probable impact of vari-
proposed projects prior to construction.
erner)
2-12403

TER AND SEWERAGE DEVELOPMENT
AN.
ropolitan Planning Commission - Kansas City
ion, Mo.
primary bibliographic entry see Field 06D.
2-12404

TURAL RESOURCE PLAN-WATER
SOURCES.
ean County Regional Planning Commission,
omington, Ill.
For primary bibliographic entry see Field 06D.
W72-12405

PRELIMINARY GEOLOGIC INVESTIGATIONS OF ROCK TUNNEL SITES FOR FLOOD AND POLLUTION CONTROL IN THE GREATER CHICAGO AREA,
Illinois State Geological Survey, Urbana.
T. C. Buschbach, and G. E. Heim.
Illinois Geological Survey Environmental Geology Notes, No 52, May 1972. 35 p, 11 fig, 5 tab, 19 ref.

Descriptors: *Geologic investigations, *Underground storage, *Water pollution control, *Flood control, *Illinois, Water storage, Storms, Tunnel construction, Rock mechanics, Underground structure, Geology, Groundwater, Faults (Geologic), Sanitory engineering, Sewers, Overflow.
Identifiers: Chicago.

A system of over 100 miles of tunnels in the bedrock of the greater Chicago area has been proposed to intercept overflow from the existing combined sanitary-storm water sewer system and to convey it to temporary storage chambers excavated in the rock. Geologic investigations made during a study for the tunnel sites included test drilling and coring, geophysical logging of boreholes, laboratory testing of samples, seismic surveying, and testing for groundwater. The drilling, coring, and logging furnished data that will be of considerable help in mapping and describing the individual units of Silurian and Ordovician strata of the area. The seismic survey indicated numerous closed depressions on the surface of the bedrock and several faults with displacements of 10 to 50 feet on the top of the Galena Group. (Woodard-USGS)
W72-12420

HEATED SURFACE JET DISCHARGED INTO A FLOWING AMBIENT STREAM,
National Center for Research and Training in the Hydrologic and Hydraulic Aspects of Water Pollution Control, Nashville, Tenn.
For primary bibliographic entry see Field 05B.
W72-12451

SURFACE DISCHARGE OF HEATED WATER,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W72-12452

MULTIDIRECTIONAL TURBULENCE PROBE DEVELOPMENT PHASE I - UNIDIRECTIONAL TURBULENCE SENSOR DEVELOPMENT.
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 02E.
W72-12453

A TEST SIMULATION OF THE TEMPERATURE OF THE ILLINOIS RIVER AND A PREDICTION OF THE EFFECTS OF DRESDEN II AND DRESDEN III REACTORS,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05B.
W72-12454

IN BWR'S, CORROSION CONTROL IS NON-CHEMICAL,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 08G.
W72-12459

ENVIRONMENTAL MATTERS CONCERNING NUCLEAR ELECTRICAL POWER PRODUCTION,
Office of Environmental Affairs (AEC), Washington, D.C.
J. J. Dinunno, and S. Levine.
Nuclear Engineering International, p 607-612, July-August 1970. 2 fig, 2 tab, 13 ref.

Descriptors: *Fuels, *Environment, *Nuclear powerplants, Legislation, Regulation, Radiation, *Thermal pollution, Electric power production, Cooling water.

Currently the use of energy in the U.S. is doubling every 10 years, and population is doubling every 35 years. A brief history of power production is given and it is concluded that alternatives to the use of fossil fuels for energy generation must be found to preserve the earth's limited supply of fossil fuels. Recent environmental legislation on both the federal and the state level is discussed and a few examples of action being taken by states are cited. Proposed amendments to AEC regulations are also discussed. Medical usage of radiation can contribute 45 percent beyond the natural background radiation level, weapons testing contributes 1 percent, and nuclear power and fuel reprocessing plants contribute much less than 1 percent. Because of the long half-lives of krypton and tritium, their quantity in the environment is increasing but they do not concentrate in food chains. The addition of heated water from powerplants results in a thermal modification of the receiving waters, changing chemical and biological processes occurring in them. The annual rate of expenditure for environmental research over the past several years by the US AEC has been approximately 70 million dollars. (Upadhyaya-Vanderbilt)
W72-12461

HOW TO PLAN A PROGRAM FOR LIQUID EFFLUENT CONTROL,
Calgon Corp., Pittsburgh, Pa. Water Management Div.
H. C. Conger.
Engineering and Mining Journal, Vol 173, No 5, p 77-79, 1972. 2 fig, 1 tab.

Descriptors: *Planning, *Industrial wastes, *Waste water treatment, Effluents, Liquid wastes, Costs, Heavy metals, *Recycling.
Identifiers: Waste recycling, Mining industry, Milling industry.

An outline is presented for developing an effective program for mining and milling industries to meet current and anticipated water-effluent control requirements. First the effluent impact on the receiving water must be assessed and a complete waterflow inventory made for the economic evaluation of future action. In defining water quality, sampling should reflect plant operations over a repeatable time cycle with a monthly schedule to detect seasonal changes; complete analyses--especially for heavy metals--should be run over a long period of time. On completion, evaluation can be made and analyses for future work trimmed and confined to known potential problem areas. Combined with water quality standards, a limnological study will provide a more accurate picture of the effects of effluent. This can lead to a more effective control program that may entail lower capital and operating costs than a program based only on water quality data. Information from a survey will enable a company to evaluate and choose the appropriate course of action--to complete or partial recycling or to effluent processing and treatment. Equipment, costs, and treatment processes are tabulated. (Jones-Wisconsin)
W72-12475

DISCUSSION OF THE ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (OECD) AND ITS WATER MANAGEMENT RESEARCH GROUP,
Waterloo Univ. (Ontario). Div. of Environmental Studies.
For primary bibliographic entry see Field 06B.
W72-12477

A CASE STUDY: THE NATURE OF THE CONFLICT EXISTING BETWEEN ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN PUERTO RICO--THE APPROACH AND STRATEGY BEING DEVELOPED,
Puerto Rico Dept. of Public Works, San Juan.
For primary bibliographic entry see Field 06B.
W72-12478

STEREOTYPES OF THE VOLGA STURGEON BEHAVIOUR IN THE REGION OF SARATOV HYDRO-ELECTRIC POWER STATION BEFORE AND AFTER THE RIVER REGULATION,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
L. K. Malinin, A. G. Poddubnyi, and V. V. Gaiduk.
Zool Zh. Vol 50, No 6, p 847-857. 1971. Illus. English summary.
Identifiers: *Fish behavior, *Fish passages, Movement, Regulation, Rivers, *Sturgeon, Transmitters, Velocity.

Traces and velocity of sturgeon movements were studied by ultrasonic transmitters. Traces of fish movement in the river and water reservoir were uniform near the river-bed. The relative velocity of fish movement varied within the range. The average velocity was 9.1 m/sec in the river and 20 m/sec in the reservoir. There were 2 peak activities of the fish movement: in the morning and in the evening. On the basis of observations of fish behavior in the dam region, practical recommendations are given for increasing the efficiency of the Saratov fish elevator.--Copyright 1972, Biological Abstracts, Inc.
W72-12509

SLICING UP THE OPEN SPACE: SUBDIVISIONS WITHOUT HOMES IN NORTHERN CALIFORNIA,
For primary bibliographic entry see Field 04A.
W72-12520

A BILL TO AMEND FEDERAL-AID HIGHWAY ACT (TO REGULATE WASTE DISPOSAL AT SEA),
House, Washington, D.C.
H. Boggs.
Congressional Record, Vol. 118, p. S7431-S7432 (daily ed.) May 8, 1972.

Descriptors: *Waste disposal, *Road construction, *Legislation, *Highways, Delaware, Pennsylvania, Delaware River, Highway effectx, Environmental effects, Federal government, Oceans, Navigable waters, Atlantic Ocean, Adoption of practices, Sewage, Sludge, Settling basins, Regulation, Oceans, Construction.

Legislation is introduced to amend the Federal-Aid Highway Act by regulating the dumping of highway construction wastes at sea or in the Nation's waterways. The bill would require the consent of the Governor of a state potentially affected by the dumping of such wastes in or adjacent to the state's waters before any payment of federal funds for such highway construction work. The need for the legislation has been amply demonstrated in Philadelphia and Delaware where the state of Pennsylvania stands ready to dump 1.8 million cubic yards of sewage sludge in Delaware Bay and the Atlantic Ocean. This could severely damage clam and oyster beds, fishing, and beaches and wetlands. Other possible disposal techniques are discussed. Hearings have been held which indicate severe damage has already occurred from sewage dumping off Delaware. Legislation has already passed the Senate and House to rectify this problem, but the two versions have not been reconciled in conference committee. (Grant-Florida)
W72-12582

REGULATING THE DISPOSAL OF WASTES RESULTING FROM HIGHWAY CONSTRUCTION,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-12583

AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-12584

POLLUTED ESTUARY,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-12586

GREAT LAKES POLLUTION: A FRAMEWORK FOR ACTION,
Queen's Univ., Kingston (Ontario). School of Law.
F. J. E. Jordan.
Ottawa Law Review, Vol 5, p 65-83, 1971. 135 ref.

Descriptors: *International joint commission, *Great Lakes, *Water quality control, *Water pollution effects, *Canada, Federal government, Water pollution control, Municipal wastes, Industrial wastes, Dredging, Water pollution sources, Eutrophication, Turbidity, Legislation, Political aspects, Administration.

A report submitted by the International Joint Commission (I.J.C.) to the governments of Canada and the United States on the state of water quality in the Lower Great Lakes drainage basin is examined. The chief sources of the pollutants on both sides of the boundary are municipalities, industries, watercraft, and dredging activities. The major consequences of the pollution are eutrophication of the lakes, deoxygenation of the waters, algal growth, bacterial and organic contamination, water turbidity, and discoloration, with harmful effects on most legitimate uses of the waters of the Great Lakes. At the jurisdictional level, the I.J.C. concluded that the main problem is the diffusion of authority to take corrective action in the basin. The Commission's recommendations indicate the general and specific goals to achieve and maintain an acceptable quality of water in the basin and suggest how, administratively and politically, the goals may be realized. An agreement between the United States and Canada is recommended. (Waldron-Florida)
W72-12589

POLLUTION PREVENTION IN THE ARCTIC---NATIONAL AND MULTINATIONAL APPROACHES COMPARED,
G. Sutton.
Ottawa Law Review, Vol 5, p 32-64, 1971. 122 ref, 1 tab.

Descriptors: *International law, *Arctic Ocean, *Water pollution control, *Canada, Water law, Legislation, Oil industry, International waters, Water pollution sources, Oil wastes, Safety factors, Water quality control, Legal aspects, Waste disposal.
Identifiers: *Water Quality Improvement Act, *Arctic Waters Pollution Act.

This study is primarily concerned with recent legislative efforts of Canada to prevent the future destruction of the Arctic by pollution. Legal issues which arise as the problems of ocean pollution confront the present body of international maritime law are examined. The Canadian Arctic Waters Pollution Prevention Act prohibits the deposit of waste of any kind into the waters of the Canadian Arctic except as authorized by regulation and attempts to prevent the polluting by the establishment of certain 'Shipping Safety Cont Zones', from which vessels are banned unless th comply with various regulations dealing with s construction and safety features. It is impossi to evaluate the validity of the Canadian legislati through the traditional approaches of mariti law. It is the inadequacy of old standards that h brought about the need for new principles in t area. The International Convention on Civil L bility for Oil Pollution Damage deals with the ture and liabilities for oil spills. This Conventio compared with both the Canadian legislation a the corresponding United States legislation, Water Quality Improvement Act. (Waldr Florida)
W72-12590

NEW DIRECTIONS IN WATER QUALI MANAGEMENT: A PROPOSAL FOR WISCO SIN,
Wisconsin Senate, Madison.
C. W. Krueger, and M. C. Quinn.
Lincoln Law Review, Vol 6, No 1, p 51-64, 19 51 ref.

Descriptors: *Wisconsin, *Water quality cont *Waste treatment, *Water pollution cont Water pollution, Pollution abatement, Municip wastes, Industrial wastes, Water pollut sources, Water quality, Regulation, Administ tion, Administrative agencies, Treatment fa ties, Water quality standards, Planning, W management (Applied), Waste disposal, Co Cost sharing, Comprehensive planning.

Many of the procedures used today in water qu ty control in Wisconsin were developed in 1920's and 1930's. In recent years the treatm requirements imposed on both municipal and dustrial waste contributors have been raised. dustrial polluters have been directed to upgr their waste removal facilities while munici sewage utilities have been ordered to provid minimum of secondary treatment. Despite s stantial progress, serious water quality probl still confront Wisconsin. The major alternativ the raising of treatment standards is a syste regional management measures designed achieve specified patterns of water quality. Su program would include the designation of c prehensive management areas, development comprehensive plans, a provision for cost sha among polluters, and the establishment of management corporations with broad responsi ties for carrying out the plan. This new appro to water pollution control is needed because e ing policies and programs have been only part successful in reducing pollution of lakes streams. (Brackins-Florida)
W72-12591

TOWARD A STATE REMEDY FOR OIL SP DAMAGES: AN INSURANCE APPROACH.
New York University Law Review, Vol 47, N p 60-82, 1972. 134 ref.

Descriptors: *Insurance, *Oil pollution, spills, *Remedies, *Damages, Pollution ab ment, Water pollution control, Water law, L aspects, Legislation, Water pollution, Regula Water pollution sources, Oil industry, Consti tional law, Federal jurisdiction, State jurisdic Oceans, Ships, Penalties (Legal), Negligen Water Quality Act, Foreign trade, Judicial sions, Maine, Insurance.

Though the costs of an oil spill are sometimes gering for all parties involved, federal mari law, which governs oil spills, offers only lim and inadequate remedies. The difficulty of pro negligence and the Limitation of Liability Act ously handicap those parties injured by oil attempting to obtain relief through maritime except when the government is seeking compe tion. Under the 1970 Water Quality Act the fe

vernment has been provided with an adequate eans of recovering its own damages. Most state gislation aimed at oil pollution imposes strict lia- lity for damages. Such legislation presents a allenge to federal admiralty jurisdiction that ay not be sustained. Furthermore, the Maine itute imposes a tax on oil terminal operators nich may be an unconstitutional tax on foreign mmerce. An alternative to state-imposed liabili- would be to establish a state insurance system reimburse parties injured by an oil spill. Fund- would come from a charge levied against ter- nal operators. Creation of a limited insurance- sed system may promote a more effective dis- bution of the social costs of oil transport. In the al analysis, however, only Congress has the thority to create new and equitable solutions for roblem so clearly national in scope. (Brackins- orida)
72-12592

DERAL COMMON LAW AND INTERSTATE LLUTION.
rvard Law Review, Vol 85, No 7, p 1439-1459, 72. 69 ref.

scriptors: *Federal jurisdiction, *Water law, dicial decisions, *Water pollution control, gal aspects, Watercourses (Legal aspects), ited States, Federal government, Constitutional , Legislation, State governments, State ju- diction, Water pollution, Water rights, In- state rivers, Interstate, Common law, Regula- n, Jurisdiction.

ter this note went to press the United States preme Court held that federal common law uld be exercised in any interstate air or water lution nuisance case regardless of the character the parties. The rationale underlying federal ju- ial law-making in suits between two states is not olicable to state-nonresident suits. Cases ween states and citizens of other states, in con- st to suits between states, are not nearly as like- o be a consequence of differences between the s of the parties' states. Furthermore the utility federal common law in this area is not signifi- nt in formulating standards to impose on con- t affecting the environment for two reasons. st, this task is performed on the federal level by tutory provision and the administrative process. ond, even when such standards are not pro- ed by statute the common law does not provide adequate alternative context within which to elop such standards. Solutions to our environ- tal problems must generally be developed by legislative or administrative process. State law uld apply to environmental nuisance cases ther brought in state or federal court. ackins-Florida)
2-12594

E EFFICACY OF FEDERAL AND STATE NTROL OF WATER POLLUTION IN INTRA- TE STREAMS,
th Carolina Univ., Chapel Hill. School of Law.
. Schoenbaum.
zona Law Review, Vol 14, No 1, p 1-38, 1972. ref.

criptors: *North Carolina, *Water pollution trol, *Interstate rivers, *Federal government, te governments, Legislation, Legal aspects, dministrative agencies, Water quality control, er resources development, Federal Water Pol- n Control Act, Rivers and Harbors Act, Com- hensive planning, Alternate planning, Govern- tal interrelations.

ng information gathered from selected streams he piedmont district of North Carolina, this ysis takes an empirical and case study ap- ch to a critical examination of the operations effectiveness of the federal and state legal and inistrative processes for water pollution con- trol in intrastate rivers. The major water pollution control laws applicable to the streams under study are examined: the Federal Water Pollution Control Act (FWPCA), which empowers the federal government to proceed directly to abate water pollution and has required states to create and enforce stream standards; the North Carolina Water and Air Resources Act of 1967, which authorizes state officials to set and enforce standards approved by the federal government; the Refuse Act of 1899, which prohibits the discharge of any refuse into the navigable waters of the United States; and the proposed amendments to the FWPCA which seek to strengthen the present federal-state regulatory scheme. Alternative approaches to water pollution control are evaluated, culminating in a recommendation for future action. (Widman-Florida)
W72-12596

REFUSE ACT OF 1899--WILL IT CURB INDUSTRIAL WASTES.
Federal Bar Journal, Vol 30, No 4, p 327-342, 1971. 16 p.

Descriptors: *Rivers and Harbors Act, *Permits, *Pollution abatement, *Water quality standards, Water law, Legal aspects, Judicial decisions, Legislation, Watercourses (Legal aspects), Water pollution, Water pollution control, Water quality control, Federal Water Pollution Control Act, Water Quality Act, Regulation, Administrative agencies, Administration, State governments, Federal government, Industrial pollution, Sewage effluents, Law enforcement, Waste disposal.
Identifiers: *Refuse Act.

In late 1970 a new program to control water pollution from industrial sources through the use of the permit authority in the Refuse Act was announced. This Act outlaws discharges and deposits into navigable waters and tributaries thereof without a permit. Violators of state water quality standards are ineligible for permits. To obtain a permit, the discharger must disclose in detail what amount and what type of effluent he intends to discharge. The permit program is based on the Federal Water Pollution Control Act, the Refuse Act, and other Federal Statutes. The Environmental Protection Agency will resolve all matters relating to the application of water quality standards. The Corps of Engineers will deny an application in accordance with the recommendation of the Environmental Protection Agency. If the State and the Environmental Protection Agency approve the application the District Engineer may deny the permit only if navigation will be hindered or the deposit will have an adverse impact on fish and wildlife resources. The permit program is a drawing together of various existing federal laws to form a single, strong system for water quality protection and enforcement. (Brackins-Florida)
W72-12597

PROPOSAL FOR A DEMONSTRATION WATER QUALITY MANAGEMENT PROGRAM ON THE HOLSTON RIVER IN EASTERN TENNESSEE,
Cornell Univ., Ithaca, n.y. Water Resources and Marine Sciences Center.
P. L. Wagner.
Technical Report 35, December 1971. 224 p, 1 fig, 2 tab, 270 ref. OWRR C-1196 (No 1963) (2).

Descriptors: *Tennessee, *River basin development, *Water quality control, *Demonstration watersheds, Institutions, Institutional constraints, Political aspects, Water pollution control, State governments, Federal government, Regional analysis, Social aspects, Administrative agencies, Adoption of practices.
Identifiers: *Holston River Basin (Tenn).

A demonstration water quality management program on the Holston River in Eastern Tennessee is proposed in the belief that regional water quality management provides an excellent opportunity to organize and implement water pollution control techniques. Objectives of the study include: development of an organizational model for regional plan implementation, development of a strategy for establishing and managing such a program, and employment of the Holston River as a case study. The report analyzes the historical and institutional experiences of the region which must be considered. The technical aspects of the pollution problem and the engineering and administrative techniques available to solve the problem are described. Various institutional options, available governmental alternatives, organizational structure, federal agency arrangements, and the project's relationship with the TVA are discussed. No single agency has the administrative capacity to bring about a full water quality program in the Holston River Basin. It is suggested that the federal government is most capable of bringing about the desired programs for a variety of reasons. (Grant-Florida)
W72-12602

SUPREME COURT DECLINES ORIGINAL JURISDICTION IN LAKE ERIE POLLUTION CASE,
J. W. Wopat.
Miami Law Review, Vol 25, No 4, p 794-799, 1971. 36 ref.

Descriptors: *Ohio, *Federal jurisdiction, *State jurisdiction, *Adjudication procedure, Judicial decisions, State governments, Federal government, Water pollution, Water pollution sources, *Lake Erie.

In Ohio v. Wyandotte Chemicals Corp., 91 S.Ct. 1005, the State of Ohio attempted to invoke the original jurisdiction of the United States Supreme Court to obtain an injunction against three non-resident chemical companies who allegedly created a public nuisance by dumping mercury into Lake Erie. Admitting that original jurisdiction was technically possible the Court declined jurisdiction, arguing that the nature of the case and the historical development of the concept made the Court an unappropriate body for the trial. The court reasoned that: (1) no issue of federal law was presented--only local nuisance principles; (2) a special master, if appointed, would be ill-equipped to act as a trial court; (3) several competent governmental agencies were already involved with the problem; and (4) Ohio state courts presented an alternative forum that could give the relief sought. Now that the Supreme Court has removed itself from this crucial area, the difficulty in computing damages and the possible effect of the instant decision in a state court action, coupled with the ineffectiveness of involved governmental agencies, promise little hope for immediate solutions to the problems of Lake Erie. (Dye-Florida)
W72-12606

SECTION 169 OF THE INTERNAL REVENUE CODE: AN INCOME TAX SUBSIDY FOR THE CONTROL OF POLLUTION,
Northeastern Univ., Boston, Mass. School of Law.
D. Givelber, and D. Schaffer.
Arizona Law Review, Vol 14, No 1, p 65-86, 1972. 73 ref.

Descriptors: *Amortization, *Taxes, *Government finance, *Water pollution control, *Grants, Tax rates, Economics, Project feasibility, Water management (Applied), Federal government, Legislation, Non-structural alternatives, Water law, Alternate planning, Pollution abatement.

The Tax Reform Act of 1969 added section 169 to the Internal Revenue Code. This section allows a taxpayer to amortize the cost of a certified pollution control facility over 5 years on a straight line basis, regardless of the actual useful life of the

facility. Whether section 169 is an efficient and rational means of subsidizing the control of pollution is discussed. A further analysis is made to determine whether a more defensible subsidy could be fashioned to reach more equitable results. The arithmetic of the subsidy is discussed in terms of the amount of the subsidy and the subsidy as a true preference. The scope of section 169 is examined by examining its effect on new plants and the types of expenditures which qualify. Since the section requires that the facilities be constructed or acquired in conformity with a state program or requirements, the question arises as to what this requirement means. Finally, whether the problems of section 169 can be solved by a better tax subsidy or by direct grants is questioned. In light of the present tax structure it would be simpler and easier to subsidize pollution control by direct grants. (Widman-Florida)
W72-12608

SAVING THE LAND-WATER EDGE FROM RECREATION, FOR RECREATION,
Fordham Univ., Bronx, N.Y. School of Law.
For primary bibliographic entry see Field 06E.
W72-12609

THE RESTORATION OF A RIVER,
For primary bibliographic entry see Field 06E.
W72-12612

SHOWDOWN ON DELAWARE BAY,
For primary bibliographic entry see Field 06E.
W72-12613

NATURAL RESOURCES DEFENSE COUNCIL V. MORTON (SCOPE OF APPLICATION OF NATIONAL ENVIRONMENTAL POLICY ACT).
For primary bibliographic entry see Field 06E.
W72-12614

AN ACT...PROVIDING FOR THE POSTING, AND FORFEITURE...OF A BOND BY ANY VESSEL IN OR ENTERING UPON THE WATERS OF THE STATE FOR THE PURPOSES OF DISCHARGING OR RECEIVING A CARGO OF ANY BULK OIL IN THE STATE.
For primary bibliographic entry see Field 06E.
W72-12615

AN ACT...FOR THE PRESERVATION AND IMPROVEMENT OF THE POTOMAC RIVER BASIN.
For primary bibliographic entry see Field 06E.
W72-12616

AN ACT...TO AUTHORIZE A WATER POLLUTION ABATEMENT GRANT PROGRAM.
For primary bibliographic entry see Field 06E.
W72-12617

AN ACT TO AMEND IC 1971, 13-1-6, CONCERNING WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W72-12618

UNITED STATES V. GENOA COOPERATIVE CREAMERY CO. (REFUSE ACT SEWAGE EXCEPTION).
For primary bibliographic entry see Field 06E.
W72-12620

LAND SUBDIVISIONS--MUNICIPAL REGULATIONS.
For primary bibliographic entry see Field 06E.
W72-12621

ENVIRONMENTAL IMPROVEMENT COMMISSION LAW.
For primary bibliographic entry see Field 06E.
W72-12622

COASTAL WETLANDS--PROTECTION.
For primary bibliographic entry see Field 06E.
W72-12623

SANITARY WATER BOARD V. HARMAR COAL CO. (APPLICATION OF CLEAN STREAMS LAW TO DRAINAGE OF MINES).
For primary bibliographic entry see Field 06E.
W72-12625

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION--UNIT NO. 3, BEESLEY'S POINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08C.
W72-12628

THE MAIN FACTORS DETERMINING THE ABUNDANCE OF VALUABLE SEMIMIGRATORY FISHES IN THE DON,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
A. E. Gorodnichii.
Vopr Ikhtiol. Vol 11, No 3, p 471-478. 1971. Illus.
Identifiers: *Fish populations, Commercial fish, Abundance, Fishes, Migration, Perches, Pike, Regulation, *Salinity, Shiners, USSR.

The main semimigratory fishes in the Don region are the pike perch and the golden shiner. Their abundance was primarily determined by the salinity of the Sea of Azov, which is dependent on the river water coming into it. During the past few years, as a result of more complete regulation of the water flow in the Don and other rivers, the salinity of the Sea of Azov has increased. It has been determined that optimal salinity for the growth and reproduction of these fishes is in the 6-10% range. Consequently, in order to control the salinity of the Sea of Azov to enhance the commercial catch of the pike perch and the golden shiner it may well be advisable to devise means by which the waters of the Dnieper river or some of the northern rivers would be directed into the sea.--Copyright 1972, Biological Abstracts, Inc.
W72-12644

TASTE AND ODOR PROBLEMS WITH THE RIVER RHINE,
Karlsruhe Univ. (West Germany). Institut fuer Gastechnik, Feuerungstechnik und Wasserchemie.
W. Koelle, P. Koppe, and H. Sontheimer.
Water Treat Exam. Vol 19, No 2, p 120-135. 1970. Illus.
Identifiers: *Water quality, Activated carbon, Benzene, Biology, Chloride, Chlorinated hydrocarbons, Chromatography, Germany, Microorganisms, *Odor, Oxidation, Pollutants, Rhine River, Sewage, Taste, Temperature.

Using activated carbon for absorption, followed by desorption with CCl4 or benzene, 70-95% of the odorous substances were extracted. Most of the odorous substances were found within the benzene extract; these were further separated by chromatographic methods. The odorous substances remaining after 1 1/2 yr are mainly chlorinated hydrocarbons in low concentrations. The biologically readily oxidizable organic substances are decomposed and the synthetic organics may remain. From a microbiological standpoint, this shift from more natural to more synthetic substances may lead to altered environmental conditions and may consequently favor those microorganisms which produce taste and odor. These odorous substances can still b degraded by some microorganisms, but this tak time.--Copyright 1972, Biological Abstracts, Inc.
W72-12681

WATER RESOURCES DEVELOPMENT IN TH MULLICA RIVER BASIN, PART I, BIOLOG CAL EVALUATION OF THE MULLICA GREAT BAY ESTUARY,
Rutgers - The State Univ., New Brunswick, N. Water Resources Research Inst.
For primary bibliographic entry see Field 02L.
W72-12706

APPLICATION OF ARTIFICIAL RECHARG TECHNOLOGY FOR MANAGING THE WATE RESOURCES - ANCHORAGE, ALASKA,
Alaska Univ., College. Inst of Water Resources.
For primary bibliographic entry see Field 04B.
W72-12707

PHOSPHATES - A CHALLENGE TO ENVIRO MENTAL SCIENCES,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 05B.
W72-12708

FISH AND FISHERIES IN THE CONTEXT (ENVIRONMENTAL CONCERN,
Food and Agriculture Organization of the Unit Nations, Rome (Italy). Dept. of Fisheries.
For primary bibliographic entry see Field 05C.
W72-12793

BASIC DATA FOR CHEMICAL WAS DISPOSAL,
Du Pont de Nemours (E. I.) and Co., Wilmingt Del. Engineering Dept.
R. W. Haywood, Jr.
Sewage and Industrial Waste, Vol 30, No 9 1156-1159, September, 1958. 1 ref.

Descriptors: *Basic data collections, *Chemi wastes, Waste disposal, Toxicity, Waste dilut Water pollution, Control, Industrial wastes.
Identifiers: *Waste characteristics, Product st stitution, Process modification.

Benefits derived from early recognition and stu of waste disposal problems are discussed. Diffic ties in obtaining basic data for evaluating disp requirements are described. No generalizations usually possible for highly variable, complex, ganic-inorganic chemical wastes. Control may achieved through product substitution or proc modification. Product substitution examples t lower treatment requirements include: plastic starch in the textile industry; mineral acid for ganic acid; and process applications producin filterable insoluble salt rather than a highly solu one. A system's approach should be applied processes to minimize the cost of production waste treatment. Several physical-chemical wa characteristics are enumerated. Testing compli tions for BOD analysis and seed preparation detailed. Adequacy of testing laboratories mus considered. Toxicological studies should inclu fish-kill effects and food chain destruction. size or volume, type (flowing, impounded, tid and present and future use of receiving waters important. For adequate dilution, the shape, qu tity, velocity, turbulence, salinity, and therm stratification of watercourses need study. (Ir-dozzi-AWWA)
W72-12803

UNDERGROUND WASTE DISPOSAL AND CONTROL.
American Water Works Association, New Y Committee on Underground Waste Disposal and Control.
For primary bibliographic entry see Field 05B.

W72-12804

ROLE OF GROUND WATER CONTAMINATION IN WATER MANAGEMENT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 05B.
W72-12807

THE RETURN OF A RIVER: THE WILLAMETTE RIVER, OREGON,
Oregon State Univ., Corvallis. Water Resources Research Inst.
G. W. Gleeson.
Available from the National Technical Information Service as PB-211 452, $3.00 in paper copy, $0.95 in microfiche. Oregon Water Resources Research Institute Publication WRRI-13, June 1972, 103 p, 24 fig, 10 tab, 83 ref. OWRR A-014-ORE (1).

Descriptors: *River basins, *Water quality control, *Recreation, Standards, Permits, Legislation, *Oregon, Pacific Northwest U.S., *Water quality standards, Pollution abatement.
Identifiers: *Willamette River (Ore).

A semi-historical description of the Willamette River is provided for the period 1926 through 1971. Efforts to effect river improvement are described. Municipalities provided waste treatment facilities for both domestic and permissible industrial wastes. The pulp and paper industry effected reduction in waste discharges to the river. Standards of water quality were established, river flow regulation was adopted for the low flow periods, limitations on water usage beyond minimal quantities were designated at specific control points, and a permit program was developed. The total effort was sustained over a period of more than thirty years. By the most widely accepted standards, the water quality of the Willamette River for more than thirty years was, in the lower reaches and particularly in the Portland harbor, bad. Now, judged by the same standards, the Willamette is once more a river of reasonable quality.
W72-12816

PRIMARY CONSIDERATIONS IN REGIONAL WASTEWATER TREATEMENT PLANNING,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 05D.
W72-12821

SUBDIVISION PLANNING THROUGH WATER REGULATION IN NEW MEXICO,
New Mexico Univ., Albuquerque. Coll. of Law.
For primary bibliographic entry see Field 04C.
W72-12831

QUALITY OF WATER FOR IRRIGATION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 03C.
W72-12840

QUALITY OF SURFACE IRRIGATION RUNOFF WATER,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
F. A. Bondurant.
American Society of Agricultural Engineers, Transactions, Vol 14, No 6, p 1001-1003, November-December 1971. 1 tab, 7 ref.

Descriptors: *Water quality, *Saline waters, *Fertilizers, *Runoff, *Irrigation water, Infiltration, Cations, Anions, Nitrates, Phosphates, Sodium, Sediments, Surface waters, Idaho, Diffusion, Return flow.

The actual loss of fertilizer from irrigated fields, which may cause contamination of other water supplies, has rarely been determined. This study considers possible mechanisms by which water flowing over or through soil may acquire fertilizer ions and analyzes field studies to determine what, if any, differences exist between irrigation water applied to a field and surface runoff water from that field with respect to common fertilizer elements. The Einstein equation for Brownian movement shows that the diffusion process of soil fertilizer ions to runoff water is not likely to cause an increase in ion concentration in the runoff because the mean velocity of diffusing ions is less than the velocity of soil infiltration. Analysis of applied water and runoff from an irrigation area near Paul, Idaho, indicated that the concentrations of nitrate, phosphate and sodium ions appearing in the runoff were almost the same as those of the applied water. The data emphasized the necessity of taking pooled samples or continuous samples. Improving overall irrigation efficiency would further reduce nutrient and sediment losses and one way to do this is to use irrigation return systems. (Casey-Arizona)
W72-12845

A REVIEW OF CONCEPTUAL MODELS AND PREDICTION EQUATIONS FOR REAERATION IN OPNE-CHANNEL FLOW,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
Y. L. Lau.
Canada Department of the Environment Inland Waters Branch Technical Bulletin No 61, 1972. 28 p, 1 tab, 22 ref.

Descriptors: *Reaeration, *Open channel flow, *Hydraulic models, *Water quality control, *Reviews, Equations, Forecasting, Evaluation, Streams, Dissolved oxygen, Biochemical oxygen demand, Analytical techniques, Self-purification.

Reaeration is a fundamental component of the oxygen balance of a river or stream and consequently knowledge of the phenomenon is vital for correct systems modelling of stream quality. The relationship between hydraulic parameters and the rate of atmospheric reaeration is not established. A program of the Hydraulic Unit at the Canada Center for Inland Waters to investigate this mechanism has been initiated. A review of the existing knowledge of the process of atmospheric reaeration is given. The conceptual models which have been proposed to explain the mechanism of reaeration are evaluated. Even though some of these models lead to logical conclusions they cannot as yet be used for the prediction of reaeration rates since they all contain parameters which are very difficult to relate to measurable hydraulic variables. The various empirical and semi-empirical prediction equations are described. Some areas of research are suggested. (Woodard-USGS)
W72-12878

GROUND WATER IN THE TORTUGUERO AREA, PUERTO RICO AS RELATED TO PROPOSED HARBOR CONSTRUCTION,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-12883

GROUND WATER ALONG RIO BUCANO AT PONCE, PUERTO RICO AND THE EFFECTS OF A PROPOSED FLOODWAY ON GROUND-WATER QUALITY,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-12884

RULES AND GUIDELINES FOR THE CONTROL OF WATER POLLUTION FROM LIVESTOCK CONFINEMENT FACILITIES AND GUIDELINES FOR CONSTRUCTION OF SEALED EVAPORATION AND RETENTION PONDS.

Colorado Department of Health, Water Pollution Control Commission, Denver, April 10, 1968, 11 p, 3 fig.

Descriptors: *Farm wastes, Feed lots, Confinement pens, *Colorado, Lagoons, Regulation, *Water pollution control.

The Colorado Water Pollution Control Commission established rules for the prevention of water pollution from livestock confinement facilities in the state of Colorado. Guidelines established by the commission are included. Some of them pertain to preliminary considerations, pond surface area, pond storage volume, discharge and percolation, and pond shape, pond fencing and maintenance, land disposal system, embankments and dikes, pond bottom settling tank and biological treatment. (Wallin-Iowa State)
W72-12951

WASTEWATER QUALITY CRITERIA,
Delaware River Basin Commission, Trenton, N.J.
R. Porges.
Preprint, presented at 6th International Water Pollution Research Conference, Session 7, Hall A, Paper No. 13, June 21, 1972, p A/7/13/1-A/7/13/8, 19 ref.

Descriptors: Waste water, *Quality control, *Water quality standards, *River regulation, *Pollution abatement, Administrative agencies, Water management, Toxicity, Heat, Nutrients, Pesticides, Viruses.
Identifiers: *Waste water criteria, Allocation concept, Effluent charges.

Waste water criteria, the implementing tools for the water management program of regulatory agencies have been based upon dilution, stream assimilation capacity, allocations, discharge of only negligible quantities, treatment technology, waste guides, economic criteria, and anti-degradation. However, in addition to the common criteria, exotics such as toxicity, radioactivity, heat, nutrients, pesticides, and viruses will receive emphasis in the next few decades. The allocation concept will be expanded to encompass a myriad of substances and attempts at economic controls by effluent charges will be utilized. Current wastewater criteria must nevertheless be considered only an interim step as future restrictions will ultimately lead to virtual prohibition of controllable, polluting discharges. In order to achieve the desired clean streams from wastewater criteria, administrative mechanisms adequately endowed with authority and responsibility will be required. (Galwardi-Texas)
W72-12976

SEWAGE DISPOSAL IN REFORMED LOCAL GOVERNMENT,
J. H. Pawley.
Effluent and Water Treatment Journal, Vol 9, No. 7, July 1969, p 399-403.

Descriptors: *Sewage disposal, *Sewage districts, *River basin commissions, *Regulation, Waste water treatment, Population, Size, *Waste disposal.
Identifiers: Government reform, Authority, River basin management, England, Royal Commission, Centralized sewage treatment.

The Royal Commission recommended that England should be divided into 61 new local government areas grouped in eight provinces. The main drainage and sewage disposal service would, therefore, be administered by 61 main authorities, the areas of which would range between 2,227 sq. miles and 93 sq. miles, with populations ranging

between 3,232,000 and 195,000. However, the question arose as to how river authorities were to fit into the consultative pattern and who was to decide priorities. The areas of river authorities would straddle more than one province and river basin management could place obligations on authorities in one province for the benefit of an adjoining province. Moreover, it was pointed out that capital improvement schemes should not be allowed to lie dormant during periods of transition from the old to the new reformed government structure. The Mersey and Weaver River Authority have provided a basis for positive action within their area pending local government reform. They defined 11 districts in which the principles of centralizing the treatment of sewage could be applied and all would be wholly within the area of a new main authority. (Galwardi-Texas)
W72-12978

AGRICULTURAL WASTES AND ENVIRONMENTAL POLLUTION,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05C.
W72-12999

06. WATER RESOURCES PLANNING

6B. Evaluation Process

GOALS, POLICIES AND MANAGEMENT OF WATER RESOURCES IN THE RIO GRANDE VALLEY, (APJ-1).
Herkenhoff (Gordon) and Associates, Albuquerque, N. Mex.
For primary bibliographic entry see Field 04B.
W72-12398

PEACE VALLEY AQUATIC RECREATION AREA, RECREATION DEVELOPMENT PLAN,
California State Dept. of Water Resources, Sacramento.
A. G. Thrapp, and V. Rosen.
Available from State of Calif, Documents Section, P.O. Box 20191, Sacramento, 95820 Price $1.00. California Department of Water Resources Bulletin No 117-15, January 1972. 10 p, 1 fig, 2 tab.

Descriptors: *Water resources development, *Recreation facilities, *California, Planning, Projections, Costs, Swimming, Camp sites, Boating, Fishing, Lakes.
Identifiers: Los Angeles County (Calif), *Aquatic recreation area.

A plan is presented for recreation facilities adjacent to the California Aqueduct at Peace Valley in the northwestern corner of Los Angeles County. Recreation facilities on this 346-acre site will provide for picnicking, camping, sightseeing, fishing, horseback riding, hiking and swimming by the cooperative efforts of the State and private enterprise. Facilities are estimated to cost $4.7 million and would serve 410,000 recreation days annually (2020) (Woodard-USGS)
W72-12429

EFFECTS OF INVESTMENTS IN WATER RESOURCES ON REGIONAL INCOME AND EMPLOYMENT,
South Dakota State Univ., Brookings. Dept. of Economics.
J. E. Wiebe.
In: Proceedings of the Symposium on Symposium on Social and Economic Aspects of Water Resources Development, June 21-23, 1971, Ithaca, New York. American Water Resources Association, Urbana, Illinois, 1972.

Descriptors: *Water resources development, *Economic effects, *Employment, *Income, Regional analysis, Unemployment, Tennessee Valley Authority, Investment, Regression analysis.
Identifiers: *Economically depressed regions, Tennessee River.

The effectiveness of water resources investment projects in alleviating regionally depressed economic conditions is evaluated. The region examined was the Tennessee River Watershed, which consists of 125 counties in parts of seven states. The statistical models used were multiple regression analysis, standard partial regression coefficients (beta-coefficients), t-test, and discriminant analysis for two groups. The study suggests (1) that residents in counties in close proximity to water resources investment projects enjoyed a greater per capita income in the long run than did residents in counties not near similar projects; (2) that investments in water resources were in the long run associated with increases in employment in counties removed from the site of the investments and decreases in employment in counties near the investments; and (3) that investments were not associated with an increase in the standard of living for people in low income and less educated groups living near investment areas as compared to similar groups living in areas removed from the investment sites. Thus, the major effects of investments in water resources on regional income and employment are regional in nature and not confined to isolated areas. (See also W72-10480) (Settle-Wisconsin)
W72-12476

DISCUSSION OF THE ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (OECD) AND ITS WATER MANAGEMENT RESEARCH GROUP,
Waterloo Univ. (Ontario). Div. of Environmental Studies.
G. R. Francis.
In: Proceedings of the Symposium on Social and Economic Aspects of Water Resources Development, June 21-23, 1971, Ithaca, New York. American Water Resources Association, Urbana, Illinois, 1972. p 193-197, 9 ref.

Descriptors: *Water resources development, Water pollution, *Management, *Industrial wastes, Thermal pollution, Research and development, *Environmental effects, Governments.

The water Management Research Group (WMRG) of the Organization for Economic Cooperation and Development was formed in 1967 as a 'sector group' concerned with policy problems. As with other sector groups, the WMRG's basic objective was seen originally as the search for improved understanding of how scientific research may be used by governments as effective support for managerial responsibilities, particularly in sectors which require long-term capital investments. In particular, the Group's members were to (1) exchange information among member countries concerning needs and priorities for water management and research, (2) identify research deficiencies, (3) define specific research problems warranting attention, (4) establish objectives for future studies in water, and (5) carry out cooperative research projects relating to water management. The problems considered by the Group include eutrophication, detergents, micropollutants, water usage in the iron and steel industry, thermal pollution, pulp and paper industry pollution, and river basin management. Due to recent changes of emphasis in the OECD, the Group's work in the future will have to be of a wide multi-disciplinary nature, and its focus will have to be on the relationship of environmental questions to economic and social policies. (See also W72-10480) (Settle-Wisconsin)
W72-12477

A CASE STUDY: THE NATURE OF THE C FLICT EXISTING BETWEEN ECONOM DEVELOPMENT AND ENVIRONMENT QUALITY IN PUERTO RICO--THE APPROA AND STRATEGY BEING DEVELOPED,
Puerto Rico Dept. of Public Works, San Juan.
A. Santiago-Vasquez.
In: Proceedings of the Symposium on Social Economic Aspects of Water Resources Deve ment, June 21-23, 1971, Ithaca, New York. An ican Water Resources Association, Urbana, linois, 1972. p 227-228.

Descriptors: *Economics, *Conservation, * vironmental effects, Agriculture, Plann Management, Puerto Rico.
Identifiers: *Economic development, *Exter ties.

Faced with a per capita 1970 income of only $1 and unemployment rates varying between 10 12 percent, Puerto Rico cannot afford to s down its economic growth without endange the welfare of its people. Yet, Puerto Rico is faced with the problem of halting environme deterioration. Over the past 30 years some of best agricultural land has been converted to o uses. Hundreds of acres of foothills have b leveled for housing development, thus crea such problems as loss of topsoil, erosion, heavy sedimentation. The coastal sand bea and estuarine areas have suffered tremendo beeause of the removal of sand for conc production. The potential production hydroelectric power has decreased significant a result of increased watershed sedimenta Flooding and a lack of adequate conservation grams have drastically reduced the island's f and fauna. To help solve these environme problems the Commonwealth government is suing several approaches: (1) a technical professional group was created to monitor vironmental trends and make policy recomme tions; (2) environmental considerations are b explicitly included in the planning process; an several specific environmental conservation grams are being promoted. (See also W72-1 (Settle-Wisconsin)
W72-12478

A PLANNING, PROGRAMMING BUDGETING APPROACH TO GOVERNM TAL COORDINATION OF NATU RESOURCE PROGRAMS FOR PRINCE WARD ISLAND,
Waterloo Lutheran Univ. (Ontario). Dept Economics.
F. Millerd.
In: Proceedings of the Symposium on Socia Economic Aspects of Water Resources Dev ment, June 21-23, 1971, Ithaca, New York. A ican Water Resources Association, Urban linois, 1972. p 233-236.

Descriptors: *Planning, *Budgeting, *Na resources, Economic impact, Economic effi cy, Unemployment.
Identifiers: *Programming, Resource dev ment, *Prince Edward Island.

A comprehensive fifteen-year development has been undertaken for Prince Edward Isla by the federal and provincial governments. The strategy of the plan is 'to restore flexibility capability both in the economy and institutio the province.' Projects within the plan are dir toward encouraging the development of viab port sectors and thus stimulating secondary tertiary activities. The agricultural progra aimed at increasing net agricultural income smaller number of full-time commercial far The tourist and recreation projects are aimed creasing the number of visitors to the island increasing their length of stay and expendit Under the forestry program, all forest land w developed and managed so as to encourag

nd's natural environment. The fisheries elopment program will endeavor to increase average incomes of fishermen. In addition to se natural resources development programs, er programs are devoted to improvements in island's social infrastructure and educational ilities. The use of the planning, programming, budgeting system (PPBS) by program nagers should insure (1) that all projects are at t designed to fulfill plan objectives, and (2) alternatives are properly evaluated. The adtages and disadvantages of PPBS are outlined. e also W72-10480) (Settle-Wisconsin)
2-12479

OVINCE OF ONTARIO'S PROGRAM FOR ANCING, CONSTRUCTING AND OPERAT- WATER POLLUTION CONTROL AND TER SUPPLY FACILITIES,
nell Univ., Ithaca, N.Y.
primary bibliographic entry see Field 05D.
2-12480

L SCIENCE IN RELATION TO WATER SOURCES DEVELOPMENT: V. ECONOMIC ALUATION OF WATER RESOURCES TA,
a State Univ., Ames.
. Timmons.
Science Society of America Proceedings, Vol No 1, p 187-194, Jan-Feb 1972. 2 fig, 49 ref.

criptors: *Water resources development, aluation, *Water allocation (Policy), Water zation, Economics, Flood control, Decision ing, Domestic water, Planning, Soil Science, er quality, Multiple use, Bibliographies.
ntifiers: *Water appraisal needs.

easing demands for water, coupled with qualieterioration of existing water supplies, require ortant decisions on the future use, allocation, development of water resources. In making e decisions, public and private entities urly need information to determine alternative rses of action. Decisions concerning water use development are based on political, economic, physical considerations. These decisions can no better than the physical data on whoch yses are performed and from which choices made. Three steps are pursued in developing elines for use by soil scientists in planning r resource studies: (1) examination of mutual ctives and interrelationships between soil nce and economics research for water use sionmaking; (2) discussion of water use decis as related to data needs; and (3) suggested elines for planning soil science research for r resources decisionmaking. (USBR)
-12658

MULATION OF TECHNIQUES TO PRE- T THE IMPACT OF MAJOR WATER OURCE CONSTRUCTION PROJECTS ON AL GOVERNMENT FINANCES,
tana State Univ., Bozeman. Water Resources arch Center.
H. Wicks, and Alan H. Taylor.
lable from the National Technical Informa- Service as PB-211 562, $3.00 in paper copy, in microfiche. Completion Report No. 27,), 20 p, 7 tab, 6 ref. OWRR A-054-MONT (1).

riptors: *Evaluation, *Economic impact, nomic prediction, *Government finance, nmunity development, *Montana, Construc- Costs, Local governments, Water resources elopment.

study attempted to estimate predictors of the ct of major water resource construction pro- on expenditures and on tax bases of local rnments. Step-wise regression of five year ges (1957-62) in expenditures for various functions in 56 Montana counties obtained from Census of Government data on variables which a priori economic reasoning would suggest as predictors yielded mostly statistically significant results. The equations did not provide reliable estimates of changes which occurred over the subsequent five years. Regression of expenditure changes on construction employment during four dam construction projects in Montana produced insignificant results. Interviews with local officials indicated the projects had not caused extraordinary financial problems. An apparent reason for lack of expenditure response to construction activity is severe statutory limitations on local government finances. Cross-section regression of various expenditures on population for Montana counties provided significant estimates of long run adjustment of local expenditures to population differences. Assuming that past long run expenditure adjustments indicate expenditure needs when there are population increases--the primary result of construction activity--the coefficients estimate per capita needs from construction impact. These estimates included general control $9.57, sewage $7.32, fire protection $7.59, police $7.62, health $9.39, welfare $5.60, highways $21.53, and education $151.90. (Hulse-Montana)
W72-12818

OBJECTIVES AND RESULTS OF THE DEVELOPMENT POLICY IN NORTH-EAST BRAZIL,
Nijmegen Univ. (Netherlands). Geographical and Physical Planning Inst.
J. M. G. Kleinpenning.
Tijdschrift voor Economische en Sociale Geografie, Vol 62, No 5, p 271-284, September-October, 1971. 1 fig, 20 ref.

Descriptors: *Regional analysis, *Semiarid climates, *Water resources development, *Human population, *Foreign lands, Hydroelectric power, Water supply, Sewerage, Federal government, Mapping, Industrial production, Social aspects, Political aspects, Economic feasibility, Geographical regions.
Identifiers: *Northeast Brazil, *Developing nations, *Population problems.

The semiarid Northeast, with about 18% of the total land area of Brazil and about 29% of the total population, is the most densely populated problem area of the country. The government has gradually developed a sense of response to the plight of the North-east beginning with small amounts of drought aid in the 1800's to the organization of the 'Superintendencia de Desenvolvimento do Nordeste' (SUDENE) in 1959. The goal of this organization is to advance the socioeconomic level of the North-east by moving on a broad front against the regions problems. The infrastructure of roads, electric power, and public health, involving water supply extension and sewage system installation, have been significant improvements. Mapping activities have been extended and upgraded to include mineral deposits, hydrogeology and fisheries. Efforts to increase the appreciation and initiation of irrigated agriculture have been made, but resisted by a conservative rural population. The industrialization program is discussed in some detail. If it is not possible to develop and further extend in the 1970's those projects begun in the 1960's, the future will be grim. Perhaps most important of all is the need for an effective regional birth control program, but the prognosis for its success is not good. (Casey-Arizona)
W72-12830

THE SPATIAL BEHAVIOR OF CAMPING AMERICA: OBSERVATIONS FROM THE ARIZONA STRIP,
Arizona Univ., Tucson. Dept. of Geography and Area Development.
L. J. Gibson, and R. W. Reeves.
Rocky Mountain Social Science Journal, Vol 9, No 2, p 19-30, April 1972. 4 fig, 2 tab, 3 ref.

Descriptors: *Water utilization, *Social needs, *Recreation demand, *Arizona, *Camp sites, Social aspects, Geographical regions, Model studies, Regression analysis, Surveys.
Identifiers: *Environmental perception.

An effort was made to find out what kind of people campers are, and what the nature of their movements through space is. Questionnaire-based interviews were conducted with 298 camping parties in June 1970, in the 6 organized and regularly maintained campgrounds located near the major highways of the Arizona Strip, the relatively isolated section of Arizona north of the Colorado River. The campersswere, by and large, a cross-section of middle class America. The typical party included a white, middle-aged husband and his wife and 1-3 children. Affluence and education were somewhat above the national norms. All regions of the U.S. were represented, except for the strip itself, but about 1/2 of the parties originated in southwestern states. About 60% planned to spend 2 nights or less in the strip and only 16% thought of it as their primary destination. The 6 campgrounds performed somewhat different functions. Those with water-based outdoor recreation were much more often primary destinations and supported longer stays. Using a multiple regression constant and coefficients, a partially successful model was devised. (Casey-Arizona)
W72-12847

URBAN WATER PLANNING--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va. 22151, as PB-211 553, $6.00 paper copy; 0.95 microfiche. Water Resources Scientific Information Center Report WRSIC72-215, July 1972. G. F. Mangan and H. A. Swenson, Editors. 373 p. 249 ref.

Descriptors: *Bibliographies, *Abstracts, *Urban hydrology, *City planning, *Information retrieval, Publications, Documentation, Indexing, Classification, Information exchange, *Planning, *Municipal water, *Water supply.
Identifiers: *Urban water planning.

This bibliography is one in a series produced wholly from the information base in Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 41,521 abstracts covering SWRA through May 15, 1972 (Volume 5, Number 10). The significant descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper has been indexed. It represents weighted terms that best describe the information content; this status is indicated by the asterisks which precede them. The comprehensive index represents all of the descriptors and identifiers by which each paper has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending Accession Number Order. In the author index, each author is keyed to the page instead of to the accession number. (Woodard-USGS)
W72-12921

WATER CENTER ORGANIZATION AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
G. L. Anderson, J. C. Frey, S. O. Ikenberry, and W. M. Swope.
Available from the National Technical Information Service as PB-211 459, $6.00 in paper copy, $0.95 in microfiche. Research Publication Number 72, February 1972, 420 p, 10 fig, 135 tab, 6 append. OWRR C-2109 (No 3364) (1).

Descriptors: *Water Resources Research Act, *Allotments, *Professional personnel, Publications, *Research facilities, *Personnel management, Colleges, *Universities, *Organizations, *Water Resources Institute, Coordination, *Management, Planning.
Identifiers: *Public Law 88-379.

Management and organizational characteristics of the 51 water centers established under the Water Resources Act of 1964 are presented. Areas discussed included the level and sources of funding, interuniversity organizational arrangements, personnel characteristics, areas of research, training emphasis, research accomplishments, and attitudes held toward the water center by administrative personnel. A statistical analysis is made of the relationship between organizational and management characteristics and accomplishments of the water centers. With some exceptions it was found that the organizational arrangements seemed to have little influence on the level of accomplishment. Significant relationships were found betweand responds to it in proportion to its concentration. Creeks draining developed land carried twice the nitrogen as those draining relatively undisturbed watershed. Human activity doubles nitrogen inflow to the lake. Exporting all sewage would remove 70% of the nitrogen. (Jones-Wisconsin)
W72-12954

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFECTS OF INVESTMENTS IN WATER RESOURCES ON REGIONAL INCOME AND EMPLOYMENT,
South Dakota State Univ., Brookings. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-12476

PROVINCE OF ONTARIO'S PROGRAM FOR FINANCING, CONSTRUCTING AND OPERATING WATER POLLUTION CONTROL AND WATER SUPPLY FACILITIES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 05D.
W72-12480

FORMULATION OF TECHNIQUES TO PREDICT THE IMPACT OF MAJOR WATER RESOURCE CONSTRUCTION PROJECTS ON LOCAL GOVERNMENT FINANCES,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W72-12818

6D. Water Demand

LAKES OF WEST VIRGINIA,
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
M. S. Baloch.
1972. 82 P, 5 FIG, 8 TAB.

Descriptors: *Impoundments, *Lakes, *Impounded waters, *West Virginia, *Census, Reservoirs, Retention, Ponds, Locks, Dams, Rivers, Hydroelectric power, Multiple-purpose reservoirs, Water storage, Low flow augmentation, Flood control.

This is an initial attempt by the West Virginia Division of Water Resources to publish an inventory of all lakes in the State of West Virginia. The data sought included the name of the lake, of the stream on which it is located, drainage area above dams, date of completion of the lake, maximum storage capacity in acre feet, uses of the lake, height of dam, name of owner, and the county in which the dam structure is located. Except for water ponded naturally in a few glades and in plugged limestone sinkholes, all of the natural surface storage of water in West Virginia is limited to the channels of streams and their flood plains. At present, dammed lakes and reservoirs constitute the most important means of storing surface water in West Virginia. Most reservoirs serve multi-purpose uses such as flood control, navigation, water supply, and hydroelectric power generation. These reservoirs vary from small privately owned ponds to giant state and federal facilities. (Poertner)
W72-12397

WATER AND SEWERAGE DEVELOPMENT PLAN.
Metropolitan Planning Commission - Kansas City Region, Mo.

April 1971. 130 p, 19 fig, 26 tab, 16 ref.

Descriptors: *Missouri, *Kansas, *Sewerage, *Water supply, *Regional analysis, Regional development, Planning, Financing, Water supply development, Water treatment, Geology, Urbanization, Drainage, Climates, Topography, Sewers, Soils, Water demand.
Identifiers: *Kansas City.

Regional goals were considered. The 'water' goal is to obtain a comprehensive water system for the region that will provide adequate supply with desirable quality standards. The 'sewerage' goal is basically to obtain and maintain efficient sewerage systems. Each county is discussed individually, keeping in mind that the proposed facilities development should be coordinated with land use development for a workable regional program. Studies of the economic condition of the planning area and the projections for population growth and distribution of that growth were made. Studies and analyses were made of water consumption and future water demands, along with the capacity and ability of existing water facilities to meet and adequately serve these future demands. Emphasis was placed on the theory that water supply and treatment is best served with consolidation of facilities into fewer, more efficient systems serving larger areas. By establishing ultimate goals, much wasted effort and duplication of efforts will be eliminated. It is suggested that a list of priorities be drawn up for each county and that frequent updating be carried out to keep abreast of future developments. (Poertner)
W72-12404

NATURAL RESOURCE PLAN-WATER RESOURCES.
McLean County Regional Planning Commission, Bloomington, Ill.

March 1972. 126 p, 3 fig, 17 tab, 10 ref.

Descriptors: *Water conservation, *Water pollution control, *Water supply, *Flood control, *Illinois, Septic tanks, Sewerage, Flood plains, Flood protection, Water requirements, Planning, Urbanization, Regional analysis, Flood plain zoning, Land use, Long-term planning, Urban drainage, Storm runoff.
Identifiers: *McLean County (Ill).

Three aspects of water resource conservation and development are considered. These include flood control, water supply, and water quality and pollution as they relate to McLean County, Illinois. Additional and updated inventory information is presented, and goals and recommendations are made to guide future decisions that will be made regarding water resource conservation and development. It is affirmed that through proper zoning of flood plain areas damage to developments will be minimized. There is enough land in the county for further growth and development without using flood plain land. A long range program is recommended, preferably for a future period of 50 years or more. A cooperative program throughout the area is recommended to preclude the proliferation of undesirable land-use patterns and duplication of development efforts. Septic tanks would be permitted only if they meet adopted standards. Further study is suggested to determine the types of treatment needed for various water uses in the area. A permanent management organization is recommended to oversee the entire system with assistance provided by the McLean County Health Department. (Poertner)
W72-12405

A PLAN FOR WATER AND SEWER.
Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.

June 1971. 94 p, 28 fig, 11 tab.

Descriptors: *Water supply development, *Sewerage, *Financing, *Comprehensive planning, *Water resources development, Georgia, Water policy, Water districts, Water pollution control, Industrial wastes, Regional analysis, Construction costs, Waste water treatment.
Identifiers: *Chatham County (Georgia), *Savannah (Georgia).

An updated version is presented of three previous planning documents: (1) 'A Plan for Water and Sewer' (Ga. P-56) published in October, 1968; (2) 'Water and Sewer Financial Plan' (Ga. P-128) published in December, 1969; and (3) 'Water and Sewerage Improvements Needed in 1975 in Chatham County' (Ga. P-128) published in March 1970. The 'Plan for Water and Sewer' outlines a program of pollution abatement and water service extension to presently populated areas and additional areas where population is projected by 198 The 'Water and Sewer Financial Plan' recommends methods of financing needed improvements over a long term, and suggested organizational structures which could implement the pollution abatement program. The 'Water and Sewerage Improvements needed in 1975 Chatham County' presents estimates of cost and facilities that would be required in the five ye period 1970-1975. This plan, being a combinatio of the three previous plans, is a generalized comprehensive guide which identifies and evaluates the physical aspects of existing and future water and sewer systems in the Savannah/Chatham County Metropolitan Area. The plan also projects the capital requirements for 6 years and recommends a means of financing the needed improvements. Other recommendations included in this report relate to cessation of discharging any partially treated or untreated sanitary waste into the recreational or other classified streams and the upgrading of existing treatment facilities to meet pollution abatement standards. (Poertner)
W72-12406

COUNTY OF SANTA BARBARA WATER AND SEWERAGE FACILITIES PLAN.
Boyle Engineering, Ventura, Calif.

Santa Barbara County-Cities Area Planning Council, Santa Barbara, California, June 1971. 220 p fig, 49 tab.

Descriptors: *Water supply, *Cities, *Comprehensive planning, *Sewerage, *California, Financial feasibility, Water requirements, Water demand, Sewage district, Regional analysis, Planning, Urbanization, Water quality, Administration, Water water treatment.
Identifiers: *Santa Barbara County (Calif), Wa water management.

This plan represents a functional element of the General Plan for the County of Santa Barbara. The study area is limited to the South Coastal a

a Ynez sections of the County. Planning ef- were directed toward providing practical -range solutions to the future needs for water, the collection and disposal of sewage. The ltant comprehensive plan answers questions erning: facilities that are required, when the ities will be needed, how much they will cost, what political jurisdiction is necessary. Infor- on is presented in a manner to establish elines for future development of physical ities. As a result of its attractive environment, ounty will continue to grow. Because of the cted growth, it is estimated that water needs ncrease by more than 50 percent. These needs e met by importation of water from the State r Project. Improvement of water quality by ment will insure protection of public health. type and degree of treatment required de- s upon the quality of raw water available. The osed plan overcomes the shortcomings that iously have plagued sewage disposal goals by osing consolidation of facilities of various nunities where possible to reduce costs and es. Separate jurisdictional districts are called provide for regional planning. It is estimated the cost to implement the Plan to meet needs e year 2000 is 33.8 million dollars, not includ- nprovements of a local nature nor construc- proposed by the Goleta County Water Dis- (Poertner)
12407

DICTIONS OF AGRICULTURAL IRRIGA- FOR INDIANA AND IRRIGATION ENTIALS OF SELECTED INDIANA SOIL ES,
na State Dept. of Natural Resources, Indi- olis.
rimary bibliographic entry see Field 03F.
12524

ROLOGIC BUDGET OF THE POUDRE EY,
ado State Univ., Fort Collins. Dept. of Civil neering.
rimary bibliographic entry see Field 02A.
12822

Water Law and Institutions

USSION OF THE ORGANIZATION FOR NOMIC COOPERATION AND DEVELOP- T (OECD) AND ITS WATER MANAGE- T RESEARCH GROUP,
loo Univ. (Ontario). Div. of Environmental s.
imary bibliographic entry see Field 06B.
2477

PLANNING, PROGRAMMING AND ETING APPROACH TO GOVERNMEN- COORDINATION OF NATURAL URCE PROGRAMS FOR PRINCE ED- D ISLAND,
loo Lutheran Univ. (Ontario). Dept. of omics.
imary bibliographic entry see Field 06B.
2479

LOCAL INSTITUTION FOR GROUND- R BASIN MANAGEMENT--A REPORT E NATIONAL WATER COMMISSION,
Plains Underground Water Conservation t No. 1, Lubbock, Tex.
imary bibliographic entry see Field 04B.
2502

RS APPROVE AMENDMENT 4.

ross Section, Vol 17, No 5, p 1, May 1971. 1 ig.

Descriptors: *Water law, *Legal aspects, *Constitutional law, *Appropriation, Water quality, Water resources development, *Texas, Bonding, Budgeting, Federal Budget.
Identifiers: Clean water Amendment, Texas Water Development Fund.

A constitutional Amendment was passed by the Texas voters on May 18, 1971, known as Amendment 4 or the Clean Water Amendment. The Amendment carried about 53 percent of the votes, 403,532 votes for and 356,473 votes against. An additional 100 million dollars worth of Texas Water Development Fund Bonds are authorized with a 6% ceiling. The 1982 termination date for the fund is repealed. Appropriated bonds will be used exclusively for water quality enhancement through matching federal funds. Voters in West Texas showed a poor turnout. Defeated Amendment 2 would have authorized 3 1/2 billion dollars in water bonds. It will take favorable votes from East and West Texas to continue progress in development of Texas water. (Popkin-Arizona)
W72-12513

WATER CODE FOR TEXAS.

The Cross Section, Vol 17, No 5, p 2, May 1971.

Descriptors: *Water law, *Legal aspects, *Legislation, *Texas, *Water resources development, Water conservation, River regulation.
Identifiers: *Texas Water Code.

The new Texas Water Code, House Bill 343 carried by Rep. Bill Clayton of Springlake, is a nonsubstantive revision of the general and permanent water laws of Texas, effective on August 31, 1971. The 1963 Legislature directed the Texas Legislative Council to plan and execute a permanent statutory revision program. The Business and Commerce Code in 1967 was the first revision enacted. The new Water Code, as the second enacted revision, consists of General Provisions, State Water Administration, River Compacts and General Law Districts in 26 chapters. Underground water conservation districts are provided in Chapter 52, Title IV, General Law Districts. The new code makes administration and understanding of Texas' water law much easier and more systematic. No substantive changes were made. Substantive changes were proposed and require approval separate from the new Water Code. (Popkin-Arizona)
W72-12514

WELL LOCATION MEASUREMENTS,
High Plains Underground Water District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.
W72-12516

SURVEY OF WESTERN STATES' UNDERGROUND WATER MANAGEMENT PROVISIONS,
Texas Tech Univ., Lubbock. School of Law.
T. Floyd.
The Cross Section, Vol 17, No 7, p 1,3, July 1971. 1 fig, 15 ref.

Descriptors: *Water law, *Legal aspects, *Legislation, *Water management (Applied), *Water resources development, Water control, Governments, Groundwater, Waste water (Pollution), Arizona, California, Colorado, Idaho, Montana, Nebraska, Oklahoma, Oregon, Texas, Utah, Wyoming, Washington.

Statutory provisions of Arizona, California, Colorado, Idaho, Montana, Nebraska, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming were compared with regard to local control exercised over underground water. Six of the twelve states had provisions for local groundwater control, and only three (California, Nebraska and Texas) gave much power to local agencies. Three states (Colorado, Utah and Wyoming) give only advisory and administrative powers to local agencies. Texas gives the strongest provisions for local groundwater control. Statutes are cited. Waste regulations are reviewed. (Popkin-Arizona)
W72-12529

THE COUNCIL OF AN INTERNATIONAL SEA--BED AUTHORITY,
Harvard Univ., Cambridge, Mass.
L. B. Sohn.
San Diego Law Review, Vol. 9, No. 3, p. 404-431, 1972. 45 ref.

Descriptors: *International law, *Alternate planning, *Law of the sea, *International waters, Programs, Canada, United States, Political aspects, United Nations, Comprehensive planning, Adoption of practices, Water resources development, Project feasibility.

It is generally agreed that the international regime for the exploration and exploitation of the sea-bed will consist of a basic set of rules and of an international machinery for the implementation of these rules. Proposals made so far and the possible ways of reconciling the apparent differences are explored. Current proposals for the sea-bed council include the Tanzanian draft statute, the Latin American working paper, the working paper of land-locked and shelf-locked states, the Soviet Draft treaty and Polish working paper, the United Kingdom proposals, the Canadian working paper, the United States working paper, and private drafts. More comprehensive proposals for an ocean regime include Ambassador Pardo's (Malta) draft, the draft statute of Mrs. Elisabeth Mann Borgese, and the Iraqi proposal. Many other options are possible within the general framework suggested by the Secretariat of the United Nations. The suggestions are merely illustrative of possible solutions and the final decision will be made at the bargaining table. If the proposed international Sea-Bed Authority is to be given important powers and duties, its structure must be satisfactory to the major groups of states. (Widman-Florida)
W72-12581

A BILL TO AMEND FEDERAL-AID HIGHWAY ACT (TO REGULATE WASTE DISPOSAL AT SEA),
House, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-12582

REGULATING THE DISPOSAL OF WASTES RESULTING FROM HIGHWAY CONSTRUCTION,
House, Washington, D.C.
C. W. Sandman.
Congressional Record, Vol. 118, E4853-E4854 (daily ed.) May 9, 1972.

Descriptors: *Road construction, *Waste disposal, *Legislation, *Highways, Pennsylvania, Highway effects, Environmental effects, Federal government, Oceans, Navigable waters, Delaware River, Atlantic Ocean, Adoption of practices, Sewage, Sludge, Settling basins, Regulation, Construction.
Identifiers: *Marine Protection Act.

The need for legislation regulating the dumping of wastes from highway construction into navigable waterbodies and the ocean is discussed. Legisaltion has been proposed that will deny federal funds for transporting and disposing of such wastes as a part of the Federal -Aid Highway Act. The problem of waste dumping is particularly acute in Philadelphia where some 2 million cubic yards of sewage sludge were almost dumped into lower Delaware Bay. This could have caused

grave harm to Atlantic beaches. The joint House-Senate conference committee on the Marine Protection Act is urged to hasten its efforts to report out the bill since one of its provisions regulates and eventually prohibits ocean dumping. Reprints of several newspaper accounts concerning the Philadelphia sludge dumping incident are contained in the Record. (Grant-Florida)
W72-12583

AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT,
House, Washington, D.C.
J. D. Dingell.
Congressional Record, Vol. 118, E4883-E4887 (daily ed.) May 9, 1972.

Descriptors: *Legislation, *Federal Water Pollution Control Act, *Abatement, *Water pollution control, Federal government, Water resources development, Standards, Toxins, Thermal pollution, Law enforcement, Water quality standards, Governmental interrelations, Administrative agencies, Legal review, Public rights, Beneficial use.

The Hon. John D. Dingell of Michigan comments on the Environmental Protection Agency's recent efforts to gain support for the Senate's proposed amendment (S.2770) to the Federal Water Pollution Control Act. A House-passed bill (H.R. 11896) to amend the Act is criticized as a weak bill designed to perpetuate the abatement theory. Included is a comparison of these two bills and comments on their goals and policies, standards, new source performance standards, enforcement, toxic and pretreatment requirements, clean lakes provisions, thermal pollution, waste treatment facility construction, permits, and citizen suits. Mr. Dingell calls attention to EPA's comment opposed to increasing the federal share for waste treatment works to more than 55 percent and EPA's silence on the subjects of citizen suits and standing. (Widman-Florida)
W72-12584

BILL OF RIGHTS FOR LAKE MICHIGAN,
House, Washington, D.C.
J. D. Dingell.
Congressional Record, Vol. 118, E4861-E4863 (daily ed.) May 9, 1972.

Descriptors: *Water pollution effects, *Illinois, *Lake Michigan, *Legislation, State jurisdiction, Water pollution sources, Legal aspects, Eutrophication, Environmental effects, Abatement, Land management, Land use, Land resources, Recreation, Permits, Adoption of practices, Impoundments, Landfills, Federal government, State governments.

Testimony of Rep. Abner J. Mikva is presented in support of the proposed Bill of Rights for Lake Michigan, which has been presented to the Illinois state legislature. The bill is designed to prevent the severe pollution problem of Lake Erie from arising in Lake Michigan. The bill provides the tools to enforce anti-pollution measures. The bill would treat the lake and its adjoining shoreland and waterways as a comprehensive natural resource unit that must be considered from a total environmental perspective. Standards are not a problem because the bill would forbid any pollution of the lake. The bill provides for prevention instead of treatment. It would require consent of city and state government and the governor prior to any impoundment or fill of the lake. The bill would make recreational land use the highest and best use around the lake. The Nixon Administration is criticized for making promises regarding the spirit of environmental protection but for not carrying out the promises. For this reason the bill of rights must be enacted by the Illinois state legislature. (Grant-Florida)
W72-12585

POLLUTED ESTUARY,
House, Washington, D.C.
G. Gude.
Congressional Record, Vol. 118, No. 75, H4320-H4321 (daily ed.) May 9, 1972.

Descriptors: *District of Columbia, *Potomac River, *Municipal water, *Municipal wastes, *Water quality control, Sewage, Disposal, Water pollution sources, Water quality, Estuaries, Estuarine environment, Currents (Water), Saline water-freshwater interfaces, Intakes, Water sources, Water supply, Water supply development, Viruses, Water pollution, Effluents.

The Potomac River south of Chain Bridge is technically not a river, but an estuary governed by the tides. The Washington drinking water supply is largely dependent upon the upper Potomac, although in recent years this has almost become inadequate in dry seasons. The estuary has been proposed as the most likely source of emergency water and temporary facilities have been emplaced and more permanent ones planned. However, the estuary is heavily polluted with the sewage effluent from upstream. This pollution problem is discussed in detail. One corrective proposal is to pipe the estuarine water upstream of the normal intake point to dilute the effluent before it enters the drinking supply. Another proposal is to pump sewage effluent further downstream. Storm runoffs are another problem which must be solved. The problems of detecting and treating viruses in the water are discussed including the polio virus, which is very difficult to detect. One water quality expert regards the virus problem as not too important, pointing out that viruses have been in water supplies for years. (Grant-Florida)
W72-12586

THE PACIFIC AQUEDUCT SYSTEM OF INTERCONTINENTAL WATER TRANSFER,
Senate, Washington, D.C.
F. Moss.
Congressional Record, Vol. 118, No. 75, S7510-S7511 (daily ed.) May 9, 1972.

Descriptors: *Water allocation (Policy), *Aqueducts, *Water demand, *Inter-basin transfers, International joint commission, Water resources development, Columbia River, Colorado River Aqueduct, Colorado River Basin, California, Saline lakes, Saline water, Desalination, Sediment transport, Human population, Water supply development, Oregon, Nevada.

The water shortage problems of the western United States are discussed along with proposed measures to alleviate the difficulties. One answer proposes a joint planning effort by the Unites States, Canada, and Mexico to solve the water allocation problems. The shortage of water in the western United States could be alleviated by diverting the excess water from the Frazier River in British Columbia to the Columbia River Basin and then down to California and eventually into the Colorado River Basin on Lake Mead. This would supply added water to areas of need in Oregon, agricultural and urban areas in central and southern California, and also Nevada. Supplying water to Nevada would open previously unusable areas for population expansion and would also prevent the increasing salinization of western waterbodies such as Lake Mead and the Colorado River. This salinization will eventually have an effect on land served by these waters. Replenishing the water supply is therefore of prime importance. (Grant-Florida)
W72-12587

KEMP SPEAKS OUT FOR THE GREAT LAKES AND WATER RESOURCE PROJECTS FOR ERIE COUNTY, N.Y.,
House, Washington, D.C.
J. Kemp.
Congressional Record, Vol. 118, No. 80, H4675-H4678 (daily ed.) May 17, 1972.

Descriptors: *Legislation, *New York, *Great Lakes, *Government finance, Water resources development, Federal government, Economic justification, Administrative agencies, Water management (Applied), Projects, Annual costs, Multiple-purpose projects, Resource allocation, Project planning, Flood control, Watershed management.

Congressman Jack Kemp of New York speaks to the Congress on the Great Lakes and Water Resource Projects for Erie County, N.Y. Included in the Record is testimony before the Agricultural Environmental and Consumer Protection Subcommittee of the House Committee on Appropriations, and testimony before the Subcommittee on Public Works of the same Committee. Congressman Kemp discusses projects including flood control in the Scajaquada watershed, Great Lakes Saint Lawrence Seaway Navigation Season Extension, and miscellaneous water resource projects in Cayuga, Cazenovia, and Buffalo Creeks. Mr. Brandon, representing the New York State Urban Development Corporation, urges favorable action by the Subcommittee on Public Works on expediting the Ellicott Creek flood control project in New York State. (Widman-Florida)
W72-12588

GREAT LAKES POLLUTION: A FRAMEWORK FOR ACTION,
Queen's Univ., Kingston (Ontario). School of Law.
For primary bibliographic entry see Field 05G.
W72-12589

POLLUTION PREVENTION IN THE ARCTIC-NATIONAL AND MULTINATIONAL APPROACHES COMPARED,
For primary bibliographic entry see Field 05G.
W72-12590

NEW DIRECTIONS IN WATER QUALITY MANAGEMENT: A PROPOSAL FOR WISCONSIN,
Wisconsin Senate, Madison.
For primary bibliographic entry see Field 05G.
W72-12591

TOWARD A STATE REMEDY FOR OIL SPILL DAMAGES: AN INSURANCE APPROACH.
For primary bibliographic entry see Field 05G.
W72-12592

SEABED BOUNDARIES BETWEEN COASTAL STATES: THE EFFECT TO BE GIVEN ISLES AS 'SPECIAL CIRCUMSTANCES',
N. Ely.
International Lawyer, Vol 6, No 3, p 219-23 1972. 13 ref.

Descriptors: *Boundaries (Property), *Continental shelf, *International law, *Ownership of beds, Continental margin, Boundary disputes, Legal aspects, Coastal areas, Islands, Marine geology, Law of the sea.

The question explored is whether a state which owns a small island off its mainland coast or off the coast of its neighbor may demand that the coastline of its islet, rather than its mainland, be the baseline from which the seabed boundary will be computed. It seems clear that recognition must be given to an islet, no matter how small, that is so close to, and identified with, a mainland or a major island as to be fairly included in the system of straight baselines uniting it with that major land mass. Isolated islands, irrespective of size, which are not only too distant to be in contact with

contiguous zone envelope of their owner's territories, and which are uninhabited, should be disqualified. But an islet which is denied effect as a basepoint for the calculation of a median line as against an opposite coast, or the calculation of an equidistance line between adjacent states on the same coast, for demarcation of continental shelf boundaries, is to be accorded continental shelf rights in an area of the seabed and subsoil co-extensive with its 12-mile contiguous zone. (Walton-Florida)
W72-12593

EDERAL COMMON LAW AND INTERSTATE OLLUTION.
or primary bibliographic entry see Field 05G.
W72-12594

AW OF THE SEA NEGOTIATIONS 1971-197--FROM INTERNATIONALISM TO NAIONALISM,
ouisiana State Univ., Baton Rouge. Law School.
.G. Knight.
an Diego Law Review, Vol 9, No 3, p 383-389, 972.

escriptors: *International law, *Fish management, *Water pollution control, *Non-consumptive use, Coordination, Water law, United Nations, Water pollution, International waters, overnments, Political aspects, Water resources evelopment, Fisheries, Wildlife management, doption of practices.

this foreword to the Law of the Seas issue of e San Diego Law Review the articles presented e discussed as they relate to the three main areas the seabed question: fisheries management, pollion control, and nonextractive uses of the abed. Throughout these areas a trend away from ternational solutions to problems of ocean source development and conservation and ward nationalistic solutions is perceived. This nd is due to the ascendant nationalism of the veloping countries and the position of the nited States Department of Defense, which eks maximum mobility in the oceans. The artis on fisheries management contain proposals ared to the long-range objectives of internanal relations and cooperation, while the articles water pollution stress the issue of where to ace the emphasis and what objectives should be ven priority. A final area discussed is that of n-extractive uses of the seabed, which includes ch concepts as floating cities, giant port facilis, and underwater parks and aquatic preserver. idman-Florida)
72-12595

IE EFFICACY OF FEDERAL AND STATE NTROL OF WATER POLLUTION IN INTRAATE STREAMS,
rth Carolina Univ., Chapel Hill. School of Law.
r primary bibliographic entry see Field 05G.
'2-12596

FUSE ACT OF 1899--WILL IT CURB INDUSIAL WASTES.
r primary bibliographic entry see Field 05G.
'2-12597

CENT DEVELOPMENTS IN THE LAW OF E SEAS III: A SYNOPSIS,
E. Arledge, A. A. Nadir, and R. L. O'Connell.
n Diego Law Review, Vol 9, No 3, p 608-667, 2. 94 ref.

escriptors: *Law of the sea, *International law, eans, *Legal review, Legal aspects, Political ects, Fishing, Exploitation, Exploration, Oil ls, Water pollution sources, Continental shelf, nership of beds, Ships, Commercial fishing, Drilling, Mining, Water pollution, Environmental effects, United Nations, Navigation.

This synopsis encompasses events occurring between March 1971 and February 1972, which were of legal significance to the development of the law of the sea. Legislation affecting conservation is discussed concerning oceanfront zoning, powerplant operation, ocean studies, wetland protection, and offshore drilling regulation. Some of the problems with international conservation of ocean fishing are discussed. Undersea mineral extraction such as petroleum and magnesium present a continuing regulatory problem. Domestic pollution resulting from oil spills and a variety of statutes and law suits involving pollution regulation are analyzed including the Marine Protection Act, ocean dumping regulations, and Coast Guard Oil Spill Rules. Developments in international pollution problems, particularly marine oil pollution, are described. A wide range of legal problems associated with the shipping industry are presented. Conflicts between nations over territorial sovereignty limits have intensified in the North Atlantic fishing banks and off the coasts of South America. Developments concerning the international seabed are discussed including Soviet seabed study plans, the Treaty Banning Emplacement of Nuclear Weapons on the Seabed, Agreements on Seabed Boundaries between Australia and Indonesia, and meetings of the United Nations Committee on the Peaceful Uses of the Seabed. (Grant-Florida)
W72-12598

THE DONNYBROOK FAIR OF THE OCEANS,
D. P. Stang.
San Diego Law Review, Vol 9, No 3, p 569-607, 1972. 33 ref, 3 append.

Descriptors: *Law of the sea, *International law, *United Nations, *International commissions, Continental margin, Fishing, Fisheries, Commercial fishing, Exploration, Exploitation, Mining, Legal aspects, Political aspects, Political constraints, Legal review, Regulation, Coasts, Water pollution, Research and development, Treaties, Oceans.

The existing law of the sea is embodied in four Geneva conventions of 1958 dealing with the territorial sea and contiguous zone, the high seas, continental shelf, and fishing and conservation. This body of law is under much pressure as developing nation-states emerge and technology creates pollution and enables nations to exploit undersea resources at greater depths. Items in need of reevaluation include the limits of the territorial sea, the precise limits of the continental shelf, regulation of foreign fishing fleets by coastal states, regulation of marine pollution by foreign states near a coastal state, regulation of foreign scientific research by coastal states, exploitation rights, and the method of controlling exploitation. A major difference of viewpoint exists between developed and developing coastal states and between coastal and landlocked states. The political aspects of the bloc of developing nations led by Red China are discussed. The courses of action and points of discussion that are likely to develop at the upcoming 1973 United Nations Seabed Committee are also analyzed. (Grant-Florida)
W72-12599

BRIDGING THE GAP TO INTERNATIONAL FISHERIES AGREEMENT: A GUIDE FOR UNILATERAL ACTION,
Oregon Univ., Eugene. School of Law.
J. L. Jacobson.
San Diego Law Review, Vol 9, No 3, p 454-490, 1972. 121 ref.

Descriptors: *Fish management, *International law, *Water resources development, *Adoption of practices, Exploitation, Management, Regulation, Fishing gear, Marine fisheries, Water law, Water pollution, Commercial fishing, Decision making, Fisheries, Fishing, Water management (Applied).

A basic assumption is made that at least a few coastal nations will soon take unilateral action in the seas, ostensibly for the sake of conserving valuable food resources endangered by overfishing or pollution. Protective action by the coastal states must: (1) be a response to a demonstrable conservation crisis, (2) be concerned solely with protection of the endangered resource, (3) not unreasonably discriminate on the high seas against nationals of other nations, (4) carry an automatic termination date, and (5) be accompanied by a clear call for international agreement. Overexploitation and the desirability of an international agreement are discussed. The immediate solution is seen as careful unilateral action of various forms. Major obstacles and difficulties include legal obstacles under international law; difficulties in formulation of management methods, which include quotas, gear restrictions, limited entry, season restrictions, and area restriction; enforcement problems; and risk of over-response by other nations. (Widman-Florida)
W72-12600

A SECOND LOOK AT UNITED STATES FISHERIES MANAGEMENT,
Miami Univ., Fla. School of Law.
T. A. Clingan, Jr.
San Diego Law Review, Vol 9, No 3, p 432-453, 1972. 32 ref.

Descriptors: *Fisheries, *Fish management, *United States, *Regulation, Planning, Expansion, Decision making, Water resources development, Programs, Administrative agencies, Water management (Applied), Fishing, Fishing gear, Marine fisheries, Commercial fishing, Management.

An overview of United States fisheries management is presented, including a brief report on the status of fishing and fisheries. U.S. fisheries, in terms of total catch, will probably not expand dramatically in the foreseeable future, while the demand for fish products will remain high. In the section on international management programs and problems the several basic patterns taken by fisheries as identified by Larkin and Larkin's proposal to meet the problems here are discussed. Domestic goals for fisheries management are discussed also. National guidelines should include only the three basic biological, economic, and social factors, with the precise balance being worked out as close to the working level as possible, and with participation by decision makers having strong industry representation. In the section on mechanisms for fisheries such topics as gear, season length, quotas, and limitation of entry are discussed. A structure is proposed for a U.S. management/regulation system and the need for assistance programs in this area is described. (Widman-Florida)
W72-12601

PROPOSAL FOR A DEMONSTRATION WATER QUALITY MANAGEMENT PROGRAM ON THE HOLSTON RIVER IN EASTERN TENNESSEE,
Cornell Univ., Ithaca, n.y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-12602

TORTIOUS WATER AND LAND USE IN THE BIG CYPRESS SWAMP,
For primary bibliographic entry see Field 04A.
W72-12605

SUPREME COURT DECLINES ORIGINAL JURISDICTION IN LAKE ERIE POLLUTION CASE,
For primary bibliographic entry see Field 05G.

W72-12606

ESTABLISH A DEPARTMENT OF NATURAL RESOURCES.

Hearing--Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, January 28, 1972. 161 p.

Descriptors: *Administrative agencies, *Legislation, *Natural resources, *Energy, Adoption of practices, Economics, Federal government, Federal jurisdiction, Administration, political aspects, Social aspects, Legal aspects.

Testimony before the Senate Interior and Insular Affairs Committee is presented on the proposal to create a Department of Natural Resources. Specifically testimony relates to the Nation's energy supply and to the administrative organization within the new department for managing the Nation's energy supplies. The new department would consist of various agencies from the Departments of Interior and Transportation and certain functions of the Atomic Energy Commission. Discussion concerns the feasibility of and advantages of such an organization and the organizational and management problems presented. The Appendix includes a position paper on the Energy and Mineral Resources Administration in the proposed Department of Natural Resources and a proposed bill to create such a department. (Grant-Florida)
W72-12607

SECTION 169 OF THE INTERNAL REVENUE CODE: AN INCOME TAX SUBSIDY FOR THE CONTROL OF POLLUTION,
Northeastern Univ., Boston, Mass. School of Law.
For primary bibliographic entry see Field 05G.
W72-12608

SAVING THE LAND-WATER EDGE FROM RECREATION, FOR RECREATION,
Fordham Univ., Bronx, N.Y. School of Law.
L. A. Teclaff, and E. Teclaff.
Arizona Law Review, Vol 14, No 1, p 39-64, 1972. 125 ref.

Descriptors: *Recreation, *Environmental effects, *Coasts, *Common law, Public rights, Navigation, Riparian rights, Appropriation, Federal government, State governments, Comprehensive planning, Water resources development, Adoption of practices, Recreation facilities, Balance of nature, Legislation, Conservation.

Water-based recreation depends heavily on the land-water edge and is exacting a significant toll from this ecologically fragile area. The nature of the recreational threat to the land-water edge is examined. The effects of common law water rights such as public rights and navigability, alienation of trustland under navigable waters, and riparian and appropriation doctrines are discussed. Both federal and state governments have encouraged the public use of the edge, but these governmental acquisitions represent only a tiny inroad into the amount of privately held land located in the edge zone. Legal constraints on the use of the edge are examined including the Wild and Scenic Rivers Act of 1968; the Rivers and Harbors Act of 1899; the Fish and Wildlife Coordination Act; the National Environmental Policy Act; state plans such as the San Francisco Bay Plan, Wisconsin's shoreland zoning system, and the Tahoe Basin Compact; the 1969 proposals of the Commission on Marine Science, Engineering, and Resources; and the proposed National Land Use Policy Act of 1971. Possible solutions are advanced for resolving the conflict between use and conservation of the edge. (Widman-Florida)
W72-12609

REGIONAL WATER SUPPLY PLANNING ACT.
N.C. Gen. Stat. secs. 162A-20 thru 162A-25 (Supp. 1971).

Descriptors: *Legislation, *North Carolina, *Water supply, *Planning, *Financing, Local governments, State governments, Water resources development, Project planning, Regions, Legal aspects, Administrative agencies, Administration, Economies of scale, Efficiencies, Governmental interrelations, Comprehensive planning, Water supply development.

The needs for regional water supply systems in North Carolina are outlined. A regional water supply system is defined. State government functions with respect to coordinated functions include identification of major sources of raw water supply for regional systems, identification of areas for development of regional systems, establishment of regionalization priorities, development of plans for connecting regional systems to major supply sources, review of plans to insure compatibility, administration of a state program of financial assistance, and provision for technical assistance to local and regional agencies. A revolving fund is established in the Department of Administration for the purpose of making advances to local governments for advance engineering planning. Conditions for granting advances include suitability of the proposed area for regional water supply development, assurance of the applicant of long-range planning to meet needs for high quality regional water service, coorination of land and water supply planning, and employment by the applicant of a licensed engineer to prepare a comprehensive water supply plan to coordinate various technical aspects. Additionally the applicant must show reasonable availability of construction funds and reasonable assurance that the project will be undertaken. (Grant-Florida)
W72-12610

WATER BANK PROGRAM.
Federal Register, Vol 37, No 99, p 10337-10341, May 1972.

Descriptors: *Wetlands, *Migratory birds, *Waterfowl, *Regulation, Legislation, Water allocation (Policy), Administrative agencies, Legal aspects, Social aspects, Institutions, Flood control, Erosion, Water quality control, Surface waters, Adoption of practices, Wildlife, Water conservation.
Identifiers: *Water Bank Act.

Regulations are issued for the Water Bank Program for 1972 pursuant to the Water Bank Act, 16 U.S.C. 1301. The regulations set forth the terms and conditions under which persons in selected areas having wetlands with a high potential for migratory waterfowl nesting and breeding may enter into 10 year agreements with the Secretary of Agriculture. Under the agreements annual payments are made for the conservation of water on specified wetlands. The specified wetlands are developed in cooperation with the local Soil and Water Conservation District. The program is designed to conserve surface waters, preserve waterfowl habitat, reduce erosion, and contribute to flood and water quality control. The regulations cover the following areas: administration, geographical applicability, eligibility, use of designated land, agreement provisions, monitoring, compliance, payments, prohibited practices, amendments of agreements, successors-in-interest, and other legal ramifications of the program. (Grant-Florida)
W72-12611

THE RESTORATION OF A RIVER,
J. G. Mitchell.
Saturday Review, Vol 55, p 35-37, April 8, 1972. 2 photo.

Descriptors: *Hudson River, *Water quality [illegible]trol, *Rivers and Harbors Act, *Legal asp[illegible] Penalties (Legal), Administrative agencies, A[illegible]tion of practices, Pollution abatement, Poll[illegible] identification, Municipal wastes, Federal gov[illegible]ment, State governments, Social asp[illegible] Economic feasibility, Heated water, W[illegible] resources development, New York.

The Hudson River cleanup began when a $1 bi[illegible] New York State bond issue was passed for a [illegible] wide Pure Waters Program. Although econc[illegible] political, and organizational barriers have pr[illegible] immense, citizen groups and the law have be[illegible] increasingly active. The Refuse Act of 189[illegible] been particularly useful in this area. The [illegible] prohibits the unlicensed dumping of wastes [illegible] navigable waterway, provides for violators [illegible] fined, and stipulates that part of the fine be tu[illegible] over to the person or persons who supplie[illegible] evidence leading to conviction. Cleaning u[illegible] river's direct industrial discharges is just a [illegible] however, as indirect discharge of industrial w[illegible] continues barely abated. Cleaning up muni[illegible] pollution itself remains a problem. Because fe[illegible] funds are scarce New York State has been fo[illegible] to prefinance the federal share, which has sh[illegible] decreased the state's own funds. The most [illegible] plicated problem is the increasing potentia[illegible] overloading the river with waste heat from p[illegible] plants. Additionally, current water reso[illegible] development plans may endanger the Hud[illegible] headwaters in the Adirondacks. (Widman-Flo[illegible]
W72-12612

SHOWDOWN ON DELAWARE BAY,
S. Lindsay.
Saturday Review, Vol 55, p 34, 36-39, March[illegible] 1972. 1 map, 3 photo.

Descriptors: *Coastal structures, *Pe[illegible] *Delaware, Legislation, Water management[illegible] plied), Coastal marshes, Comprehensive plan[illegible] Administrative agencies, Adoption of practi[illegible] Regulation, Political aspects, Social aspects, [illegible] governments, Water resources develop[illegible] Delaware River, Coasts.

In 1971 Delaware attracted nationwide atte[illegible] by its Coastal Zone Act, which barred [illegible] manufacturing industry from locating in a two[illegible] wide strip along the state's coastline. It s[illegible] cally banned oil refineries, petrochemical [illegible] plexes, basic steel and paper mills, and mari[illegible] minals for the transshipment of liquid and [illegible] bulk materials. It welcomed under a permit s[illegible] such nonpolluting enterprises as automobi[illegible] sembly plants, and garment, jewelry, and le[illegible] goods factories. In this interview Governor [illegible] son of Delaware discusses the importance [illegible] Delaware Bay and River to the major East [illegible] markets. The interview also examines the qu[illegible] of whether to use the same land for recreation[illegible] tourism or industry, the possibility of all [illegible] offshore oil terminals in the future, the ener[illegible] mand, and the radioactive waste disposal pro[illegible] The Governor also discusses control over c[illegible] development for tourism and recreation, p[illegible] tion growth, siting of oil refineries and ste[illegible] paper mills, the conflict between growth a[illegible] vironmental protection, the future of Dela[illegible] the possibility of a national policy concernin[illegible] use and energy growth, and the role of the p[illegible] citizen in this area. (Widman-Florida)
W72-12613

NATURAL RESOURCES DEFENSE COU[illegible] V. MORTON (SCOPE OF APPLICATIO[illegible] NATIONAL ENVIRONMENTAL POLICY [illegible]
458 F.2d 827-846 (D.C. Cir. 1972).

Descriptors: *United States, *Administrativ[illegible] sions, *Oil pollution, *Environmental e[illegible] Legal aspects, Legal review, Legislation, J[illegible] decisions, Decision making, Administrative[illegible]

, Regulation, Oil industry, Federal govern-
t, Adjudication procedure, Water law, Ad-
istration, Water pollution, Water pollution
ces, Oil spills, Beds under water, Water
urces development.
tifiers: *National Environmental Policy Act.

tiff conservation group brought suit for a
minary injunction against defendant Interior
rtment to prevent an oil and gas lease sale of
s to some eighty tracts of submerged lands.
ndant initiated the sale and filed an environ-
tal impact statement. Plaintiffs contended that
tatement failed to give adequate consideration
ternatives. Defendant contended that the Na-
l Environmental Policy Act does not require
ct statements to discuss environmental con-
ences of suggested alternatives, that alterna-
which are not complete solutions to the
lem do not have to be included, and that an al-
tive requiring legislative implementation is
nd the scope of the impact statement. The
d States Court of Appeals for the District of
mbia held that Congress in enactment of the
nal Environmental Policy Act contemplated
mpact statements would constitute sources of
mation for making relevant decisions as to
ation of benefits of proposed projects in light
vironmental risks. The court held that the In-
Department, to comply with NEPA, must
nt alternatives and environmental risks in-
t to such alternatives. The court denied the
n for reversal of the lower court's decision.
pts from the impact statement are included
appendix. (Brackins-Florida)
12614

N\CT...PROVIDING FOR THE POSTING, N FORFEITURE...OF A BOND BY ANY VES- IN OR ENTERING UPON THE WATERS HE STATE FOR THE PURPOSES OF HARGING OR RECEIVING A CARGO OF BULK OIL IN THE STATE.

and Laws ch. 504 (1971). *Maryland, *Water
ion control, *Legislation, *Water pollution
s, Abatement, State governments, Adminis-
: agencies, Water law, Navigable waters,
ater, Oil wastes, Water quality control, Pol-
abatement.

er 504 provides for the posting and forfei-
n certain conditions, of a bond by any ves-
or entering upon the waters of the state for
rposes of discharging or receiving a cargo of
lk oil. The Act also provides that the com-
ory fee collectible from a person responsi-
oil spillage shall cover the cost of eliminat-
residue of oil spillage and the cost of restor-
as damaged to their original condition. This
nsatory fee shall be charged and collected
Maryland Port Authority and the Depart-
f Natural Resources. Any person responsi-
oil spillage shall be liable to any other per-
any damages to his real or personal proper-
ctly caused by the spillage. (Waldron-
)
615

T...FOR THE PRESERVATION AND IM- MENT OF THE POTOMAC RIVER

od Laws ch. 30 (1971).

tors: *River basin development, *Water
e, *Maryland, *Water quality control,
aw, Local governments, River basin com-
s, District of Columbia, Flood control,
g, Recreation facilities, Water resources
ment, Long-term planning, Legislation,
government, State governments, Adminis-
gencies, Droughts.
ers: *Potomac River Basin.

The Potomac River Basin has experienced many years of drought which severely damaged the productivity of agriculture and drastically reduced the flow of the river, threatening water supplies throughout the basin and particularly in the Washington metropolitan area. For these and other reasons the President asked the Secretary of the Interior to work with the affected state and local governments and the District of Columbia to prepare a program which would include provisions for cleaning up the river, protecting its natural beauty, and providing adequate recreational facilities. These interested parties formed the Potomac River Basin Advisory Committee. The Committee prepared a draft of an interstate-federal compact calling for the creation of the Potomac River Basin Commission. Senate Bill 91 presents this compact to the Maryland legislature for approval. The Bill also provides that the Maryland Potomac Water Authority shall be kept regularly informed of the activities of the Potomac River Basin Commission and shall have continuous opportunity to advise the Maryland member of the Commission. (Waldron-Florida)
W72-12616

AN ACT...TO AUTHORIZE A WATER POLLUTION ABATEMENT GRANT PROGRAM.

Laws of Mississippi ch. 456 (1971).

Descriptors: *Grants, *Water pollution control, *Legislation, *Mississippi, Abatement, Financing, Administrative agencies, Water law, State governments, Local governments, Construction costs, Sewage treatment, Waste treatment, Financing.

House Bill 81 amends the Mississippi Code of 1942 to designate the Mississippi Air and Water Pollution Control Commission as the administering agent for the state's water pollution abatement program; to delete expired provisions; to authorize a water pollution abatement grant program; and for related purposes. The water pollution abatement grant program shall make grants available for construction to any political subdivision legally authorized to own, maintain and operate a sewage, industrial waste or other waste collection, transport, treatment and disposal program. No recipient shall receive from state funds any grant in excess of 25% of the cost of construction. No grant shall be made via this act unless the project is in conformity with the State Water Pollution Control Plan and has been certified by the Air and Water Control Commission as entitled to priority over other eligible projects. Grants-in-aid of construction in amounts of $500,000 or less shall be made to the eligible political subdivision immediately upon approval of the award by the appropriate federal agency or agencies. (Waldron-Florida)
W72-12617

AN ACT TO AMEND IC 1971, 13-1-6, CONCERNING WATER POLLUTION CONTROL.
Indiana Laws no 176 (1971).

Descriptors: *Treatment facilities, *Indiana, *Legislation, *Water pollution control, Water treatment, Administrative agencies, Public health, Waste treatment, Water distribution (Applied), Public utilities, Permits, Operation and maintenance.

Public Law No. 176 amends the former law to provide that the state health commissioner shall classify all water and wastewater treatment plants and water distribution systems actually used or intended for use. Classification shall take due regard of the size, type, character of wastes or water to be treated, and other physical conditions affecting such treatment plants and distribution systems. The commissioner shall certify persons as to their qualifications to supervise successfully the operation of water or wastewater treatment plants and water distribution systems. The commissioner may revoke the certificate of an operator following a hearing before the commissioner or designated representative. After July 1, 1972, all water or wastewater treatment plants and water distribution systems, whether publicly or privately owned, must be under the supervision of an operator whose competency is certified by the commissioner. (Waldron-Florida)
W72-12618

TOWN OF HEMPSTEAD V. OCEANSIDE YACHT HARBOR, INC. (UPLAND OWNER'S RIGHT OF ACCESS).
328 N.Y.S.2d 894-898 (App. Div. N.Y. 1972).

Descriptors: *Right-of-way, *Riparian rights, *Marinas, *New York, Judicial decisions, Legal aspects, Access routes, Public access, Reasonable use, Recreation, Water law, Navigation, Trespass, Adjacent landowners, Piers, Boundaries (Property), Navigable waters.

Plaintiffs sued to recover reasonable rental for the use and occupation of their underwater land by defendant in the operation of its business as a marina. By colonial grants plaintiffs are the owners of the land under water adjacent to the upland owned by defendant, upon which upland is erected a bulkhead from which ramps are attached to floating docks. Plaintiffs claimed that defendant, through the construction of the mooring slips, went beyond the riparian rights of an upland owner and trespassed on plaintiffs' rights. Defendant contended that his riparian rights included the activity in which he engaged. The lower court found the plaintiffs; the Appellate Division reversed and held defendant had the right to maintain the docks. The court stated that defendant had a right of access to and from the channel over plaintiffs' offshore, as long as exercised in a reasonable manner. This right included the power to build a pier or dock for the use of the public or owner. The right of access may be shared with others for purposes unrelated to use of the upland, not to extend to purposes extrinsic to commerce and navigation. The upland owner may erect more than one dock, as long as not unreasonable, and lease these to third parties. The rental of mooring slips to the public did not constitute an unreasonable exercise of dominion over underwater land in view of the state policy toward encouragement of development of waterfronts. (Ilkson-Florida)
W72-12619

UNITED STATES V. GENOA COOPERATIVE CREAMERY CO. (REFUSE ACT SEWAGE EXCEPTION).
336 F. Supp. 539-542 (W. D. Wis. 1972).

Descriptors: *Navigable rivers, *Waste disposal, *Sewage, *Industrial wastes, *Rivers and Harbors Act, Judicial decisions, Sewers, Water pollution, Industrial plants, Wastes, Navigable waters, Mississippi River, Legal aspects, Law enforcement, Water law, Municipal wastes, Water pollution sources, Legislation, Food processing industry, *Wisconsin.

Defendant company is charged with discharging milk wastes from its creamery into the Mississippi River, a navigable river, in violation of the Rivers and Harbors Appropriation Act. The discharged liquid contained milk wastes and wash water with suspended solids from the rinsing of the floor, vats and utensils of the creamery. Defendant claimed that the refuse matter it discharged was within the exception to the Act's proscription: 'other than flowing from streets and sewers and passing therefrom in a liquid state into any navigable water'. Defendant alleged that its underground tanks and pipes constituted a sewer from which its refuse flowed in a liquid state although containing suspended solids. Therefore, defendant reasoned, its refuse was exempt from penalty. The United States District Court found that defendant's

discharge was refuse matter and that not all refuse flowing from sewers in a liquid state is exempt, but only that which is actually sewage, that is, human, animal and domestic wastes as distinguished from industrial wastes. Thus, even assuming in the instant case that defendant's discharge system was a sewer discharging matter in a liquid state, the refuse matter it discharged was not within the exemption since it was not sewage. Navigation need not be impaired for there to be a violation of the Act. Defendant was adjudged guilty. (Ilkson-Florida)
W72-12620

LAND SUBDIVISIONS--MUNICIPAL REGULATIONS.
Maine Public Laws ch 454 (1971).

Descriptors: *Maine, *Legislation, *Land use, *Planning, Waste disposal, Sewage disposal, Municipal wastes, Solid wastes, Water pollution, Water pollution control, Water supply, Legal aspects, Regulation, Administration, Local governments, Urbanization, Erosion, Land management, Law enforcement.

The Act provides that no land in a subdivision may be conveyed or offered or agreed to be conveyed without the approval of the proper local officials. When reviewing subdivisions for approval, consideration shall be given to a specified list of criteria, including whether the proposed subdivision will result in undue water pollution, considering the ability of the soils and streams to support waste disposal; whether there will be an unreasonable burden on the water supply; soil erosion or reduction in the ability of the land to hold water; whether the subdivision will provide for adequate solid and sewage waste disposal, or if municipal services are to be used, whether it will cause an unreasonable buden on the municipality's ability to dispose of its wastes. Approval for subdivisions situated within 250 feet of any pond, lake, river, or tidal waters, must consider whether the proposed subdivision would adversely affect the quality of such body of water or unreasonably affect the shoreline of such body of water. Provisions are included for fines and injuctions for enforcement of the Act. (Brackins-Florida)
W72-12621

ENVIRONMENTAL IMPROVEMENT COMMISSION LAW.
Maine Public Laws ch 461 (1971).

Descriptors: *Maine, *Water pollution sources, *Permits, *Waste disposal, *Legislation, Legal aspects, Water law, Sewage disposal, Municipal wastes, Industrial wastes, State governments, Water quality, Water quality standards, Water quality control, Water pollution, Monitoring, Waste dilution, Riparian rights, Regulation.

The Act provides that no one shall discharge any waste, refuse, effluent or sewage into any water without obtaining a license therefor from the Environmental Improvement Commission. Exemptions will be granted for municipal waste discharges as the same existed on September 1, 1959, and for other discharges as such discharge existed in quality or quantity on August 8, 1953. Exemptions may be lost by changes in quantity or quality of discharge or by transfer of ownership of the source. All exemptions will be void on October 1, 1976. The Commission shall issue a license upon a finding that the discharge will receive the best practical treatment and that it will not lower the water quality of the receiving body below its classification, or the classification which the Commission expects to recommend for it. Procedure for license application is included with provisions for notice and a public hearing. The Commission is delegated authority for inspections and monitoring of sources. No riparian owner shall have a cause of action against any licensee unless the licensed discharge will either of itself or in combination with existing discharges lower the statutory classification of said body of water and cause actual damages to such owner. (Brackins-Florida)
W72-12622

COASTAL WETLANDS--PROTECTION.
Maine Public Laws ch 541 (1971).

Descriptors: *Maine, *Legislation, *Coastal marshes, *Estuaries, *Wetlands, Coastal plains, Legal aspects, Water law, Local governments, Eminent domain, Administration, Dredging, Sewage disposal Water pollution, Water resources development, Administrative agencies, Water policy, Penalties (Legal).

The Wetlands Control Board may adopt orders regulating, restricting, or prohibiting dredging, filling removing or altering of any coastal wetland or draining or depositing sanitary sewage or any other pollutant on any coastal wetland. Provisions are included for notice and hearing to any affected party. Copies of any such order shall be recorded in the registry of deeds for the county in which said wetlands are located and mailed to each affected landowner. The exclusive procedure for appeals is through the Superior Court in the proper county. If a decree has been entered providing that an order of the Board shall not apply to the wetland involved in any appeal, then the Board may provide for the acquisition of the wetland by eminent domain if it determines the acquisition is justified by an emergency situation posing a threat to the public safety, health and welfare, to the protection of public or private property, to public or private salt water supplies or to estuarine or marine fisheries. Provisions are included for fines and injunctions in the event of violations of the Act or an order of the Board. (Brackins-Florida)
W72-12623

SANITARY WATER BOARD V. HARMAR COAL CO. (APPLICATION OF CLEAN STREAMS LAW TO DRAINAGE OF MINES).
285 A.2d 898-904 (Commw. Ct. Pa. 1972).

Descriptors: *Administrative agencies, *Pennsylvania, *Coal mine wastes, *Mine water, Judicial decisions, Water law, Mine drainage, Water pollution sources, Legislation, Stream improvement, Appeals, Legal review, Legal aspects.

Plaintiff coal company sought to obtain a permit to pump water from an adjacent inactive mine. Plaintiff did not own the inactive mine, but the accumulation of water in the adjacent mine posed a threat to its mine. Plaintiff obtained a permit from the Department of Health to pump the water into a creek. The Sanitary Water Board disapproved the permit. The Board's administrative decision was reversed as it was held to be unsupported by substantial evidence. The Commonwealth Court of Pennsylvania also held that the Clean Streams Law applies only to mine operators who own the mine from which the water is pumped. The court noted that no aquatic study was made by the Board. The court stated that the Board must present convincing evidence when it refusesa permit. The Board's own report showed that if the pumping ceased, the abandoned mine would fill more rapidly than plaintiff's mine and a ground water discharge would result into the same stream into which the water was then being pumped. (Waldron-Florida)
W72-12625

TOWNSHIP OF SALISBURY V. VITO (RIGHT OF LANDOWNER TO MAINTAIN POND).
285 A.2d 529-532 (Pa. 1971).

Descriptors: *Pennsylvania, *Municipal water, *Overflow, *Judicial decisions, Cities, Legislation, Right-of-way, Highways, Drainage, Farm ponds, Watercourses (Legal), Streams, Appeals Ponds.

Plaintiff town, pursuant to a statute, sought to en join defendant landowners from discharging wate onto a city road. The statute provided that no per son shall interfere with any drain, ditch, water course, or drainage facility in a township withou first submitting suitable plans to the township commission. Defendants dug two ponds on thei property. Even on dry days one of the ponds over flowed its banks onto the city road. The pond an a fence encroached upon the right-of-way of th road. Defendants channeled water into the pon from a stream flowing on or close to defendants land. The lower court, upon a plea by plaintiff fo general relief, had ordered defendants to fill i their pond, even though plaintiff had not aske specifically for this relief. The Supreme Court o Pennsylvania perpetually enjoined defendant from discharging water from their land onto public road, from diverting water into their pond and from interfering with the flow of the strea The chancellor's requirement that defendants fi in their pond was overruled. Any part of a chancel lor's decision must be supported by the record The defendants were held to have the right t maintain a proper pond on their premises. (Wa dron-Florida)
W72-12626

HILTON V. SPECIAL BOARD (AUTHORITY O SPECIAL BOARD TO ALLOW LANDFILL AN CONSTRUCTION OF PIER).
284 A.2d 917-920 (N.H. 1971).

Descriptors: *New Hampshire, *Lake shore *Administrative agencies, *Jurisdiction, Swamp Judicial decisions, Appeals, Water law, Permit Beaches, Piers, Recreation facilities, Land owne ship, Water rights, Avulsion, Land forming.

The owner of land adjacent to a public lak received permission from the Special Board to f certain swampy areas along the shore of the lak for the purpose of creating a beach and building pier which would provide docking facilities f thirty boats. Plaintiffs objected to the approv plan and appealed, claiming that defendant Speci Board had misconstrued its authority. Plaintiffs a gued that the adjacent landowners proposed acquire land from the public waters and shou have petitioned the Governor and Council. T court held that the permit granted, as far as t proposed beach was concerned, would not rest in the acquisition of land from public waters a therefore was properly considered by the Spec Board. However, the court held that the Spec Board exceeded its jurisdiction by granting a p mit for construction of the pier. The court in mated that only the Governor and Council cou grant a permit for such a large pier. (Waldro Florida)
W72-12627

CITY OF COLUMBUS V. FARM BURE COOPERATIVE ASS'N. (LIABILITY FOR A TERATION OF DRAINAGE THROUG EMINENT DOMAIN).
273 N.E.2d 888-893 (Ct. App. Ohio 1971).

Descriptors: *Easements, *Judicial decisio *Eminent domain, *Urban drainage, *Culver Legal aspects, Appropriation, Flooding, Draina Runoff, Conveyance structures, Drains, Surf drainage, Ditches, Urban runoff, Storm runo Floodflow, *Ohio.

Plaintiff city appropriated land from defend landowner for a new and larger drainage culv Drainage waters from plaintiff's present culv flowed naturally across defendant's land thro an existing ditch. Only a small portion of def dant's property would be taken for the impro ment. Defendant contended the changes cont

plated would so accelerate the flow as to cause flooding of its property and that it should be awarded damages accordingly. The Ohio Court of Appeals held that the city had a right to improve the existing ditch so as to increase the volume and accelerate the flow of water without becoming liable to defendant for consequential damages to the residue of defendant's land, such damages being damnum absque injuria. But since plaintiff was taking another portion of defendant's land, the consequential damages become compensable. Therefore, the judgment of the trial court was reversed and the case remanded for a new trial. (Brackins-Florida)
W72-12629

UBDIVISION PLANNING THROUGH WATER EGULATION IN NEW MEXICO,
New Mexico Univ., Albuquerque. Coll. of Law.
For primary bibliographic entry see Field 04C.
W72-12831

VATER CENTER ORGANIZATION AND ANAGEMENT,
ennsylvania State Univ., University Park. Inst. or Research on Land and Water Resources.
or primary bibliographic entry see Field 06B.
/72-12954

F. Nonstructural Alternatives

HE USE OF DETAILED SOILS INFORMATION FOR DELINEATING AND REGULATING LOOD PLAINS: LEGAL AND ADMINISTRATIVE CONSIDERATIONS,
Visconsin Univ., Madison. Water Resources enter.
. A. Yanggen.
vailable from the National Technical Information Service as PB-211 324, $3.00 in paper copy, 0.95 in microfiche. Wisconsin Water Resources enter, Technical Completion Report 1972. 66 p, 5 g, 6 append. OWRR B-002-WIS (13).

escriptors: *Flood plain zoning, *Flood plains, Flood stages, *Indirect flood measurement, *Regional flood, *Legislation, *Water law, *Soil orizons, *Soil classification, *Soil formation, oil surveys, *Wisconsin.
entifiers: *Soil maps.

he preferred method for establishing flood zones by means of detailed engineering flood predicons and hydraulic studies; however, there are uations where such studies will be delayed for a mber of years. Rather than not regulate areas ch as scattered flood plains used for recreation d agriculture, detailed soil survey information n be used, especially in mature landscapes, to lineate regulatory flood hazard areas. Unfortutely interpretation of the flood plain area is less curate in glaciated areas with broad flat flood ins or where man-made obstructions have anged the natural stream flow. Subject to these nitations, soils information can be used to lineate the boundaries of the regulatory flood in to an acceptable degree of accuracy. The al considerations relevant to flood plain zoning, well as the advantages and limitations of using ls information for establishing flood plains are ntified. Wisconsin law requires counties, cities d villages to adopt effective flood plain zoning linances, and the code recognizes the use of tailed soil maps for delineation of flood areas. the 30 counties that have adopted ordinances, counties have used the detailed soil survey as predominant method for delineation in rural as. (See also W72-12655) (Kerrigan-Wisconsin)
72-12654

VELOPMENT OF NEW TECHNIQUES FOR LINEATION OF FLOOD PLAIN HAZARD ZONES - PART I: BY MEANS OF DETAILED SOIL SURVEYS - PART II: BY MEANS OF AIR-PHOTO INTERPRETATION,
Wisconsin Univ., Madison. Water Resources Center.
G. B. Lee, D. E. Parker, D. A. Yanggen, and C. J. Milfred.
Available from the National Technical Information Service as PB-211 325, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Technical Completion Report, 1972. 90 p, 5 fig, 14 tab, 39 ref. OWRR B-002-WIS (14).

Descriptors: *Flood plain zoning, *Land use, *Flood plains, *Historic floods, *Flood frequency, *Indirect flood measurement, Soil profiles, *Non-structural alternatives, *Alluvium.
Identifiers: *Soil interpretations, *Airphoto interpretations, *Soil maps.

Part I describes investigations designed to evaluate interpretations of detailed soil maps, as a means of determining flood plain boundaries for regulatory purposes. Part II describes similar studies based on interpretation of airphotos. Six Wisconsin sites were studied. Boundaries of 100 year floods determined by engineering methods were used as a basis of comparison. Results showed (Part I) that reasonably accurate boundaries of 100 year floods can be drawn in many places by interpretation of detailed soil maps. Greatest accuracy is achieved in relatively mature undisturbed landscapes. The method is low cost, rapid and particularly applicable to rural areas. It is recommended that the interpretation of maps be done by an experienced soil surveyor, that field checks be made, and that ancillary information be used to the fullest extent possible. Greater accuracy could be achieved by improved design of soil maps. Results of airphoto studies (Part II) showed that flood plain boundaries could also be drawn by interpretation of aerial photographs, in areas where physiographic features were distinct. Color and panchromatic imagery were equally accurate. Color allowed for more rapid interpretation. Land use regulations for floodplains delineated by interpretation of soil maps or airphotos should contain provisions for on-site investigations of questionable areas. (See also W72-12654) (Lee-Wisconsin)
W72-12655

6G. Ecologic Impact of Water Development

ENVIRONMENTAL MATTERS CONCERNING NUCLEAR ELECTRICAL POWER PRODUCTION,
Office of Environmental Affairs (AEC), Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-12461

METEOROLOGICAL EFFECTS OF THE HEAT AND MOISTURE PRODUCED BY MAN,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 05A.
W72-12464

A CASE STUDY: THE NATURE OF THE CONFLICT EXISTING BETWEEN ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN PUERTO RICO--THE APPROACH AND STRATEGY BEING DEVELOPED,
Puerto Rico Dept. of Public Works, San Juan.
For primary bibliographic entry see Field 06B.
W72-12478

SPOKANE RIVER PROJECT (DRAFT ENVIRONMENTAL STATEMENT).
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 08C.
W72-12603

GULF INTRACOASTAL WATERWAY, TEXAS SECTION, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W72-12604

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION--UNIT NO. 3, BEESLEY'S POINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08C.
W72-12628

DISTRICT OF COLUMBIA WATER POLLUTION CONTROL PLANT (EXPANSION AND UPGRADING), (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Philadelphia, Pa. Region III.
For primary bibliographic entry see Field 05D.
W72-12630

ECOLOGICAL IMPACT OF WATER RESOURCE DEVELOPMENTS,
Bureau of Reclamation, Denver, Colo.
D. A. Hoffman.
Bureau of Reclamation Report REC-ERC-72-17, June 1972. 28 p, 13 fig, 4 tab, 34 ref.

Descriptors: *Ecology, *Water quality, *Water resources development, *Highway effects, *Canal construction, *Reservoir operation, Bibliographies, Environmental effects, Planning, Aquatic environment, Fish, Natural resources, Hydraulic models, Spoil banks, Reservoirs, Natural resources, Limnology, Stream fisheries, Stream channels.
Identifiers: McClusky Canal, N. Dak.

Four papers describe a sequence of ecological impact analysis, ranging from predicting the consequences of planned management programs to descriptions and evaluations of ongoing programs. Use of preproject ecological surveys, bioassays, and laboratory scale models are described. Structures to increase fish habitat in changed river channels are evaluated; recommendations for increasing or maintaining the level of production in changed river systems are presented. These papers were presented at the symposium on Water, Man, and Nature, cosponsored by the Bureau of Reclamation and the American Institute of Biological Sciences at Colorado State University, Ft. Collins, Colo, August 30-31, 1971. (USBR)
W72-12668

WATER RESOURCES DEVELOPMENT IN THE MULLICA RIVER BASIN, PART I, BIOLOGICAL EVALUATION OF THE MULLICA - GREAT BAY ESTUARY,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
For primary bibliographic entry see Field 02L.
W72-12706

AGRICULTURE AS AN ENVIRONMENTAL FACTOR,
Norges Veterinarhoegskole, Oslo. Dept. of Microbiology and Immunology.
For primary bibliographic entry see Field 05B.
W72-12906

07. RESOURCES DATA

7B. Data Acquisition

TENNESSEE WATER QUALITY, SURFACE STREAMS.
Tennessee Water Quality Control Board, Nashville.
For primary bibliographic entry see Field 05A.
W72-12400

PROBLEMS OF EVAPORATION ASSESSMENT IN THE WATER BALANCE,
For primary bibliographic entry see Field 02D.
W72-12415

DIRECT METHODS OF SOIL MOISTURE ESTIMATION FOR WATER BALANCE PURPOSES,
For primary bibliographic entry see Field 02G.
W72-12417

SALINITY CALCULATIONS FROM IN SITU MEASUREMENTS,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 02L.
W72-12427

A PLEISTOCENE SUSQUEHANNA RIVER CHANNEL CONNECTS THE LOWER REACHES OF THE CHESTER, MILES, AND CHOPTANK ESTUARIES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W72-12428

INFILTRATION ANALYSIS II-SPRINKLING-PLOT ANALYSIS,
Ministry of Works, Wellington (New Zealand).
For primary bibliographic entry see Field 02G.
W72-12431

A METHOD FOR FORECASTING ANNUAL INFLOW OF WATER TO LAKE SEVAN (METOD PROGNOZA GODOVOGO PRITOKA VOD V OZERO SEVAN),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12439

MULTIDIRECTIONAL TURBULENCE PROBE DEVELOPMENT PHASE I - UNIDIRECTIONAL TURBULENCE SENSOR DEVELOPMENT.
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 02E.
W72-12453

COMPARISON OF THERMAL DATA FROM AIRBORNE AND VESSEL SURVEYS OF LAKE ERIE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 05A.
W72-12455

SATELLITE MEASUREMENT OF LAKE-SURFACE TEMPERATURES,
Allied Research Associates, Inc., Concord, Mass.
For primary bibliographic entry see Field 02H.
W72-12460

COLOR INFRARED (CIR) PHOTOGRAPHY: A TOOL FOR ENVIRONMENTAL ANALYSIS,
Dartmouth Coll., Hanover, N.H. Dept. of Geography.
For primary bibliographic entry see Field 05A.
W72-12487

LIGHT-SCATTERING PROFILES IN THE STRAITS OF FLORIDA,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.; and Miami Univ., Coral Gables, Fla. Optical Physics Lab.
For primary bibliographic entry see Field 05B.
W72-12488

THE INVERSE AUTOCORRELATIONS OF A TIME SERIES AND THEIR APPLICATIONS,
North Carolina Univ., Chapel Hill. Dept. of Statistics.
W. S. Cleveland.
Technometrics, Vol 14, No 2, p 277-293, May 1972. 11 tab, 12 ref.

Descriptors: *Correlation analysis, *Time series analysis, *Statistical methods, Mathematical studies, Equations, Quality control, Statistical models, Fourier analysis, Variability, Estimating.
Identifiers: *Time series, *Autocorrelations, Autoregression, Chemical concentration.

Autocorrelations of a time series were defined to be those which are associated with the inverse of the spectral density of a series and were calculated as the autocorrelations associated with the inverse of the spectral density estimate. Estimating inverse autocorrelations differed depending on whether autoregressive or periodogram smoothing methods of estimating the spectral density were used. The estimates of the inverse autocorrelations are used to assist in identifying a parsimonious, moving-average, autoregressive model for the series and to provide rough initial estimates of the parameters for an iterative search for the maximum of the likelihood function. The techniques of using inverse autocorrelations of a series are applicable to chemical process concentration readings. (Long-Battelle)
W72-12499

A SHORT LIFE TEST FOR COMPARING A SAMPLE WITH PREVIOUS ACCELERATED TEST RESULTS,
General Electric Co., Schenectady, N.Y. Research and Development Center.
W. Nelson.
Technometrics, Vol 14, No 1, p 175-185, February 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Regression analysis, *Statistical methods, Evaluation, Distribution, Temperature, Reliability, Mathematical models, Probability, Testing, Sampling, Mathematical studies, Equations, Quality control, Statistical models, Operations research, Statistics.
Identifiers: *Accelerated testing, Arrhenius model.

A statistical test for equality of the logarithmic means of two lognormal life distributions is presented for the situation where information on the first distribution is obtained from a regression analysis of accelerated life test data obtained at various temperatures and the information on the second distribution is the time to the first failure in a sample tested at a particular temperature. The test is based on the Arrhenius model. (Long-Battelle)
W72-12500

A DEVICE FOR REMOVING WATER OR MUD FROM SHALLOW WATER WELLS (USTROYSTVO DLYA UDALENIYA VODY ILI PUL'PY IZ NEGLUBOKIKH GRUNTOVYKH SKVAZHIN),
For primary bibliographic entry see Field 04B.
W72-12689

DETERMINATION OF THE WATER EQUIVALENT OF SNOW COVER--METHODS AND EQUIPMENT.
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-12697

PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 05B.
W72-12712

SELF-BALANCING BRIDGE FOR DIFFERENTIAL CAPACITANCE MEASUREMENTS,
Wayne State Univ., Detroit, Mich. Dept. of Chemistry.
D. H. Chidester, and R. R. Schroeder.
Analytical Chemistry, Vol 44, No 6, p 985-9, May 1972. 13 fig, 1 tab, 10 ref.

Descriptors: *Measurement, *Bridges (Electr, Capacitors, *Electrolytes, *Adsorption, Mercu, Aqueous solutions, Reliability, Instrumentati, Equipment, Zeta potential.
Identifiers: *Differential capacitance, Precisi, Ion selective electrodes, Mercury electrode.

A description is given of a new, self-balanc capacitance bridge, which was designed and c structed utilizing electromechanical servo con of the capacitance multiplier for making ferential capacitance measurements. Using a Hz signal of less than 10 mV peak to pe capacitance in the range of 0.25 to 2.0 mF ve measured with a precision of plus or minus 1 cent. Differential capacitance measurements mercury electrodes were made using aque solutions of several different electrolytes and ve compared with data found in the literature. study of the adsorption of camphor at a hang mercury drop electrode was conducted to con the instrument's ability to function in systems strongly adsorbed species. (Byrd-Battelle)
W72-12716

PRECIPITATION SCAVENGING (1970).
For primary bibliographic entry see Field 05B.
W72-12752

SCAVENGING OF AEROSOL PARTICLES BY SPRAYS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-12765

CONTINUOUS CHARGED CLOUD-PARTICLE SAMPLER,
Manchester Univ. (England). Dept. of Physics
For primary bibliographic entry see Field 05B
W72-12766

PULSED-LASER HOLOGRAPHY FOR ANALYSIS OF PARTICLE SIZE AND DISTRIBUTION,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B
W72-12767

THERMAL-DIFFUSION CHAMBERS AS CLOUD-NUCLEI COUNTERS,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
For primary bibliographic entry see Field 05B.
W72-12768

AUTOMATIC SEQUENTIAL RAIN SAMPLER FOR SCAVENGING STUDIES,
Argonne National Lab., Ill. Radiological Physics Div.
For primary bibliographic entry see Field 05B.
W72-12769

WASHOUT OF GASEOUS IODINE SPECIES,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-12772

SPEED CALIBRATION OF THE PLESSEY MODEL M021 SELF-RECORDING CURRENT METER,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02E.
W72-12879

7C. Evaluation, Processing and Publication

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE, PHASE II,
Oklahoma Univ. Research Inst., Norman.
For primary bibliographic entry see Field 04B.
W72-12389

A PROGRAM FOR ESTIMATING RUNOFF FROM INDIANA WATERSHEDS PART II. ASSEMBLY OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W72-12392

AVAILABILITY OF WATER IN KALAMAZOO COUNTY, SOUTHWESTERN MICHIGAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-12408

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1970,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W72-12430

WATER RESOURCES INVESTIGATIONS IN PUERTO RICO, AND VIRGIN ISLANDS, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Puerto Rico, *Virgin Islands, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Rainfall, Runoff, Streamflow, Sediment transport, On-site investigations, Water quality, Chemical analysis, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Puerto Rico and the Virgin Islands are summarized. A selected bibliography is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 145 primary, secondary, and water management streamflow stations; 79 groundwater observation wells; and 75 water quality observing sites. Small State maps show principal sources of groundwater, annual average precipitation, average annual runoff, drainage areas developed for public water use, and representative chemical analysis of surface water. A map, scale 10 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Puerto Rico and the Virgin Islands in August 1969. (Woodard-USGS)
W72-12444

WATER RESOURCES INVESTIGATIONS IN MICHIGAN, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 8 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Michigan, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Glacial Aquifers, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Michigan are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 205 primary, secondary and water management streamflow stations; 335 groundeater observation wells; and 36 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, and discharge of the principal rivers. A map, scale 43 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Michigan in October 1968. (Woodard-USGS)
W72-12445

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 5 fig, 1 map, 2 tab.

Descriptors: *Water resources, *Investigations, *New York, *Inter-agency cooperation, Precipitation (Atmospheric), Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Water temperature, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in New York are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 300 primary, secondary and water management streamflow stations; 70 groundwater observation wells; and 80 water quality observing sites. Small State maps show prinicpal sources of groundwater, mean annual precipitation, average annual runoff, discharge of the principal rivers, and the dissolved solids in ground and surface waters. A map, scale 18 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in New York in July 1968. (Woodard-USGS)
W72-12446

WATER RESOURCES INVESTIGATIONS IN UTAH, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Utah, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Dissolved solids, Water level fluctuations, Great Salt Lake, Bibliographies, Networks, Maps, Histograms.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Utah are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 278 primary, secondary, and water management streamflow stations; 472 groundwater observation wells; and 118 water quality observing sites (29 on streams and 89 wells). Small State maps show principal sources of groundwater, mean annual precipitation, discharge of the principal rivers, water level fluctuations of Great Salt Lake, and the dissolved solids in ground and surface waters. A map, scale 50 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Utah in September 1968. (Woodard-USGS)
W72-12447

WATER RESOURCES INVESTIGATIONS IN VIRGINIA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 4 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Virginia, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-supplies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Virginia are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 173 primary, secondary, and water management streamflow stations; 64 groundwater observation wells; and 21 water quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, average annual precipitation, and average annual runoff. A map, scale 32 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Virginia in July 1969. (Woodard-USGS)
W72-12448

TIME SERIES ANALYSIS OF WATER POLLUTION DATA,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 05A.
W72-12498

THE ANNUAL WATER STATEMENT, 1971--1972,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.
W72-12503

EXTENSION OF OCEANOGRAPHIC STUDIES IN PUGET SOUND AND THE NORTHEAST PACIFIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02L.
W72-12639

COMPUTER SIMULATION OF FRACTURING OF LAYERED ROCK,
Nagoya Univ. (Japan).
For primary bibliographic entry see Field 08E.
W72-12666

WATER RESOURCES INVESTIGATIONS IN WYOMING, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Wyoming, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Wyoming are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 216 primary, secondary, and water management streamflow stations; 238 groundwater observation wells; and 91 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, average annual runoff, sediment concentration of rivers, discharge of the principal rivers, and the dissolved solids in major streams. A map, scale 42 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Wyoming in December 1968. (Woodard-USGS)
W72-12698

SOME CURRENT TRENDS IN GEOMORPHOLOGY,
Wisconsin Univ., Madison. Dept. of Geography and Geology.
For primary bibliographic entry see Field 02J.
W72-12701

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA--A COMPILATION OF PEAK DATA, OCTOBER 1958 TO SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02E.
W72-12703

BASIC DATA FOR CHEMICAL WASTE DISPOSAL,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Engineering Dept.
For primary bibliographic entry see Field 05G.
W72-12803

WATER RESOURCES DATA FOR NEW YORK, 1970: PART 2. WATER QUALITY RECORDS.
Geological Survey, Albany, N.Y.

Geological Survey Data Reports, 1972. 256 p, 10 fig, 5 tab, 22 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Basic data collections, *New York, Sampling, Sediment transport, Rain water, Water analysis, Chemical analysis, Water chemistry, Water temperature.

Water resources data for the 1970 water year for the State of New York include records of data for the chemical and physical characteristics of surface water and groundwater. Also chemical quality of precipitation data are reported for 8 stations in New York and for one station just over the border in Pennsylvania. Water-quality information is presented for chemical quality, microbiological content, water temperature, and fluvial sediment. Chemical quality includes concentrations of individually dissolved constituents and certain properties or characteristics such as hardness of water, specific conductance, and pH. Microbiological information includes quantitative identification of certain bacteriological indicator organisms. The data include a description of the sampling station and tabulations of the samples analyzed. The description of the sampling station gives location, drainage area, periods of record for the various water-quality data, extremes of the pertinent data, and general remarks. (Woodard-USGS)
W72-12862

STREAMFLOW VARIATION AND DISTRIBUTION IN THE BIG CYPRESS WATERSHED DURING WET AND DRY PERIODS,
Geological Survey, Tallahassee, Fla.
H. J. Freiberger.
Florida Bureau of Geology Map Series No 45, 1972. 1 sheet, 8 fig, 1 ref.

Descriptors: *Streamflow, *Discharge measurement, *High flow, *Low flow, *Florida, Watersheds (Basins), Stream gages, Rainfall-runoff relationships, Hydrologic data, Maps, Curves, Overland flow, Canals.
Identifiers: *Big Cypress Watershed (Fla), *Everglades National Park (Fla).

A part of the water needs of Everglades National Park and the Lower Gulf Coast communities is fulfilled by water that drains from the Big Cypress Watershed. This map report shows the magnitudes, direction, and distribution of surface-water flows through the watershed during periods of high and low flows. The Big Cypress Watershed in southwestern Florida encompasses an area of about 2,450 square miles, most of which lies in Collier County. Streamflow throughout the Watershed was determined from discharge measurements made at about 250 sites during November 18-20, 1969, in a period of high flow and on March 9, 1971, in a period of low flow. During November 18-20, 1969, the total flow through the outlets along Everglades Parkway between the Levee 28 Interceptor Canal and Naples was 1,603 cfs. This flow was distributed through canals and overland. On March 9, 1971, the flow through Everglades Parkway between the same two points was 40 cfs. There was no overland sheet flow through the outlets along this 50-mile stretch of Everglades Parkway. The flow was divided between just two canals, 29 cfs in Barron River Canal and 11 cfs in the Turner River Canal. (Woodard-USGS)
W72-12869

SELECTED WATER-QUALITY RECORDS FO TEXAS SURFACE WATERS, 1970 WATI YEAR,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W72-12870

WATER RESOURCES INVESTIGATIONS WISCONSIN, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigatio Folder, 1 sheet, 1968. 6 fig, 1 map.

Descriptors: *Water resources, *Investigatio *Wisconsin, *Inter-agency cooperation, Surve Planning, Hydrologic data, Basic data collectio Precipitation (Atmospheric), Runoff, Streamflo Sediment transport, On-site investigations, Wa temperature, Water quality, Dissolved soli Water level fluctuations, Bibliographies, N works, Maps.
Identifiers: *Cooperative water-studies progra Research projects.

The water resources studies and investigations the U. S. Geological Survey in Wisconsin are su marized. A selected bibliography of material cc cerning the State is included. A list is given State and Federal agencies, counties, and cit who cooperate in different parts of the progra The hydrologic data network consists of 102 p mary, secondary, and water management strea flow stations; 205 groundwater observation wel 18 spring flow observation sites; and 40 wa quality observing sites. Small State maps sh principal sources of groundwater, average ann precipitation, average annual runoff, discharge the principal rivers, and the quality of ground a surface waters. A map, scale 44 mi to the inc shows by symbols, numbers, and colored outli the hydrologic data network and investigations Wisconsin in August 1968. (Woodard-USGS)
W72-12874

WATER RESOURCES INVESTIGATION VERMONT, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigatio Folder, 1 sheet, 1969. 3 fig, 1 map.

Descriptors: *Water resources, *Investigatio *Vermont, *Inter-agency cooperation, Surve Planning, Hydrologic data, Basic data collectio Precipitation (Atmospheric), Streamflow, Runo Sediment transport, On-site investigations, Wa quality, Water level fluctuations, Bibliographi Networks, Maps.
Identifiers: *Cooperative water-studies progra Research Projects.

The water resources studies and investigations the U. S. Geological Survey in Vermont are su marized. A selected bibliography of material cc cerning the State is included. A list is given State and Federal agencies, counties, and cit who cooperate in different parts of the progra The hydrologic data network consists of 53 prin ry, secondary, and water management streamfl stations; 14 groundwater observation wells; an water quality observing sites. Small State ma show mean annual precipitation, average ann runoff, and discharge of the principal rivers. map, scale 20 mi to the inch, shows by symbo numbers, and colored outline the hydrologic d network and investigations in Vermont December 1968. (Woodard-USGS)
W72-12875

8. ENGINEERING WORKS

A. Structures

:WER BEDDING AND INFILTRATION, GULF OAST AREA,
ılane Univ., New Orleans, La.
K. Mayer, F. W. Macdonald, and S. E. Steimle.
ɔpy available from GPO Sup Doc EPA 11022 EI,05/71, $1.50; microfiche from NTIS as PB-1 282, $0.95. Environmental Protection Agency, ater Pollution Control Research Series, May '72. 183 p, 48 fig, 33 tab, 21 ref. EPA Program 022 DEI 05/72. 80-04-68.

escriptors: *Infiltration rates, *Sanitary engineering, *Sewerage, *Backfill, *Infiltration, .eakage, Manholes, Sewers, Louisiana, Construction joints, Joints (Connections), Trenches, pelines.
entifiers: *New Orleans (Louisiana), Sewer intration, Sewer bedding, Sewer construction, edding material, Construction practices.

roundwater infiltration studies were performed ı several sewer systems in 1962-63 and again in '70 and the results were compared. Infiltration easurements in the systems ranged from zero to 1,560 gallons per inch of diameter per mile per ıy. The infiltration was slightly increased in some ıes and was greatly decreased in others. The :crease is attributed to soil and grease clogging e breaks, as was observed in subsequent televi-ɔn inspection. Infiltration has been found to vary ith time. The high infiltration rates were at-ibuted to poor construction methods used by ɔntractors on the main sewer system and by umbers on house connections. A survey of 1,600 anholes showed 3.5 percent to have infiltration the time of the inspection and others likely to :velop infiltration during periods of heavy rain-lls. Bedding and backfill material should provide ren distribution of load and support for the pipe. second function of this material should be to im-:de the flow of water surrounding the sewer hen the pipe is laid below the water table. The aterial should completely surround the pipe. oertner)
'72-12394

HE RESPONSE OF AN INTAKE TOWER AT OOVER DAM TO EARTHQUAKES,
ureau of Reclamation, Denver, Colo.
W. Cozart.
ureau of Reclamation Report REC-ERC-71-50, ec 1971. 16 p, 11 fig, 1 photo, 4 tab, 18 ref.

escriptors: *Earthquakes, *Seismic design, *Acleration (Physics), Seismic studies, Measuring struments, Dam design, Structural engineering, ructural behavior, Dynamics, Seismographs, ibliographies, Digital computers, Structural anal-is, Computer models, Arizona.
entifiers: *Intake towers, Damping, Earth ovements, Dynamic methods, Hoover Dam, ode, Dynamic response.

ecords of earthquakes from seismographs at oover Dam enabled comparisons of time depen-nt accelerations measured near the top of one of e intake towers with accelerations computed by lumped mass, generalized coordinate method. ne of the seismographs is located in the ownstream Nevada Intake Tower at elevation 27. Another is in a switchyard oil house about 3 mi from the intake structure. The intake tower, proximately 338 ft high (excluding a hoist house top), is comprised of an inner barrel, approxiately 30 ft inside diameter, surrounded by 12 ually spaced tapered fins. The outside diameter the base is 82 ft. The mathematical model used lumped masses. Included in the model was the effect of the water around the tower. Analyses were by computer, using digitized accelerograph records for input. Output was an acceleration vs time graph of the top lumped mass of the tower. Graphs for 3 earthquakes and 2 values of damping are included. The study showed that: (1) 12 lumped masses were sufficient to compute accurately the frequencies and shapes of the first 4 modes; (2) viscous damping factors of 0.02 to 0.03 appear to be in the correct range; and (3) satisfactory comparisons of computed and measured accelerations can be made. (USBR)
W72-12657

STUDY OF CONSTRUCTION METHODS FOR LARGE UNDERSEA CONCRETE STRUCTURES.
Santa Fe-Pomeroy, Inc., San Francisco, Calif. Engineering Div.
For primary bibliographic entry see Field 08F.
W72-12702

8B. Hydraulics

HYDRAULIC TESTING OF HOLE UA-1-HTH-1, AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
W. C. Ballance, and G. A. Dinwiddie.
Available from the National Technical Information Service, $3.00 in paper copy, $0.95 in microfiche. Geological Survey Report USGS-474-144 (Amchitka-32), May 1972. 27 p, 6 fig, 4 tab, 1 ref. AEC AT (29-2)-474.

Descriptors: *Boreholes, *Hydraulics, *Hydraulic properties, *Alaska, Testing, Pressure head, Depth, Water analysis, Chemical analysis, Dating, Geologic time, Pumping, Groundwater, Water yield, Drawdown, Natural recharge, Hydrologic data, Data collections, Methodology, Hydraulic conductivity, Transmissivity.
Identifiers: *Amchitka Island (Alaska), C-14.

Hole UA-1-HTH-1 on Amchitka Island, Alaska, was drilled and hydraulically tested in July and August 1971. The elevation of land surface at the site is 50.13 meters above mean sea level. Total depth of the hole was 1,054 m but, because of borehole erosion and bridging, only about 198 m of the hole was hydraulically tested with straddle packers. Some information was obtained on the lower part of the hole by use of the pressure recorders. The heads below land surface tested with straddle packers ranged from 3.9 m in the interval 80.5 to 125.0 m to 5.7 in the interval 227.4 to 278.6 m. The composite static water level following a pumping test was 5.5 m. The composite head below 278.6 m, determined from a pressure recorder, was about 12.2 m. The head distribution indicates a decreasing head with depth. Water samples were collected from two intervals for chemical, radiochemical, and C-14 analysis. The unadjusted age of water in the interval 183.5 to 234.7 m was 8,410 years, and 17,800 years for the interval 227.4 to 278.6 m. (Woodard-USGS)
W72-12421

KANSAS STREAMFLOW CHARACTERISTICS. PART 9, MEAN ANNUAL RUNOFF AS RELATED TO CHANNEL GEOMETRY OF SELECTED STREAMS IN KANSAS,
Kansas State Geological Survey, Lawrence.
For primary bibliographic entry see Field 02E.
W72-12423

ON THE BEDDING IN THE NATURAL-LEVEE AND THE POINT-BAR DEPOSITS OF THE GOMTI RIVER, UTTAR PRADESH, INDIA,
Lucknow Univ. (India). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-12424

SEDIMENT TRANSPORT CAUSED BY WAVE MOVEMENT (TRANSPORT NANOSOV VOLNAMI),
Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12435

STUDIES IN DENSITY STRATIFIED FLOWS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. L. Wilkinson.
New South Wales University Water Research Laboratory Report No 118, April 1970. 167 p, 75 fig, 37 ref, 10 append.

Descriptors: *Stratified flow, *Density stratification, *Supercritical flow, *Subcritical flow, *Forecasting, Mathematical studies, Analytical techniques, Equations, Velocity, Hydraulic jump, Flow profiles, Streamflow, Model studies, Boundaries (Surfaces), Boundary layers.
Identifiers: Density jump, Rapidly varied flow.

The rapidly varied flow phenomenon in a density stratified system is examined where only one layer flows and the other is stationary. The flow regime changes from supercritical to subcritical across the region of rapidly varied flow. The analogous phenomenon in open channel hydraulics is the hydraulic jump. In stratified flows it is referred to as a density jump because it is generally accompanied by a change in the density of the flowing layer. An entrainment function is derived, relating a local entrainment parameter to a local Froude number within the entraining zone of a density jump. Some features of unsteady density flows are examined showing that the properties of starting flow or nose are controlled by the following layer, which in turn, is generally controlled by boundary friction. Conditions downstream of density jump can be predicted for power station cooling pond outfalls and some ocean-sewage outfalls. A design example is included showing how power station cooling pond efficiencies can be optimized by the control of mixing at the outfall. (Woodard-USGS)
W72-12449

HEATED SURFACE JET DISCHARGED INTO A FLOWING AMBIENT STREAM,
National Center for Research and Training in the Hydrologic and Hydraulic Aspects of Water Pollution Control, Nashville, Tenn.
For primary bibliographic entry see Field 05B.
W72-12451

HYDRAULIC MODEL STUDIES OF THE FOREBAY RESERVOIR INLET-OUTLET STRUCTURE FOR MT. ELBERT PUMPED--STORAGE POWERPLANT, FRYINGPAN-ARKANSAS PROJECT, COLORADO,
Bureau of Reclamation, Denver, Colo.
P. L. Johnson.
Bureau of Reclamation Report REC-ERC-72-5, Jan 1972. 16 p, 16 fig.

Descriptors: *Pumped storage, *Outlets, *Vortices, *Model studies, Hydraulic models, Flow characteristics, Flow distribution, Head loss, Trash racks, Model tests, Water surface, Inlets (Waterways), Hydraulic structures, Deflectors, Penstocks, Forebays, *Colorado.
Identifiers: *Intake transitions, *Velocity distribution, *Fryingpan-Arkansas Project, Colo.

Hydraulic model studies at a 1:23.23 scale were performed to assure satisfactory flow conditions through the forebay reservoir inlet-outlet structure for Mt. Elbert Pumped-Storage Powerplant in Colo. The main purpose for the studies was to develop a design to provide a uniform velocity distribution at the trashracks during the pumped cycle. Uniform velocity distribution would minimize the possibility of forming strong vortex shedding and reduce the forces causing trashrack fatigue

failure. Flow conditions for the generating cycle were evaluated to ensure a uniform velocity distribution free of air entraining surface vortices. Head loss measurements were made for the inlet-outlet structure and a portion of the penstocks. A horizontal deflector with flip blocks was developed to improve the vertical velocity distribution at the trashrack position. A flat upward sloping floor was developed to replace the original concave floor in the structure. Both a raft-type structure and a lattice-like wall structure were developed to suppress generation of surface vortices. Neither structure eliminated the vortices, but did eliminate air intake into the penstocks. (USBR)
W72-12663

LABORATORY STUDY OF A FLAT-BOTTOM TRAPEZOIDAL VENTURI FLUME,
Bureau of Reclamation, Denver, Colo.
R. A. Dodge.
Bureau of Reclamation Report REC-ERC-72-14, April 1972. 10 p, 10 fig, 4 ref.

Descriptors: *Discharge measurement, *Venturi flumes, Hydraulics, Water measurement, Calibrations, Head loss, Energy loss, Laboratory tests, Boundaries (Surfaces), Roughness (Hydraulic).
Identifiers: *Trapezoidal flumes, Test results, Model tests.

One flat-bottom trapezoidal venturi flume was studied in the laboratory as part of the Bureau of Reclamation Water Measurement Program. The flume has side slope angles of 45 deg. The angles of convergence of the inlet transition and divergence of the outlet transition were 5 deg. The inlet transition throat and outlet transition were 3 ft long. The throat bottom width was 4 in. The measuring station was one-half ft upstream from the start of the convergence. The flume was calibrated for a painted wood surface and a sand-coated surface. The discharge range was 0.5 to 5.0 cfs. The measuring head for the sand roughened flume was 2% higher at 0.5 cfs and 1% higher at 5.0 cfs than for the painted wood flume. Errors in discharge from 2-1/2 to 4-1/2% occur when friction is neglected in computing the discharge from equations developed for the painted wood flume. Energy losses for the flat-bottom trapezoidal venturi flume are from 30 to 50% of the losses for the 1-ft Parshall flume which has about the same discharge range. Backwater computations can be used to calculate measuring head elevation. However, prior knowledge of friction and eddy loss factors is required. Relative roughness effects should be accounted for in the low discharge range. (USBR)
W72-12667

EXPERIMENTAL STUDIES OF THE REFRACTION OF UNIFORM WAVE TRAINS AND TRANSIENT WAVE GROUPS NEAR A STRAIGHT CAUSTIC,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 02E.
W72-12871

A NEW MATHEMATICAL MODEL FOR THE VELOCITY DISTRIBUTION IN TURBULENT SHEAR FLOW,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 02E.
W72-12872

BED-LOAD SEDIMENTS,
Australian National Univ., Canberra. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-12877

A REVIEW OF CONCEPTUAL MODELS AND PREDICTION EQUATIONS FOR REAERATION IN OPNE-CHANNEL FLOW,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05G.
W72-12878

8C. Hydraulic Machinery

PUMPED-STORAGE POTENTIAL OF THE PACIFIC NORTHWEST, PARTS I, II, AND SUMMARY REPORT.
Corps of Engineers, Portland, Oreg. North Pacific Div.
For primary bibliographic entry see Field 03E.
W72-12411

ADVANCED NONTHERMALLY POLLUTING GAS TURBINES IN UTILITY APPLICATIONS.
United Aircraft Research Labs., East Hartford, Conn.
For primary bibliographic entry see Field 05B.
W72-12450

SPOKANE RIVER PROJECT (DRAFT ENVIRONMENTAL STATEMENT).
Federal Power Commission, Washington, D.C.

Available from the National Technical Information Service as PB-207 913-D, $3.00 in paper, $0.95 in microfiche. March 31, 1972. 116 p, 2 map, 2 illus, 6 photo, 6 dwg.

Descriptors: *Washington, *Environmental effects, *Project planning, *Permits, *Electric power, Dams, Powerplants, Water pollution control, Water resources development, Alternate planning, Administrative agencies, Coordination, Decision making, Construction, Comprehensive planning, Federal government.
Identifiers: *Environmental Impact Statements, *Spokane (Wash).

The action consists of licensing for continued operation four Washington developments, each having a dam, powerhouse, and pertinent facilities. No adverse environmental effects are expected to occur with the continued operation of the project. Pollution abatement action programs are in progress. Reconstruction of the Monroe Street plant will cause minor adverse environmental effects, including noise, dust, and other forms of air pollution, which cannot be prevented but may be mitigated. The continued operation of the project is essential to the production of electric power in the Northwest and will provide for increased public benefits in outdoor, scenic, and recreational opportunities. Alternatives include licensing as is, denial, and licensing under conditions. Alternatives to reconstruction of the Monroe Street plant are to replace project works as needed, remove all project works, or modify the plan of reconstruction. Attached are a staff description of the application amendment, notice of application, agency review and applicant correspondence, applicant's proposal to reconstruct the Monroe Street plant, applicant's environmental statement, and applicant's recreation plan. (Widman-Florida)
W72-12603

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION--UNIT NO. 3, BEESLEY'S POINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.

Available from the National Technical Information Service as PB-205 671D, $3.00 in paper copy, $0.95 in microfiche. November 19, 1971. 23 p, 1 tab.

Descriptors: *Dredging, *Environmental effects, *New Jersey, *Electric powerplants, Water pollution sources, Air pollution, Effluents, Waste water disposal, Channels, Engineering, Environmental engineering, Design data, Design criteria, Aesthetics, Oil spills, Construction, Cooling water, Conveyance structures, Condits.
Identifiers: *Environmental Impact Statements, *Cape May County, N.J.

The proposed project involves the expansion of the B. L. England Generating Station located on the Great Egg Harbor Bay at Beesley's Point, Cape May County, New Jersey. Expansion involves the addition of one 160,000 kw oil-fired steam electric generating unit. Additionally a cooling water intake channel must be dredged and constructed and a discharge pipe must be laid in Great Egg Harbor. Fuel delivery will be accomplished by rail so as to lessen the chance of an oil spill. The probable environmental impacts of the project include some water quality and air quality impairment, increased noise from the powerplant construction, and some aesthetic impairment in the project area. Adverse impacts include some air and water quality impairment from the discharge of effluents, however the effluent discharges comply with federal and state standards. Through equipment malfunction and abnormal waste discharges extensive pollution is possible; however, proper engineering design and operating procedures will minimize this possibility. Alternatives considered include: alternate sites, including those outside the system; alternate fuels, methods of delivery, type of boiler, and other project equipment; individual waste treatment of miscellaneous plant water uses; and no construction. (Grant-Florida)
W72-12628

THE SNOWY MOUNTAINS HYDROELECTRIC AND IRRIGATION SCHEME (AUSTRALIA),
For primary bibliographic entry see Field 04A.
W72-12824

8D. Soil Mechanics

SEISMIC TECHNIQUES FOR DYNAMIC TESTING AND ENGINEERING STUDIES OF SEABED SEDIMENTS,
Illinois Univ., Chicago.
P. H. Feldhausen, and M. L. Silver.
Underwater Journal Information Bulletin, Vol 3, No 6, p 263-279, Dec 1971. 19 fig, 2 tab, 60 ref.

Descriptors: *Seismic studies, *Foundation investigations, Dynamic tests, Soil mechanics, Bibliographies, Geophysics, Soil properties, Sediment deposits, Borehole geophsics, Geologic investigations, Soil tests, Lake sediments, Shear waves, Marine clays.
Identifiers: *Seismic tests, *Underwater foundation, Modulus of elasticity, Ocean bottom, Underwater structures, Resonance frequency method, Pulse method, Seismic reflection, Undersea aqueduct (Collective).

Seismic soil testing in the laboratory and the field enables underwater specialists to determine the engineering properties of soils subjected to dynamic loads from winds, waves, machinery, and earthquakes. These techniques provide more information than seismic reflection profiling because wave speeds in marine sediments are measured directly. The wave speeds are related to engineering properties, such as stress-strain behavior and energy attenuation in a vibrating soil-structure system. Laboratory methods discussed include pulse methods and resonant frequency testing. New and proposed in situ marine testing methods, including borehole shooting and surface wave tests, are described. Case histories of dynamic testing programs showed that many research marine site investigation techniques may soon be used routinely. (USBR)
W72-12660

IL-CEMENT SLOPE PROTECTION ON BU-AU OF RECLAMATION FEATURES,
reau of Reclamation, Denver, Colo.
DeGroot.
reau of Reclamation Report REC-ERC-71-20, y 1971. 100 p, 51 fig, 3 tab, 74 chart, 17 ref, ap-nd.

scriptors: *Soil cement, *Slope protection, rosion control, *Earth dam, Dam construction, rability, Sands, Gradation, Soil compaction, eze-thaw tests, Mixing, Compaction equip-nt, Construction, Embankments, Bibliogra-es, Soil investigations, Construction equip-nt, Tests.
ntifiers: Merritt Dam (Nebr), Cheney Dam ans), Lubbock Regulating Reservoir (Tex), n Elder Dam (Kans), Starvation Dam (Utah), tting and drying tests, Performance tests, cords, Construction control.

summary of Bureau of Reclamation experience h soil-cement slope protection is presented. mpacted soil-cement has been used as a riprap stitute on 7 major Bureau structures. Areas cussed include: preconstruction testing, con-uction equipment and procedures, construction trol testingfor soil-cement, and performance of l-cement facings. Successful performance of a l-cement test section at Bonny Reservoir in tern Colorado was used as the basis for design he facings; durability and compressive strength results limits established from the test section erally have been followed. Most soils used by Bureau have been fine, silty sands; a summary test results is presented. The soil-cement is ed in a continuous flow mixing system, placed, then compacted in nearly horizontal lifts with combination of sheepsfoot and pneumatic ing. Erosion of uncompacted material at the e of the lifts results in a stairstep pattern of the e. Durability tests on record cores taken at st features show low weight losses. Per-mance of soil-cement facings in service has n generally satisfactory. More than normal kage has occurred at a few locations on ney Dam in Kansas. (USBR)
2-12665

I. Rock Mechanics and Geology

LIMINARY GEOLOGIC INVESTIGATIONS ROCK TUNNEL SITES FOR FLOOD AND LUTION CONTROL IN THE GREATER ICAGO AREA,
ois State Geological Survey, Urbana.
primary bibliographic entry see Field 05G.
2-12420

E RESPONSE OF AN INTAKE TOWER AT OVER DAM TO EARTHQUAKES,
eau of Reclamation, Denver, Colo.
primary bibliographic entry see Field 08A.
2-12657

MPUTER SIMULATION OF FRACTURING LAYERED ROCK,
oya Univ. (Japan).
attori, and S. Mizutani.
ineering Geology International Journal, Vol 5, 4, p 253-269, Dec 1971. 13 fig, 16 ref.

criptors: *Fractures (Geologic), *Simulation, ilures, Computer models, *Rock mechanics, tification, Mathematical models, Stress con-ration, Faults (Geologic), Griffith theory, iographies, Stochastic processes, Anisotropy, ar strength, Cracks, Rocks.
ntifiers: *Crack propagation, *Failure sur-es, Fabics, Japan, Rock breakage, Shear ks, Shear failure.

The influence of layers upon the fracturing character of rock can be simulated by computer. Fracturing in a homogeneous material generally occurs on a flat plane, but fracturing in rock often is on an irregular surface. To simulate rock fracturing, a random walk model was devised consisting of a square 2-dimensional grid system of 101 by 101 grid cells. The rock strength in each grid cell was assigned using random numbers with a Gaussian distribution function. Three types of rock models were used: isotropic, nonisotropic with a layered fabric, and nonisotropic without a layered fabric. For these models: (1) failure begins when the shearing stress in a part of the grid system increases to a certain value; (2) the shearing stress reaches a maximum on a plane inclined at 45 deg to the principal stress direction; and (3) very high stresses concentrate at the edges of a small crack. Model results showed that layers have a great influence on the fracture patterns produced. The effect of the layered fabric becomes greater as the inclination of the layered anisotropy approaches 45 deg to the principal stress direction, and as the difference between the strength of the matrix and the layered material becomes greater. (USBR)
W72-12666

8F. Concrete

PREDICTION OF POTENTIAL STRENGTH OF CONCRETE FROM THE RESULTS OF EARLY TESTS,
Material Research and Development, Inc., Raleigh, N.C., and West Virginia Dept. of Highways, Charleston.
S. B. Hudson, and G. W. Steele.
Highway Research Record, No 370, p 25-35, 1971. 8 fig, 2 tab, 3 ref, append.

Descriptors: *Quality control, Test specimens, *Concrete technology, *Nomographs, *Concrete control, *Compressive strength, Graphical analysis, Test procedures, *Concrete testing.
Identifiers: Test results, Concrete properties, Mathematical analysis.

Three experiments investigated the practicality of using early tests of jobsite-made concrete cylinders for quality control. The experiments included concrete of 3 cement constants, 3 brands of cement, and 4 methods of conditioning specimens prior to test. Test results, when statistically analyzed, indicated a definite linear relationship between the logarithm of concrete maturity in degree-hours and the relative compressive strength. When specimens were tested at spaced values of maturity, an equation capable of predicting the 28-day strength of concrete to within about 500 psi was derived. A nomograph expedited computations of predicted values. Some simulation was conducted on 8 sets of jobsite cylinders tested at 23 to 42 hours of age. The average difference between predicted 28-day strengths and routine 28-day test results was about 300 psi. Practical application of this method requires a definite early test procedure and equation constants experimentally derived for commonly used concrete mixtures. Predicted results from early tests on jobsite cylinders can then be used for quality control and for prompt warning of unacceptable concrete. (USBR)
W72-12662

STUDY OF CONSTRUCTION METHODS FOR LARGE UNDERSEA CONCRETE STRUCTURES.
Santa Fe-Pomeroy, Inc., San Francisco, Calif. Engineering Div.

Available from NTIS, Springfield, Va. 22151 as AD-732 794, $3.00 in paper copy, $0.95 in microfiche. Dept of Navy Civil Engineering Lab Report CR 72.002, September 1971. 94 p, 15 fig, 11 ref, 2 append. 62399-71-C-0015.

Descriptors: *Engineering structures, *Underwater, *Oceans, *Concrete structures, Methodology, Reviews, Prestressed concrete, Cast-in-place structures, Reinforced concrete, Hydraulic structures, Construction materials, Design.
Identifiers: *Underwater construction.

Each offshore site has a different set of geographical conditions that should be evaluated prior to designing and selecting a method for construction of a large undersea concrete structure. These variables are considered in water depths up to 1000 feet. Undersea structures fall into two main categories: An Atmosphere Dry Unit (ADU), and an Equal Pressure Unit (EPU). An ADU is a structure having its interior space pressurized to one atmosphere, and is subjected to an external hydrostatic pressure corresponding to its depth below the water surface. An EPU is a structure which is subject to the same external and internal pressure. The interior of the structure may be wet or dry, depending on its function. For EPU structure with dry interior, a water/air interface control chamber would be provided through which personnel and materials may pass from one medium to the other. Three methods of construction include: (1) segmental and modular structures; (2) concrete mixed on surface and delivered to site on seabed; and (3) concrete mixed and poured in-situ, using locally available materials. Modular construction, combined with grouting by direct line delivery method, is considered the most promising method. (Woodard-USGS)
W72-12702

8G. Materials

IN BWR'S, CORROSION CONTROL IS NON--CHEMICAL,
General Electric Co., Schenectady, N.Y.
S. G. Sawochka, and W. L. Pearl.
Industrial Water Engineering, p 23-27, March 1971. 1 fig, 2 tab, 4 ref.

Descriptors: *Nuclear powerplants, *Corrosion control, Demineralization, Radioactivity, Temperature, Oxidation, *Water cooling, Condensers, Wastes.
Identifiers: *Boiling water reactors, Feedwater, Heater drains.

Replacement of copper alloys with stainless steel for feedwater heater tubing has dramatically reduced the formation of corrosion products in the boiling water reactor's primary coolant. Nonreliance on chemical control avoids a possible radiolytic decomposition of these chemicals in the primary system, which could lead to significant radioactivity and corrosion problems. Contaminants in the condensate result from corrosion of steam and turbine piping, turbine components, extraction steam piping, and feedwater heater shell, tubing, and drain lines. The presence of 60 ppb oxygen in a neutral pH feedwater system forms a protective layer on steel that substantially decreases iron corrosion products transported by the feedwater. Above 300 F, 25 ppb oxygen was sufficient to form the protective oxide. Corrosion products entering the primary coolant with the feedwater have a limited life, on the order of 1 minute, because of differences in the chemistries of the two waters. Corrosion product concentration in the primary coolant was approximately an order of magnitude less when Monel and copper-nickel tubed feedwater heaters were refitted with stainless steel. (Upadhyaya-Vanderbilt)
W72-12459

PWR WATER: VARYING CHEMISTRY AND 'HOT' CONTAMINANTS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05D.
W72-12465

SEISMIC TECHNIQUES FOR DYNAMIC TESTING AND ENGINEERING STUDIES OF SEABED SEDIMENTS,
Illinois Univ., Chicago.
For primary bibliographic entry see Field 08D.
W72-12660

8H. Rapid Excavation

RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS AND PRECIPITATION COLLECTED IMMEDIATELY BEFORE AND AFTER THE SECOND PRODUCTION-TEST FLARING, PROJECT RULISON,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W72-12422

8I. Fisheries Engineering

A SECOND LOOK AT UNITED STATES FISHERIES MANAGEMENT,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 06E.
W72-12601

THE SURVIVAL OF THE BAIKAL OMUL EGGS (COREGONUS AUTUMNALIS MIGRATORIUS GEORGI) IN THE SPAWNING GROUNDS OF KICHERA RIVER AND THE EFFECTS OF THE WATER LEVEL ON THE GENERATION SIZE,
I. P. Shumilov.
Vopr Ikhtiol. Vol 11, No 2, p 280-289. 1971. Illus.
Identifiers: *Fish reproduction, *Fish eggs, Coregonus autumnalis migratorius, Invertebrates, *Kichera River, Size, Spawning, Survival, USSR.

Studies were conducted on the factors which affect the survival rate of C. autumnalis migratorius eggs in the spawning grounds of the Kichera River and, consequently, the size of the subsequent generations. Evaluation of the results showed that survival rate of the eggs in the spawning areas that were studied was 46.4%. The breakdown of the losses was as follows: eaten by invertebrates-28.6%, eaten by other fish-6.9%, and carried off by water current from the spawning grounds-2.1%. In order to increase the population of omuls it was recommended that reproduction be conducted under controlled conditions where destruction of the eggs can be prevented.--Copyright 1972, Biological Abstracts, Inc.
W72-12731

PITUITARY INJECTIONS IN THE REARING OF GRASS AND SILVER CARPS,
Moscow State Univ. (USSR).
A. P. Makeeva, and B. V. Verigin.
Vopr Ikhtiol. Vol 11, No 2, p 217-231. 1971. Illus.
Identifiers: *Fish physiology, *Fish reproduction, Fish management, Aristichthys nobilis, *Carps, Ctenopharyngodon idella, Hypophthalmicthys molitrix, Injections, Pituitary.

Studies were conducted from 1966 to 1970 at the Akkurgan fishery in Uzbekistan to determine the optimal dosages of pituitary extract injections into grass carp (Hypophthalmichthys molitrix), silver carp (Ctenopharyngodon idella), and the golden carp (Aristichthys nobilis) for maturation of the females and development of eggs. Analysis of the results showed that the percentage of fish yielding eggs and their fertility increased with an increase in the dosage of the pituitary extract up to 5 mg/kg. However, the dosage should be individually adjusted to the weight of the female. Contrary to the findings of others, higher dosages of pituitary extracts did not have an adverse effect on the viability of the eggs. Delay in the collection of the eggs from the females sharply reduces the fertility of the eggs and their viability. In addition, the pituitary extracts also lead to more rapid maturation of the females. Thus, this factor should be taken into consideration in determining the appropriate time for the collection of the eggs.--Copyright 1972, Biological Abstracts, Inc.
W72-12746

NET AVOIDANCE BEHAVIOR IN AMERICAN SHAD (ALOSA SAPIDISSIMA) AS OBSERVED BY ULTRASONIC TRACKING TECHNIQUES,
McGill Univ., Montreal (Quebec). Dept. of Biology.
W. C. Leggett, and R. A. Jones.
J Fish Res Bd Can, Vol 28, No 8, p 1167-1171, 1971, Illus.
Identifiers: *Fish behavior, *Nets, Alosa sapidissima, Avoidance, Shad, Tracking techniques, Ultrasonics.

During tracking of 13 adult A. sapidissima with ultrasonic transmitters in 49 approaches to commercial drift gillnets in the lower Connecticut River, only 1 shad was captured. Typically, shad moved to within 1-2 m of the net before sensing its presence, then turned and swam along the net, close to the mesh, to its end, where they turned and continued their upriver migration. Sight appeared to play an important role in net detection. However, 14 avoidances were observed when light intensities were inadequate to allow visual detection of the mesh. It was concluded that other senses, perhaps the lateral line, also function in net avoidance, especially when sight is impaired.--Copyright 1972, Biological Abstracts, Inc.
W72-12889

DEVELOPING EFFICIENT METHODS FOR FEEDING CARP GROWN JOINTLY WITH PHYTOPHAGIC FISHES, (IN RUSSIAN),
Y. V. Moskalev.
Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 62-65. 1969.
Identifiers: *Carps, *Feeding, Fish hatcheries, *Phytophagic fish.

The experiments were carried out in ponds with an area of 0.1-0.2 ha at the Sinyukha Fish Farm at a sowing density of 4700 carp/ha and a ratio of bighead to carp of 1:1 or 0.5:1. Grass carp were planted as a melioration agent. Observations were made of a general reduction in the growth rate of the carp, except that the rate increased until the middle of July. During the 2nd half of the season growth rate could be improved by the application of 2 metric centers/ha of lime and the addition to the feed of phosphate salts and a fat-soluble polyvitamin concentrate. By this method, the carp grew 20% faster than controls.--Copyright 1972, Biological Abstracts, Inc.
W72-13034

THE DEVELOPMENT OF BIOLOGICAL TECHNIQUES FOR REARING THE LARVAE OF THE SILVER CARP, GRASS CARP, AND BLACK CARP TO VIABLE STAGES, (IN RUSSIAN),
E. R. Sukhanova, G. S. Kornienko, and A. I. Strelova.
Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 45-50. 1969.
Identifiers: *Black, *Carps, Fertilizers, Food, Grass carp, Larvae, Protozoans, *Rearing, Rotifer, *Silver carp, Techniques, Viable.

The experimental rearing of larvae supplied by the Goryachii Klyuch Fish Farm was carried out separately by species in ponds with an area of 0.1 to 0.3 ha or in aerated tanks at the Oktyabr' skii Fish Farm in Krasnodar Krai. Fertilizers used were inorganic and combined, to which had been added horse manure or composted herbage. A condition for a high yield of fingerlings is the timely development in the ponds of rotifers, food necessary for all 3 spp. of cultivated fish at early stages of their development. The combined fertilizer favored the development of food fauna for the larvae. At a larval planting density of 0.8-1.2 million/ha, the natural food supply was underexploited. On the 13th to 14th day of rearing the larvae reached the 1st fingerling stage of development. Tank rearing is possible but requires that the rotifers and protozoans be grown separately. It is possible to supply the larvae for 2-3 days with a nutrient mixture of 70% egg yolk, 20% milk powder, and 10% hydrolyzed yeast.--Copyright 1972, Biological Abstracts, Inc.
W72-13035

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH IN VIRGINIA -- 1969-1971,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and T. W. Johnson.
Available from the National Technical Information Service as PB-211 450, $3.00 in paper copy, $0.95 in microfiche. Bulletin 49, April 1972, 125 p. OWRR A-999-VA (13).

Descriptors: *Water resources development, *Universities, *Research and development, *Education, Training, *Water Resources Institute.

Water resources research in Virginia colleges and universities over a 3-year period is summarized and organized by institution. Indices by title, Principal Investigator, and key words are given.
W72-12953

WATER CENTER ORGANIZATION AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst for Research on Land and Water Resources.
For primary bibliographic entry see Field 06B.
W72-12954

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES RESEARCH IN VIRGINIA -- 1969-1971,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 09A.
W72-12953

WATER CENTER ORGANIZATION AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst for Research on Land and Water Resources.
For primary bibliographic entry see Field 06B.
W72-12954

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication AND Distribution

OIL SLICKS AND FILMS.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05B.
W72-12426

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART I. SUBSURFACE WASTE INJECTION.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-12685

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART II. SALINE WATER INTRUSION.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-12686

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART III. PERCOLATION FROM SURFACE SOURCES.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-12687

SANITARY LANDFILL LEACHATE TRAVEL IN VARIOUS SOIL MEDIA--A BIBLIOGRAPHY,
Vermont Univ., Burlington. Technical Information Center.
For primary bibliographic entry see Field 05B.
W72-12873

URBAN WATER PLANNING--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 06B.
W72-12921

10F. Preparation of Reviews

PROBLEMS OF EVAPORATION ASSESSMENT IN THE WATER BALANCE,
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OCEANIC PART OF THE HYDROLOGICAL CYCLE,
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W72-12416

DIRECT METHODS OF SOIL MOISTURE ESTIMATION FOR WATER BALANCE PURPOSES,
For primary bibliographic entry see Field 02G.
W72-12417

A REVIEW OF LITERATURE ON TFM (3-TRIFLUOR-METHYL-4-NITROPHENOL) AS A LAMPREY LARVICIDE,
Bureau of Sport Fisheries and Wildlife La Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 05C.
W72-12580

SOME CURRENT TRENDS IN GEOMORPHOLOGY,
Wisconsin Univ., Madison. Dept. of Geography and Geology.
For primary bibliographic entry see Field 02J.
W72-12701

INTERACTIONS OF CLOUD CONDENSATION NUCLEI AND ICE NUCLEI WITH CLOUD AND PRECIPITATION ELEMENTS: A REVIEW,
Washington Univ., Seattle. Dept of Atmospheric Sciences.
For primary bibliographic entry see Field 05B.
W72-12755

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 22
NOVEMBER 15, 1972

W72-13039 -- W72-13609

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 22
NOVEMBER 15, 1972

W72-13039 -- W72-13609

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

DIFFUSIVITY OF BISULFIDE ION IN AQUEOUS SOLUTION,
Auburn Univ., Ala. Water Resources Research Inst.
R. H. Dinius, and L. C. Redding.
Available from the National Technical Information Service as PB-211 607, $3.00 in paper copy, $0.95 in microfiche. Bulletin 7, May 1972. 16 p, 3 tab, 23 ref. OWRR A-018-ALA (2).

Descriptors: *Diffusivity, *Activation energy, *Aqueous solutions, *Hydrogen sulfide, *Polarographic analysis, pH, Electrolyte, Temperature, Hydrogen ion concentration, Chemical analysis, *Ions.
Identifiers: *Bisulfide ions, *Sulfide ions.

The diffusivities and activation energy for the diffusion process of hydrogen sulfide, bisulfide ions and sulfide ions computed from the polarographic limiting currents are reported. The total sulfide was maintained constant in all measurements; pH, supporting electrolyte concentration and temperature were varied over a significant range. The diffusion coefficients and activation energy for diffusion of the bisulfide ion are plausible although smaller than one might expect. The diffusion coefficients and activation energies for diffusion of hydrogen sulfide and sulfide ion are anomalously low. A satisfactory explanation for these low values is not readily apparent.
W72-13292

02. WATER CYCLE

TURBULENT PRESSURE FLUCTUATIONS IN WATER WITH ADDITIVES,
Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
A. Millward, and G. M. Lilly.
Available from the National Technical Information Service as AD-736 634, $3.00 in paper copy, $0.95 in microfiche. Southampton University Department of Aeronautics and Astronautics Report, 1971. 47 p, 16 fig, 27 ref, 2 append.

Descriptors: *Pipe flow, *Boundary layers, *Turbulent flow, *Pressure drag, *Additives, Polymers, Testing, Investigations, Reynolds number, Shear stress, Evaluation, Hydraulics.
Identifiers: Drag reduction, Turbulent pressure fluctuations.

The pressure fluctuations at the wall beneath a turbulent boundary layer were measured for various concentrations of dilute polymer solutions to determine the effect of the polymer on the structure of the flow and to provide an insight into the mechanism causing drag reduction in pipe flow. Measurements of the pressure fluctuations were made in a 2 in. diameter pipe at Reynolds numbers of approximately 350,000 with solution concentrations of 1/20/ppm of a polyethylene oxide (Polyox WSR 301) and 5-50/ppm of a polyacrylamide (Separan AP 30). The presence of the polymer molecules reduced the formation of the small eddies occurring in the region of the wall sublayer. From the reduction of drag in dilute polymer solutions there is also a reduction in the dissipation of energy from the flow. The mechanism of drag reduction is explained in terms of a branching process involving energy transfer to the polymer molecules at an energy level which is lower than that of viscous dissipation. (Woodard-USGS)
W72-13047

2A. General

THE HYDROLOGICAL ROLE OF FORESTS OF THE LITHUANIAN SSR,
For primary bibliographic entry see Field 04A.
W72-13158

PLEISTOCENE SEDIMENTOLOGY, CREDIT RIVER, SOUTHERN ONTARIO: A NEW COMPONENT OF THE BRAIDED RIVER MODEL,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13193

EFFECT OF WATER TABLE CONFIGURATION ON GROUND WATER FLOW FIELDS,
Tehran Polytechnic (Iran). Civil Engineering Inst.
For primary bibliographic entry see Field 02F.
W72-13198

LONG MEMORY MONTHLY STREAMFLOW SIMULATION BY A BROKEN LINE MODEL,
Instituto Geografico Nacional, Guatemala City; and San Carlos Univ. (Guatemala).
L. E. Garcia, D. R. Dawdy, and J. M. Mejia.
Water Resources Research, Vol 8, No 4, p 1100-1105, August 1972. 4 fig, 1 tab, 7 ref.

Descriptors: *Statistical models, *Markov processes, *Stochastic processes, Simulation analysis, Mathematical models, Model studies, Hydrograph analysis, Correlation analysis.
Identifiers: *Chixoy River (Guatemala), *Broken-line method (Statistical).

The Chixoy River in northern Guatemala exhibits a long-term dependence of monthly streamflows. A broken line model is developed to simulate the long-term dependence for the Chixoy River. The method for the determination of parameters for simulation is computationally easy. In addition, an algorithm is developed for preserving the memory of the historical streamflow record, which is operationally useful because if simulations of future streamflow are to be used for purposes of planning and design, such simulations should preserve a memory of the past, if long-term persistence is assumed to exist. The broken line model is shown to be a useful operational alternative to an autoregressive model. (Knapp-USGS)
W72-13459

RAINFALL-RUNOFF REGRESSION WITH LOGARITHMIC TRANSFORMS AND ZEROS IN THE DATA,
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.
R. F. Kilmartin, and J. R. Peterson.
Water Resources Research, Vol 8, No 4, p 1096-1099, August 1972. 1 tab, 3 ref.

Descriptors: *Rainfall-runoff relationships, *Regression analysis, *Statistical methods, *Variability, Data processing, Streamflow forecasting, *California.
Identifiers: *San Lorenzo River (Calif).

When some zeros occur in a data matrix to be used in a log-log regression analysis, the data require the addition of a 'small increment' to make the transformation of the zeros feasible. If this increment is less than 1.0, the logarithm takes on negative values that, when they are squared, may have as much weight in the variance computations as the nonzero data, or more. The use of 1.0 as an increment is suggested, since log 1.0=0.0 and zero would have the desired weight of a null variate in both the variance computations and the regression relation. In a multilag rainfall-runoff regression for the San Lorenzo River at Big Trees, California, increments of 1.0 added to all variates resulted in significant improvements in the standard error of estimate and the coefficient of multiple determination in comparison to results with an increment of 0.001 added to only the zero variates. (Knapp-USGS)
W72-13460

MULTILAG MULTIVARIATE AUTOREGRESSIVE MODEL FOR THE GENERATION OF OPERATIONAL HYDROLOGY,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
G. G. S. Pegram, and W. James.
Water Resources Research, Vol 8, No 4, p 1074-1076, August 1972. 7 ref.

Descriptors: *Systems analysis, *Statistical models, *Mathematical models, *Regression analysis, Markov processes, Stochastic processes, Surface-groundwater relationships, Rainfall-runoff relationships.
Identifiers: *Operational hydrology.

A model currently popular in the generation of operational hydrology is the lag 1 multivariate autoregressive process. In many cases this model adequately describes the combined streamflow of a region, but its extension to a multilag model may be useful since streamflow records have occasionally been found not to resemble realizations of simple Markov processes. All variables are treated as stationary and normally distributed with zero means. The groundwater recession curve of a hydrograph is usually assumed to be exponential in form, so that two different recession curves would form deterministic, mathematically independent sequences. The streamflow during a particular period is a fair indicator of the state of storage in the catchment. Most sequences of rainfall residuals appear to be serially uncorrelated although they may be highly interdependent. (Knapp-USGS)
W72-13464

WATERSHED PHYSICS: SOIL VARIABILITY CRITERIA,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
A. S. Rogowski.
Water Resources Research, Vol 8, No 4, p 1015-1023, August 1972. 2 fig, 5 tab, 27 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Mathematical models, *Soil water movement, *Variability, Statistical methods, Statistical models, Saturated flow, Groundwater basins.
Identifiers: *Watershed physics.

Variability criteria were developed for input parameters to the moisture characteristic and hydraulic conductivity models. The parameters include the water contents at air entry and at 15 bars as well as the hydraulic conductivity used in matching the predicted values with the experimental values at saturation. The available data suggest that the water contents at 15 bars and at air entry have a normal distribution whereas the hydraulic conductivity has a log normal distribution. The distributions of water contents and conductivities for different soil series with depth and over an area are illustrated. In watershed studies a soil may be considered uniform with depth or over an area if the coefficient of variation with respect to water content does not exceed 15% at 15 bars and 10% at air entry and the logarithmic standard deviation for hydraulic conductivity is less than log 2. If these conditions are met, the water contents at 15 bars and at air entry as well as the saturated conductivities may be averaged. (Knapp-USGS)
W72-13471

CONCEPTUAL ANALYSIS OF RAINFALL AND RUNOFF DATA WITH A HYBRID COMPUTER,
Field Associates, Tucson, Ariz.
J. R. McCarthy.
Water Resources Research, Vol 8, No 4, p 942-955, August 1972. 18 fig, 3 tab, 18 ref.

Descriptors: *Rainfall-runoff relationships, *Computer models, *Hybrid computers, *Water balance, Hydrologic budget, Demonstration watersheds, Simulation analysis, Arid lands.
Identifiers: Atterbury Experimental Watershed (Ariz).

A watershed is represented by a serial multistage system in which each stage employs a generalized conceptual element. The stages are initial abstractions, surface storage, translation, intermediate abstractions, channel storage, final abstractions, and outlet storage. The specific character of each stage is determined by using data from an actual watershed and a hybrid computer. Data compiled from a 16-acre tract on the Atterbury Experimental Watershed near Tucson, Arizona, are used. A broad spectrum of recorded conditions gives rise to typical problems involving rainfall-runoff relations on arid land watersheds. Infiltration becomes the important initial abstraction, and Horton's equation is modified to make the capacity rate of infiltration a function of time and precipitation intensity. The analysis relates depression losses to storm variables so that the starting time of the runoff can be estimated. A provision is included for subsequent depression losses that may occur, for example, during multiple peak flows. The translation model developed permits the shifting of the computed hydrograph to coincide with the actual runoff. Linear reservoirs are used in storage stages. A suggested 'parameter matrix' increases the reliability of predictions. (Knapp-USGS)
W72-13477

STREAMFLOW SIMULATION: (1) A NEW LOOK AT MARKOVIAN MODELS, FRACTIONAL GAUSSIAN NOISE, AND CROSSING THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
I. Rodriguez-Iturbe, J. M. Mejia, and D. R. Dawdy.
Water Resources Research, Vol 8, No 4, p 921-930, August 1972. 2 fig, 30 ref.

Descriptors: *Statistical models, *Markov processes, *Stochastic processes, Simulation analysis, Mathematical models, Model studies, Hydrograph analysis, Correlation analysis.
Identifiers: *Broken-line method (Statistical).

Two different models are common in the hydrologic literature: the traditional Markovian or autoregressive type of model and the self-similar or fractional Gaussian noise (FGN) type of model. These two types of models are analyzed and a new approach for analyzing hydrologic time series is introduced. This new approach uses a different model that has advantages over Markovian or FGN models. The model preserves more properties of hydrologic interest more easily than the two other models. A broken line process is suggested as a potential hydrologic simulation model. The process is composed of the sum across a series of broken lines. By proper choice of the number of broken lines considered and of their parameters, various statistical characteristics may be modeled. These include an arbitrary monotonic correlation structure and memory. In addition, the second derivative of the correlation function at the origin may be preserved. This preservation of the second derivative is an important property in crossing theory. (See also W72-13479) (Knapp-USGS)
W72-13478

STREAMFLOW SIMULATION: 2. THE BROKEN LINE PROCESS AS A POTENTIAL MODEL FOR HYDROLOGIC SIMULATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. M. Mejia, I. Rodriquez-Iturbe, and D. R. Dawdy.
Water Resources Research, Vol 8, No 4, p 931-941, August 1972. 15 fig, 1 tab, 6 ref.

Descriptors: *Statistical models, *Markov processes, *Stochastic processes, Simulation analysis, Mathematical models, Model studies, Hydrograph analysis, Correlation analysis.
Identifiers: *Broken-line method (Statistical).

The broken line process, an alternative to Markovian and FGN processes, is suggested for hydrologic simulation. It is economical in parameters and can preserve an arbitrary set of statistical characteristics, including long memory and the Hurst phenomenon. (See also W72-13478) (Knapp-USGS)
W72-13479

RIPPLES ON UNDERSIDE OF RIVER ICE COVERS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W72-13573

STOCHASTIC FIVE DAILY STREAM FLOW MODEL,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. T. Kottegoda.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9165, p 1469-1485, September 1972. 9 fig, 1 tab, 17 ref, 3 append.

Descriptors: *Stochastic processes, *Synthetic hydrology, *Streamflow forecasting, *Mathematical models, Probability, Correlation analysis, Simulation analysis, Regression analysis, Data collections.

A stochastic data-generating technique is applied to extend the records of British rivers. Because of the shortcomings in daily flow models, a 5-day time unit is adopted. An autoregressive process is more representative of the data than other short memory types. This is confirmed by tests on the synthesized data. For the series examined a fourth order process is adequate. The probability distributions of the independent residuals are confined to a limited range but different functions are necessary to fit individual series. Best fits are obtained by the Pearson Type III and Type IV and the lognormal distributions. The correlation structure is preserved in the generated data and other significant characteristics are similar to those in historical records. (Knapp-USGS)
W72-13575

SOIL MORPHOLOGY AND WATER TABLE RELATIONS: I. ANNUAL WATER TABLE FLUCTUATIONS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W72-13584

2B. Precipitation

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICULTURE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 03B.
W72-13053

HYGROSCOPIC SEEDING IN OKLAHOMA: VOLUMES I AND II,
Flight Test Research, Inc., Long Beach, Calif.
For primary bibliographic entry see Field 03B.
W72-13065

CAUSES OF TIDE-LEVEL FLUCTUATIONS IN ARCTIC SEAS (O FAKTORAKH, FORMIRUYUSHCHIKH SGONNO-NAGONNYYE KOLEBANIYA UROVNYA ARKTICHESKIKH MOREY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-13068

SATELLITE CLIMATOLOGY,
For primary bibliographic entry see Field 07C.
W72-13274

SOME FEATURES IN THE DIURNAL VARIATIONS OF RAIN AND WIND OVER NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
W. J. Saucier.
Available from the National Technical Information Service as PB-211 614, $3.00 in paper copy, $0.95 in microfiche. Report No. 69, (Interim report 1), June 1972, UNC-WRRI-72-69, 49, 4 fig, 5 tab, 4 ref. OWRR-A-061-NC (1).

Descriptors: *Meteorological data, *Synoptic analysis, *Precipitation (Atmospheric), *Wind velocity, Air temperature, Weather data, *North Carolina, *Diurnal.

An exploratory study was made of the diurnal variations of precipitation occurrence and of surface wind speed from summaries of hourly observations during the decade 1951-1960 at airport stations in and neighboring North Carolina. Results are presented in the form of climatological probabilities of rainfall occurrence for each hourly period of the day in four months for nine sites in the region. Geographic patterns of these diurnal trends in hourly rain occurrence are given for the month of July in two categories of rainfall amounts during the hourly intervals, namely, measurable rain and quarter-inch rain. Significant geographic variations were found. Diurnal variations of surface wind speed are presented and analyzed for those four months at the coastal and piedmont stations. The most prominent feature resulting is the tendency for winds from south-southwest and those from north-northeast, the two modal directions for the region, to have radically different and in certain respects reversed diurnal trends of wind speed. This is evident inland and also at the marine location of Hatteras. These are related to diurnal changes in the temperature pattern of the atmosphere's boundary layer under the differing controls by the continental and marine surfaces.
W72-13302

PHYSICAL AND HYDROMETEOROLOGICAL CHARACTERISTICS OF THE SNOWY RANGE OBSERVATORY,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W72-13306

AN INVESTIGATION INTO THE EFFECT OF AN INDUSTRIAL HEAT AND MOISTURE SOURCE ON LOCAL ATMOSPHERIC CONDITIONS,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05B.
W72-13313

RAINFALL-RUNOFF REGRESSION WITH LOGARITHMIC TRANSFORMS AND ZEROS IN THE DATA,
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.
For primary bibliographic entry see Field 02A.
W72-13460

RAIN GAGE CATCH VARIATION DUE TO AIRFLOW DISTURBANCES AROUND A STANDARD RAIN GAGE,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
C. C. Mueller, and E. H. Kidder.
Water Resources Research, Vol 8, No 4, p 1077-1082, August 1972. 3 fig, 8 ref.

Descriptors: *Rain gages, *Calibrations, *Winds, Particle size, Raindrops, Velocity.

Although the spatial position has an important influence on the performance of a rain gage, the physical presence of the gage itself must be considered a hindrance to its operation. An obstruction to airflow in the vicinity of the gage, owing to the presence of the gage, results in disturbances in the local precipitation pattern in which the rainfall measurement is made. The airflow pattern data obtained in a study of a wind tunnel model and aerodynamic drag characteristics of water drops are used to perform a computer simulation on the movements of the drops as they approach the gage. These drop paths are analyzed to establish the effectiveness of the gage in measuring precipitation. If drops are 1-5 mm in diameter, the gage catches from 93% to 11% of the drops as the free stream velocity increases from 10 to 50 feet per second. In general, the decrease in catch is less pronounced as the drop size is increased. (Knapp-USGS)
W72-13463

2C. Snow, Ice, and Frost

ICE FORMED BEACH FEATURES FROM LAKE ST. JEAN, QUEBEC,
Centre de Recherche Forestiere des Laurentides, Quebec.
J. C. Dionne, and C. Laverdiere.
Canadian Journal of Earth Sciences, Vol 9, No 8, p 979-990, August 1972. 16 fig, 28 ref.

Descriptors: *Beaches, *Iced lakes, *Sedimentary structures, *Canada, Stratigraphy, Geomorphology, Beach erosion, Shores.
Identifiers: Lake St. Jean (Quebec).

Features characteristic of polar beaches, including ice-push ridges, ice-contact cusps, shore-ice kettles, residual marks left by melting ice, ice-rafted sediments, and wind features, occur on the beach at Val Jalbert, Lake St. Jean, Quebec. This example shows that the area covered by so-called 'polar beaches' is not restricted to the Arctic and Antarctic regions. Even though the preservation potential of ice-made figures and microrelief is considered low, such sedimentary features, if preserved in favorable circumstances, might aid in interpreting former depositional environments. (Knapp-USGS)
W72-13062

BIENNIAL CYCLE OF ICE FLUCTUATIONS (DVUKHLETNIY TSIKL V KOLEBANIYAKH LEDOVITOSTI),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
N. A. Volkov, and B. A. Sleptsov-Shevlevich.
Problemy Arktiki i Antarktiki, No 34, p 13-19, Leningrad, 1970. 2 fig, 3 tab, 7 ref.

Descriptors: *Oceanography, *Arctic Ocean, *Ice, *Cycles, *Fluctuations, Variability, Sampling, Probability.
Identifiers: *USSR, *Kara Sea, *Laptev Sea, *East Siberian Sea, *Chuckchee Sea, Biennial, Ice waves, Anomalies, Autocorrelation coefficients.

Investigations of spatial and temporal patterns of biennial waves in long-period ice fluctuations in arctic seas were based on data on the amount of ice in 7 arctic regions between the Barents and Chuckchee Seas for 10-day periods in July-September 1934-67. The regions examined were the southwestern and northeastern parts of the Kara Sea, the western and eastern parts of the Laptev Sea, the East Siberian Sea between longitudes 140-160 deg E and between 160-180 deg E, and the southwestern part of the Chuckchee Sea. On the basis of geographic distribution and nature of biennial ice fluctuations, the arctic can be divided into 3 principal regions: (1) the northeastern part of the Kara Sea and the western part of the Laptev Sea, gravitating toward the Atlantic; (2) the eastern part of the Laptev Sea, and the East Siberian Sea, adjoining the periphery of the Siberian anticyclone; and (3) the Chuckchee Sea, gravitating toward the Pacific. Distinct biennial ice fluctuations are observed in all arctic seas. Maximum biennial ice fluctuations are observed in the northeastern part of the Kara Sea and in the western part of the Laptev Sea. In the Chuckchee Sea, the amplitudes of ice fluctuations are high, while in the East Siberian Sea, the biennial fluctuations are small. Amplitudes of the biennial cycles in the Kara Sea reached 301,000 sq km and those in the Chuckchee Sea 53,000 sq km, which is 59% and 20%, respectively, of the areas of these seas. (Josefson-USGS)
W72-13067

CAUSES OF TIDE-LEVEL FLUCTUATIONS IN ARCTIC SEAS (O FAKTORAKH, FORMIRUYUSHCHIKH SGONNO-NAGONNYYE KOLEBANIYA UROVNYA ARKTICHESKIKH MOREY),
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
N. V. Mustafin.
Problemy Arktiki i Antarktiki, No 34, p 5-12, Leningrad, 1970. 10 ref.

Descriptors: *Oceanography, *Arctic Ocean, *Tides, *Sea level, *Water level fluctuations, Currents (Water), Waves (Water), Surges, Winds, Wind tides, Atmospheric pressure, Ice, Streamflow, Shores, Coasts, Equations.
Identifiers: *USSR, *Kara Sea, *Laptev Sea, *East Siberian Sea, *Chuckchee Sea, Meteorological tides, Tide level, Drift ice, Fast ice.

Meteorological tides, caused by atmospheric factors, play the most important role in tide-level fluctuations of the Kara, Laptev, East Siberian, and Chuckchee Seas. The major causes of variations in sea level are wind, atmospheric pressure, waves, rotation of the earth, sea depth, bottom relief, and shoreline configuration. Drift ice has no significant effect on wind tides, while fast ice decreases the amplitude of sea level fluctuations. Equations are developed to describe the relationship between average monthly levels at a continental Arctic station and at an island station located approximately 100 km seaward. (Josefson-USGS)
W72-13068

WENDIAN GLACIATION OF EUROPE AND THE NORTH ATLANTIC IN THE LATE PRECAMBRIAN (VENDSKOYE OLEDENENIYE YEVROPY I SEVERNOY ATLANTIKI (VERKHNIY DOKEMBRIY)),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
N. M. Chumakov.
Akademiya Nauk SSSR Doklady, Vol 198, No 2, p 419-422, 1971. 2 fig, 19 ref.

Descriptors: *Glaciation, *Glaciers, *Glacial sediments, *Precambrian era, *Europe, Geographical regions, Till, Stratigraphy, Facies (Sedimentary), Age.
Identifiers: *USSR, *Scandinavia, *Tillites, Ice sheet, Periglacial.

The Lapland glacial horizon has been suggested as a new name for the European Wendian glacial sediments, underlying the basal trilobite-free beds of the Lower Cambrian and laid down some 650 million years ago. In northern Norway, eastern Greenland, the Middle Urals and, possibly, in Spitsbergen and parts of Sweden, the Lapland horizon can be divided into 3 parts: (1) a lower glacial subhorizon, which is most explicit in northern Norway; (2) an upper, Scandinavian glacial subhorizon; and (3) an interglacial Norwegian-Scandinavian subhorizon that separates them. On the Russian platform and in southern Norway, the Lapland horizon cannot be clearly differentiated. The Lapland glacial horizon is evidently widespread and may be related to the Tien Shan glacial horizon and to tillites in Asia, Australia, Africa, and Brazil. (Josefson-USGS)
W72-13071

ENGINEERING AND ECONOMIC IMPLICATIONS OF ICEBERGS IN THE NORTH ATLANTIC,
Memorial Univ. of Newfoundland, St. John's. Dept. of Engineering.
For primary bibliographic entry see Field 06B.
W72-13086

A STUDY OF SOME CHARACTERS OF METABOLISM OF SCOTCH PINE SEEDS DURING STORAGE IN SNOW,
For primary bibliographic entry see Field 02I.
W72-13154

THE APPLICATION OF THE AUGER HOLE METHOD IN HOLDERNESS GLACIAL DRIFT,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02F.
W72-13268

SATELLITE CLIMATOLOGY,
For primary bibliographic entry see Field 07C.
W72-13274

BIBLIOGRAPHY OF LITERATURE PERTINENT TO SNOWPACK MANAGEMENT,
Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford.
Utah State University College of Natural Resources Bibliography Series No 1, 1972. 22 p, 322 ref.

Descriptors: *Bibliographies, *Documentation, *Snowpacks, *Snow management, *Snow surveys, Information retrieval, Snowfall, Snow cover, Snowmelt, Hydrologic data, Meteorological data, Data collections.

This bibliography lists 322 items concerning snowpack properties and management. The list is alphabetized according to author. (Woodard-USGS)
W72-13279

HIGH LEAD CONCENTRATIONS IN COLUMBUS SNOW,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 05A.
W72-13296

AN ANALYSIS OF THE DEMANDS FOR WATER FROM THE PRIVATE SECTOR IN A SUB-ARCTIC URBAN AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 06C.
W72-13298

PHYSICAL AND HYDROMETEOROLOGICAL CHARACTERISTICS OF THE SNOWY RANGE OBSERVATORY,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W72-13306

APPROXIMATE SOLUTION TO THE FREEZING OF THE ICE-WATER SYSTEM,
New Hampshire Univ., Durham. Dept. of Chemical Engineering.
S. D. Foss, and S. S. T. Fan.
Water Resources Research, Vol 8, No 4, p 1083-1086, August 1972. 2 fig, 8 ref.

Descriptors: *Freezing, *Ice, *Thermodynamics, *Kinematics, Cryology, Heat transfer, Ice-water interfaces.

A simplified solution to the Stefan problem for the ice-water system is presented. The solution is based on the assumption that the freezing process is the rate-controlling step and hence that the temperature of the solid phase is represented by a linear function of thickness. This solution is compared with the series solution of Westphal. The two solutions agree remarkably well for small Stefan numbers and deviate from one another for larger Stefan numbers. This comparison indicates that when the freezing process is the rate--controlling mechanism, the proposed simplified solution yields satisfactory results. (Knapp-USGS)
W72-13462

ULTRASONIC VELOCITIES OF THE DILATATIONAL AND SHEAR WAVES IN FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H. Foundations and Materials Research Branch.
Y. Nakano, R. J. Martin, III, and M. Smith.
Water Resources Research, Vol 8, No 4, p 1024-1030, August 1972. 6 fig, 1 tab, 19 ref.

Descriptors: *Seismic studies, *Frozen soils, *Ultrasonics, *Permafrost, *Seismic properties, Soil physical properties, Geophysics, Travel time, Soil physics, Exploration, Mapping, Temperature, Hysteresis.
Identifiers: Seismic velocities.

Ultrasonic velocities of the dilatational and shear waves in water-saturated frozen soils were measured as a function of temperature by both pulse first arrival and critical angle methods. A strong correlation exists between the dilatational wave velocities and the unfrozen water content. The observed hysteresis in the velocities of silt and clay during a freeze-thaw cycle is considered to be caused by hysteresis in the frozen water content. A general tendency for the shear wave velocity to decrease with ascending temperature exists, but the effect of temperature is not as pronounced as on the dilatational velocity. Calculations based on measured dilatational and shear velocities showed that the Poisson's ratios of sand are almost constant. However, the ratios of silt and clay decrease monotonically with ascending temperature. (Knapp-USGS)
W72-13470

PREDICTION OF SPRING RUNOFF,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 02E.
W72-13474

COMPARISONS OF TWO ANTARCTIC LAKES WITH DIFFERENT TROPHIC STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 05C.
W72-13511

RIPPLES ON UNDERSIDE OF RIVER ICE COVERS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. D. Ashton, and J. F. Kennedy.
Proceedings, American Society of Civil Engineers, Journal of the Hydraulics Division, Vol 98, No HY9, Paper 9191, p 1603-1624, September 1972. 14 fig, 1 tab, 14 ref, append. NSF Grant GK-17698 USACE DACW25-69-0098.

Descriptors: *Ice cover, *Ripple marks, *Freezing, *Ice-water interfaces, *Mathematical models, Melting, Heat balance, Heat flow, Convection, Heat transfer, Conduction, Turbulence, Cryology.
Identifiers: *River ice.

A mathematical model is developed to predict the occurrence and describe the properties and behavior of ice ripples that form on the underside of river ice-covers. The local rate of freezing or melting at the ice-flow interface is related to the difference between the local heat transfer rates by conduction through the ice and by turbulent transfer from the flow to the ice. The local heat flux to the interface from the flow is expressed as a small perturbation expansion in terms of the steepness of the monochromatic interfacial wave, and is assumed to be shifted relative to the interface wave. The analysis yields a stability criterion and expressions for the amplification rate and celerity of the ripples. Laboratory data are used to obtain values for the constants introduced into the theory and to corroborate the analytical results. Field data are examined in the light of the laboratory results. (Knapp-USGS)
W72-13573

SALT AND WATER MOVEMENT IN UNSATURATED FROZEN SOIL,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 02G.
W72-13579

MELTING OF SNOW COVER,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
P. P. Kuz'min.
Israel Program for Scientific Translations, Jerusalem, 1972. 290 p, (TT 71-50095, Originally published by Gidrometeorologicheskoe Izdatel'stvo, Leningrad, 1961).

Descriptors: *Snow, *Snow cover, *Snowmelt, Snowpacks, Melt water, Runoff, Radiation, Temperature, Heat, Heat balance, Water balance, Water yield, Heating, Freezing, Meteorology, Topography, Seasonal, Forecasting, Analytical techniques, Instrumentation.
Identifiers: *USSR, Snow stakes, Heat exchange, Nomograms.

This monograph discusses the sources of heat which are necessary to melt snow and describes methods used to compute runoff from snowmelt. The analytical procedures developed are based on observations of various items in the energy and water balance and are designed for seasonal water-yield and rate-of-runoff forecasting. Intended primarily for hydrologists and meteorologists, the text will also prove useful to scientific workers in fields relating to the study and exploitation of snow cover in the national economy. (Josefson-USGS)
W72-13588

2D. Evaporation and Transpiration

REGULARITIES OF WATER EXCHANGE IN CORN UNDER OPTIMAL GROWING CONDITIONS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Kukuruzy, Dnepropetrovsk (USSR).
For primary bibliographic entry see Field 03F.
W72-13362

STUDIES ON MOISTURE CONDITIONS OF THE SOIL AND THE TRANSPIRATION OF CERTAIN PHYTOCENOSES OF THE BUCEGI MASSIF (CARPATHIANS),
C. Bindiu.
Rev Roum Biol Ser Bot, Vol 16, No 2, p 111-118, 1971, Illus, English summary.
Identifiers: *Soil moisture, *Forests, Abies G, Carpathians, Fagus D, Larix G, Phytocenoses, Pinus G, Romania, Soils, *Transpiration, *Bucegi massif.

The active moisture regime and the spatio-temporal variation of capillary potential (curve pF) are presented in the soils of 5 forest phytocenoses: Abieto-Fagetum dacicum, Abietum dacicum, Fagetum dacicum, Laricetum carpaticae and Pinetum carpaticum. The most favorable moisture conditions are in the Pinetum phytocenose; the least favorable in the Laricetum one. Larch, although having a higher average diurnal transpiration intensity (98-145 mg.g.-1 .h-1) to drought, has a great adaptation capacity. This explains the presence of the species in pure stands on superficial and strongly drained soils.--Copyright 1972, Biological Abstracts, Inc.
W72-13410

EVAPORATIVE COOLING OF A BODY OF WATER,
Zambia Univ., Lusaka. School of Engineering.
J. M. K. Dake.
Water Resources Research, Vol 8, No 4, p 1087-1091, August 1972. 1 tab, 9 ref.

Descriptors: *Evaporation, *Heat transfer, *Mass transfer, Humidity, Water temperature, Air temperature, Meteorology.

Known physical laws and empirical evaporation formulas are correlated to provide a simple means for estimating evaporative heat losses from water bodies. The result also provides an adjustment for atmospheric stability to established evaporation formulas. (Knapp-USGS)
W72-13461

A STOCHASTIC APPROACH TO THE STUDY OF EVAPORATION FROM LAKE ONTARIO,
Cornell Univ., Ithaca, N.Y.
S. L. Yu.
Available from University Microfilm, Ann Arbor, Michigan, Order No 69-7409, Microfilm $3.00, Xerox $7.60. Ph.D. Dissertation, September 1968. 161 p.

Descriptors: *Evaporation, *Lake Ontario, *Statistical methods, Mass transfer, Markov processes, Meteorological data, Water resources, Water temperature, Humidity, Wind velocity.
Identifiers: Air temperature, Water surface area.

Monthly mean values of evaporation from Lake Ontario were studied as a time series for the period 1872 to 1965 inclusive. The evaporation estimates were generated by a mass-transfer equation. The mass transfer coefficient was calculated by using Harbeck's equation relating the coefficient with water surface area. In order to obtain long-term values of water surface temperature for Lake Ontario, an estimation equation was developed based on statistical analyses of the relationship between observed water temperature, air temperature, wind speed, and sunshine percentage records. Correlation and spectral analyses were performed on both the raw data and the anomalies of evaporation and of the relevant meteorological parameters involved in the mass-transfer equation. High evaporation values were obtained for fall and winter months and low for early spring and summer months. On the average, maximum evaporation was observed for October and condensation for April. The average annual evapora-

tion was found to be 2.58 ft. A first order Markov model was found to adequately describe the evaporation, air temperature, and relative humidity anomalies, whereas a second order model could be used to fit the anomalies of wind speed and the water surface temperature. (Galwardi-Texas)
W72-13495

2E. Streamflow and Runoff

WATER RESOURCES OF WISCONSIN, CHIPPEWA RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13046

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-13051

WATER RESOURCES INVESTIGATIONS IN HAWAII AND OTHER PACIFIC AREAS, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13061

INVESTIGATION TECHNIQUES OF HYDROGEODYNAMIC PROCESSES IN THE LAKE BAYKAL AND ANGARA RIVER BASINS (GIDROGEODINAMICHESKIYE PROTSESSY V BASSEYNE BAYKALA I ANGARY I METODY IKH ISSLEDOVANIYA).
For primary bibliographic entry see Field 02H.
W72-13069

A NOTE ON THE MEASUREMENT OF PLANAR VELOCITY FIELDS BY STEREO--PHOTOGRAMMETRY,
Southampton Univ. (England). Dept. of Civil Engineering.
R. Butterfield, R. M. Harkness, and K. Z. Andrawes.
Journal of Hydraulic Research, Vol 10, No 1, p 15-26, 1972. 6 fig, 5 ref.

Descriptors: *Photogrammetry, *Flow measurement, *Velocity, *Photography, Flow characteristics, Flow rates.
Identifiers: *Stereophotogrammetry.

Stereophotogrammetry can be used for measurement of planar velocity fields in fluids. The technique used was developed for the measurement of displacement and strain fields in granular materials in connection with work in soil mechanics, but it is equally applicable to any planar flow in which the plane of interest is either self-textured or can be artificially textured by neutral buoyancy markers. If a stationary camera is used to photograph a planar object which moves in plane between exposures, and these plates are viewed with a stereoscope, the object will appear to float in space relative to the static background at a height which is proportional to its displacement component parallel to a line joining the projector centers. Furthermore, if there is a whole field of small identifiable moving targets, the stereo images obtained will show a continuous 'hill and valley' landscape. Such topography can be contoured by conventional stereophotogrammetric procedures and the maps produced will show contours of the surface velocity components of the targets parallel to the eye base of the plotting machine. It should be noted that these contour diagrams contain the complete specification of the surface velocity field in component form. Consequently both the magnitude of the velocity and the streamline direction are immediately available at any point in the flow. (Knapp-USGS)
W72-13200

SOME ASPECTS OF ANALYZING TRANSVERSE DIFFUSION IN RIVERS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
E. R. Holley, J. Siemons, and G. Abraham.
Journal of Hydraulic Research, Vol 10, No 1, p 27-57, 1972. 7 fig, 12 ref.

Descriptors: *Mixing, *Diffusion, *Dispersion, Streamflow, Path of pollutants, Channel morphology, Turbulence, Velocity.
Identifiers: *Transverse dispersion.

In hydraulic analyses, it is sometimes assumed that a single average velocity and average depth may be used to characterize flow in an irregularly shaped cross section. Many unknown aspects of the problem are then implicitly lumped into the diffusion coefficient. As many of the variables as possible should be correctly included in the analysis so it becomes clear what mechanisms the diffusion coefficient must represent. Some additional factors which previously might have been lumped into the diffusion coefficient are analyzed. In particular, consideration is given to the variation of depth, longitudinal velocity and diffusion coefficient within the cross section, and to transverse velocities. Numerical illustrations are used to show that all of these factors may be significant in diffusion problems. In particular, it is shown that transverse velocities in rivers may be cause rates of spreading which are of the same order of magnitude as that due to diffusion. A method was derived and illustrated to show how these various factors may be correctly considered in calculating diffusion coefficients from measured concentrations. Analytical solutions for a rectangular channel were used to estimate the longitudinal distance required for a tracer to cross a channel and then to become uniformly mixed with the flow. (Knapp-USGS)
W72-13202

WATER FOR INDUSTRIAL DEVELOPMENT IN KEMPER, LEAKE, NESHOBA, NOXUBEE, AND WINSTON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 03E.
W72-13278

SIMULATION MODEL FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W72-13301

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM (HISARS) REFERENCE MANUAL,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 07C.
W72-13308

PREDICTIONS OF TEMPERATURE IN STREAMS RECEIVING THERMAL DISCHARGES BY USING A DETERMINISTIC MODEL AND COMPUTER TECHNIQUE,
For primary bibliographic entry see Field 05B.
W72-13310

STREAM TEMPERATURE RESPONSE TO THERMAL POLLUTION,
Vanderbilt Univ., Nashville, Tenn. Dept. of Sanitary and Water Resources Engineering.
For primary bibliographic entry see Field 05B.
W72-13315

SOME PROPERTIES OF LINK MAGNITUDE FOR CHANNEL NETWORKS AND NETWORK PATTERNS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
M. F. Dacey.
Water Resources Research, Vol 8, No 4, p 1106-1111, August 1972. 10 ref.

Descriptors: *Drainage patterns (Geologic), *Geomorphology, *Topography, *Networks, *Probability, Mathematical models, Variability.
Identifiers: *Topology.

The generating function is given for the magnitude of a link randomly selected from the collection of topologically distinct channel networks of magnitude n and from the collection of topologically distinct network patterns of magnitude n. For large n, the link magnitude from both sample spaces has the inverse Polya distribution. An urn model underlying this distribution provides an intuitive explanation for the very long tail of the probability distribution of the link magnitude. (Knapp-USGS)
W72-13458

LONG MEMORY MONTHLY STREAMFLOW SIMULATION BY A BROKEN LINE MODEL,
Instituto Geografico Nacional, Guatemala City; and San Carlos Univ. (Guatemala).
For primary bibliographic entry see Field 02A.
W72-13459

RAINFALL-RUNOFF REGRESSION WITH LOGARITHMIC TRANSFORMS AND ZEROS IN THE DATA,
Bechtel Corp., San Francisco, Calif. Hydro and Community Facilities Div.
For primary bibliographic entry see Field 02A.
W72-13460

MULTILAG MULTIVARIATE AUTOREGRESSIVE MODEL FOR THE GENERATION OF OPERATIONAL HYDROLOGY,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13464

PREDICTION OF SPRING RUNOFF,
Minnesota Univ., St. Paul. Dept. of Soil Science.
D. G. Baker.
Water Resources Research, Vol 8, No 4, p 966-972, August 1972. 4 fig, 3 tab, 11 ref.

Descriptors: *Runoff forecasting, *Frozen ground, *Snowmelt, *Rainfall-runoff relationships, Water balance, Infiltration, Evaporation, Snowpacks, Snow surveys, Thawing, *Minnesota, Overland flow, Streamflow forecasting.
Identifiers: Spring runoff.

A high correlation was found between the precipitation that fell when soils were frozen (defined as the 'cold period') and the early spring runoff in eight of 10 watersheds in southern and central Minnesota. The cold period precipitation thus becomes a useful tool in predicting early spring runoff amounts in those areas where soils freeze. Results also indicated that cold period precipitation can be entirely accounted for by runoff and sublimation (or evaporation). Additions to the soil water reserves need not be called on to satisfy an accounting of the disposal of the 'cold precipitation.' This runoff prediction method has the advantage of simplicity once the linear regression equation for a watershed is calculated. The method requires only the measurement of soil temperature and precipitation at one station in each watershed. (Knapp-USGS)
W72-13474

NEW CONCEPT IN HYDROGRAPH ANALYSIS,
Nebraska Univ., Omaha. Dept. of Civil Engineering.
W. F. Rogers.
Water Resources Research, Vol 8, No 4, p 973-981, August 1972. 2 fig, 1 tab, 11 ref.

Descriptors: *Hydrograph analysis, *Drainage patterns (Geologic), Peak discharge, Time of concentration, Unit hydrographs, Rainfall-runoff relationships.
Identifiers: *Channel length frequency.

Channel length frequency distribution is proposed as a parameter that has a qualitative relationship to the surface runoff hydrograph. Measurements of the distance from the basin outlet along the drainage channel to the head of each first order channel form a random distribution of distances. Frequency histograms of these distances, when compared with the surface runoff hydrograph from general storms, show consistent similarity. Some implications involving these similarities are that (1) first order channels are source areas of surface runoff, (2) concentrations of similar first order channel distances account for the hydrograph peak and secondary hydrograph peaks, (3) the timing of delivery of surface runoff to the outlet influences the hydrograph rise time and base width, (4) surface runoff occurs lower on the hydrograph recession limb than is generally assumed, (5) arbitrary base flow and interflow separation has questionable validity, (6) the distribution of first order channels in a drainage basin reflects the influence of geology on surface runoff, (7) channel length frequency distribution influences the distribution of unit volume runoff for unit hydrographs, and (8) channel length frequency distribution alone can account for variations in hydrograph peaks of otherwise homogeneous drainage basins. (Knapp-USGS)
W72-13475

IDENTIFICATION OF PARAMETERS IN UNSTEADY OPEN CHANNEL FLOWS,
California Univ., Los Angeles. Dept. of Engineering Systems.
L. Becker, and W. W-G. Yeh.
Water Resources Research, Vol 8, No 4, p 956-965, August 1972. 3 fig, 3 tab, 6 ref.

Descriptors: *Open channel flow, *Parametric hydrology, *Unsteady flow, *Numerical analysis, Mathematical models, Mathematical studies.
Identifiers: *Parameter identification.

The influence coefficient algorithm is a simple, easily implemented, and rapidly convergent computational procedure for identifying parameters in unsteady open channel flow. Identification is a mathematical process whereby the parameters embedded in a differential equation defining a system are determined from observations of system input and output. The parameters specifically chosen for identification are the two 'friction slope' characteristics: the channel roughness coefficient and the exponent of the hydraulic radius in the empirical friction slope relation, a number usually assumed to be 4/3. These parameters are not physically measureable and have to be determined from the solutions of the mathematical model using concurrent input and output measurements. This new procedure is related to both quasilinearization and on stability and convergence features related to the finite difference solutions of the governing flow equations. (Knapp-USGS)
W72-13476

CONCEPTUAL ANALYSIS OF RAINFALL AND RUNOFF DATA WITH A HYBRID COMPUTER,
Field Associates, Tucson, Ariz.
For primary bibliographic entry see Field 02A.
W72-13477

STREAMFLOW SIMULATION: (1) A NEW LOOK AT MARKOVIAN MODELS, FRACTIONAL GAUSSIAN NOISE, AND CROSSING THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13478

STREAMFLOW SIMULATION: 2. THE BROKEN LINE PROCESS AS A POTENTIAL MODEL FOR HYDROLOGIC SIMULATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13479

MEASUREMENT OF VELOCITY-CONCENTRATION COVARIANCE,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 05B.
W72-13574

STOCHASTIC FIVE DAILY STREAM FLOW MODEL,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13575

2F. Groundwater

WATER RESOURCES OF WISCONSIN, CHIPPEWA RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13046

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. R. Hotchkiss, and G. O. Balding.
Geological Survey Open-file Report, August 6, 1971. 107 p, 21 fig, 3 plate, 21 tab, 84 ref.

Descriptors: *Water resources development, *Hydrologic data, *Data collections, *California, Groundwater, Surface water, Aquifers, Hydrogeology, Water yield, Water quality, Water utilization, Water wells, Dumping, Irrigation, Water importing, Groundwater recharge, Overdraft, Groundwater movement, Streamflow, Chemical analysis.
Identifiers: *San Joaquin Valley (Calif), *Tracy-Dos Palos (Calif).

The Tracy-Dos Palos area (California) includes about 1,800 square miles on the northwest side of the San Joaquin Valley. The Tulare Formation of Pliocene and Pleistocene age, terrace deposits of Pleistocene age, and alluvium and flood-basin deposits of Pleistocene and Holocene age constitute the fresh groundwater reservoir. Pre-Tertiary and Tertiary sedimentary and crystalline rocks, undifferentiated, underlie the valley and yield saline water. Hydrologically most important, the Tulare Formation is divided into a lower water-bearing zone confined by the Corcoran Clay Member and an upper zone that is confined, semiconfined, and unconfined in different parts of the area. Lower zone wells were flowing in 1908, but subsequent irrigation development caused head declines and land subsidence. Overdraft in both zones ended in 1951 with import of surface water. Bicarbonate water flows into the area from the Sierra Nevada and Diablo Range. Diablo Range water is higher in sulfate, chloride, and dissolved solids. Upper zone water averages between 400 and 1,200 mg/liter dissolved solids and water hardness generally exceeds 180 mg/liter as calcium carbonate. Nitrate, fluoride, iron, and boron occur in excessive concentrations in water from some wells. Dissolved constituents in lower zone water generally are sodium chloride and sodium sulfate with higher dissolved solids concentration than water from the upper zone. (Woodard-USGS)
W72-13051

WATER RESOURCES INVESTIGATIONS IN HAWAII AND OTHER PACIFIC AREAS, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13061

EXPLORATION OF MULTIPHASE FLUID FLOW IN A SALINE AQUIFER SYSTEM AFFECTED BY GEOTHERMAL HEATING,
Alabama Univ. Dept. of Civil and Mineral Engineering.
H. R. Henry, and J. B. Hilleke.
Alabama University Bureau of Engineering Research Report 150-118, July 1972. 105 p, 53 fig, 18 ref. USGS Contract 14-08-0001-12681.

Descriptors: *Groundwater movement, *Flow, *Saline water, *Geothermal studies, *Hydraulic models, Florida, Sea water, Aquifer characteristics, Data collections, Computer models, Theoretical analysis, Mathematical studies, Equations, Correlation analysis, Injection wells, Path of pollutants.
Identifiers: Coastal aquifers.

The effects of dispersion and geothermal heat upon flow, salinity, and temperature profiles in a coastal aquifer are described. The Floridan aquifer was modeled experimentally and mathematically to yield qualitative correlation with field data. Both dispersion and geothermal heating played a significant role in determining the position of the sea-water wedge and the strength of induced circulation in the salt-water zone. Also, a theoretical development serves as a base for predicting the direction that entrained waste might move after being injected into the Boulder Zone segment of the Floridan aquifer. The equations and method of solution are applicable to any aquifer, and not just for the field circumstances of Florida. (Woodard-USGS)
W72-13064

ELECTROMAGNETIC METHODS FOR MAPPING AND EVALUATING AQUIFERS,
California Univ., Berkeley. Water Resources Center.
F. H. Morrison.
Available from the National Technical Information Service as PB-211 646, $3.00 in paper copy, $0.95 in microfiche. Completion Report, UCAL-WRC-W-190, California Water Resources Center, Los Angeles, July 1972. 3 p, 2 ref. OWRR B-067-CAL (1).

Descriptors: Groundwater, *California, *Aquifer characteristics, Resistivity, *Subsurface mapping.
Identifiers: *Santa Clara Valley, Geophysical prospecting.

An electromagnetic depth sounding experiment with a horizontal loop carrying an oscillating current was carried out in Santa Clara Valley, California. The field data are interpreted in terms of the polarization parameters of the magnetic polarization ellipse. The chosen parameters are tilt-angle, ellipticity and the modulus of wave-tilt. The electrical discontinuities deduced are in general agreement with well data and with a geologic section based on resistivity soundings. The results clearly reveal an intermediate, highly resistive layer, which is a permeable stratum for groundwater recharge. It is concluded that a portable electromagnetic sounding system, measuring only tilt-angle and ellipticity, should easily locate highly resistive gravel deposits bounded by conductive clay

beds. It is theoretically obvious that the system is useful in those regions where it is extemely difficult to inject current into the ground.
W72-13182

EFFECT OF WATER TABLE CONFIGURATION ON GROUND WATER FLOW FIELDS,
Tehran Polytechnic (Iran). Civil Engineering Inst.
M. Shahbazi.
Journal of Hydraulic Research, Vol 10, No 1, p 93-111, 1972. 15 fig, 13 ref.

Descriptors: *Water table, *Groundwater movement, *Laplaces equation, *Flow nets, Recharge, Discharge (Water), Percolation, Mathematical models, Hydrogeology, Numerical analysis.

The Laplace equation was solved analytically in two-dimensional homogeneous, isotropic groundwater flow fields for different water-table configurations with the aid of least squares method. The flow pattern for different shapes of water-table configuration was obtained from a mathematical model. For the water-table configurations which have central symmetry relative to the intersection of the water-table curve and the mid-line of the basin, no matter what the slope, the transition point from recharge to discharge is half-way between the water divide and the valley bottom. For other water-table configurations, the transition point from the discharge zone to the recharge zone is not half-way between the water divide and valley bottom, but tends to occur closer to the lowest elevation. (Knapp-USGS)
W72-13198

FLOW UNDER A WEIR ON SOIL UNDERLAIN BY SLOPING IMPERVIOUS LAYER,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
For primary bibliographic entry see Field 02G.
W72-13199

A NEW TECHNIQUE FOR TIME-VARIANT GROUND WATER FLOW ANALYSIS,
R. Herbert, and M. Zytynski.
Journal of Hydrology, Vol 16, No 2, p 77-92, June 1972. 13 fig, 6 ref.

Descriptors: *Groundwater movement, *Water level fluctuations, *Drawdown, *Simulation analysis, Drainage effects, Drainage systems, Mathematical models, Seepage, Withdrawal, Permeability, Numerical analysis, Computer programs.

A new numerical method is described which accurately simulates the time-variant movement of the water table in unconfined saturated strata. The method is suitable for use on a digital computer and requires far less storage space and computing time than alternative more complex techniques in regular present day use. The new technique is tested against well-proven alternative methods and proves to be accurate and convenient to use. The new technique is particularly suited to the analysis of the performance of groundwater lowering systems and a suite of programs has been developed based on the new method which has been successfully used as a design aid to many groundwater lowering schemes. (Knapp-USGS)
W72-13263

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS, 1966-69,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 03D.
W72-13264

ON THE HYDROGEOLOGY OF THE COASTAL REGION OF SOUTHEASTERN FINLAND,
Geological Survey of Finland, Otaniemi.
For primary bibliographic entry see Field 04B.
W72-13265

GROUND WATER IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES CALIFORNIA, SPRING 1969 TO SPRING 1970,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W72-13266

ANALYSIS OF A NETWORK-MODEL FOR DISPERSIVE FLOW,
Hebrew Univ., Jerusalem (Israel).
S. Mandel, and Z. Weinberger.
Journal of Hydrology, Vol 16, No 2, p 147-157, June 1972. 4 fig, 7 ref.

Descriptors: *Dispersion, *Porous media, *Groundwater movement, *Hydraulic models, Model studies, Mixing, Tracers, Path of pollutants, Mathematical models, Networks, Capillary conductivity.

The foundations of dispersion theory were re-examined by analyzing the flow of a tagged liquid through an irregular hexagonal lattice structure. For the model, anisotropy of the medium is subject to the condition that the direction of flow coincides with an axis of anisotropy. Eulerian analysis of the model yields the following results: (a) The variance of lateral dispersion is proportional to the distance measured in the direction of flow and to the geometry of the network (proportional to the square of mean cell-height and inversely proportional to mean cell-length). (b) The variance of longitudinal dispersion is proportional to distance measured in the direction of flow, proportional to the variance of the residence times of liquid in the elementary channels, and inversely proportional to mean cell-length. (Knapp-USGS)
W72-13267

THE APPLICATION OF THE AUGER HOLE METHOD IN HOLDERNESS GLACIAL DRIFT,
Hull Univ. (England). Dept. of Geography.
M. Bonell.
Journal of Hydrology, Vol 16, No 2, p 125-146, June 1972. 4 fig, 3 tab, 27 ref.

Descriptors: *Hydraulic conductivity, *Glacial drift, *Groundwater movement, *Aquifer testing, Water yield, Boreholes, Piezometers, Withdrawal, Hydrogeology.
Identifiers: England.

The auger hole method was applied in Holderness glacial drift, England, to determine variations in hydraulic conductivity in the context of a shallow groundwater investigation in a small experimental catchment. The computational methods employed and some details of the practical problems encountered in field measurement are discussed. The results are used in the interpretation of hydrogeological, well hydrograph and drainage phenomena associated with the drift material. The calculated hydraulic conductivity values derived from the Kirkham and Van Bavel and Ernst formulae are compared. The Ernst approximate formula is sufficiently accurate for determination of conductivity within the limited range of pumping test geometries dealt with. (Knapp-USGS)
W72-13268

UNCONFINED AQUIFER AND SLOW DRAINAGE,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Journal of Hydrology, Vol 16, No 2, p 117-134, June 1972. 6 ref.

Descriptors: *Groundwater movement, *Drawdown, *Water level fluctuations, *Theis equation, Storage coefficient, Water yield, Unsteady flow, Unsaturated flow, Hydrogeology.
Identifiers: *Unconfined aquifers.

One of the features of unsteady free surface flow is the phenomenon of slow draining of water-bearing materials. This phenomenon is usually identified and referred to as delayed yield from storage. By this is understood the slowing of the rate of lowering of the piezometric surface during the early period of pumping for the unsteady radial flow to a pumped well compared to the well-known nonequilibrium Theis theory. However, consideration of the nature of this phenomenon may show an identification to be inexpedient. The slow drainage observed in practice may also be considered as a delayed process of vertical transfer; there is no delayed yield. (Knapp-USGS)
W72-13269

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA: II. BASIC NON-LINEAR PROBLEM,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. A. Wooding.
Journal of Hydrology, Vol 16, No 2, p 105-116, June 1972. 3 fig, 7 ref.

Descriptors: *Groundwater movement, *Mass transfer, *Ion transport, *Diffusion, *Mathematical studies, Translocation, Ion exchange, Equilibrium, Leaching, Chemical precipitation, Porous media, Adsorption.

Singular perturbation methods are used to treat analytically the problem of steady one-dimensional flow in a porous column, assuming nonlinear exchange equilibrium and concentration-dependent diffusivity, when the Peclet number is large. The breakdown of the original problem into a nonlinear outer problem, which is hyperbolic and of first order, and an inner problem which is equivalent to a set of ordinary differential equations, greatly facilitates analysis. The development and movement of concentration discontinuities within the flow is examined via the outer expansion, the first term of which neglects diffusion entirely. The next term gives a first estimate of diffusion effects. Material diffusing towards a discontinuity increases its speed. In the neighborhood of a disconuity, a state of quasi-equilibrium exists between diffusion and convective effects due to the relative velocity between the characteristics and the discontinuity. The first term of the inner expansion is matched both ahead of and behind the jump with the aid of only one arbitrary function of integration; the second function remains undetermined. At the next order, this function is evaluated as a shift of origin of the inner expansion to match the displacement of the jump due to diffusion. However, at this next order of matching, a new undetermined function appears. Extensions of the method to more general cases of nonlinear, nonequilibrium exchange, and when source terms are present, are discussed briefly. (Knapp-USGS)
W72-13270

MAJOR AQUIFERS IN CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak.
J. Kume.
South Dakota Geological Survey Information Pamphlet No 2, 1972. 2 p, 4 fig.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water supply, *South Dakota, Hydrologic data, Water wells, Water utilization, Groundwater movement, Water yield, Water quality, Water resources development.
Identifiers: *Charles Mix County (S Dak), *Douglas County (S Dak).

Groundwater sources in Charles Mix and Douglas Counties, South Dakota, include six major aquifers in unconsolidated deposits--the Choteau, Corsica, Geddes, Greenwood, Delmont, and

Tower aquifers. The unconsolidated deposits comprise preglacial stream sediments, glacial deposits, and postglacial alluvium. The Choteau aquifer is the largest; it underlies an area of 209,000 acres and contains about 2,200,000 acre-feet of water in transient storage. The Corsica, Geddes, Greenwood, Delmont, and Tower aquifers underlie a combined area of 138,000 acres, and contain about 1,300,000 acre-feet of water in transient storage. Groundwater in the unconsolidated deposits ranges in quality from fresh (water containing less than 1,000 milligrams per liter total solids) to slightly saline, and is generally very hard. Groundwater is used principally for domestic, stock, irrigation, and municipal water supplies. The Choteau aquifer is the most widely used of the aquifers in unconsolidated deposits. It supplies water to 13 irrigation wells, 5 public-supply wells, and about 300 stock and domestic wells. (Woodard-USGS)
W72-13272

DATA FROM CONTROLLED DRILLING PROGRAM IN DU PAGE, KANE, AND KENDALL COUNTIES, ILLINOIS.
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 04B.
W72-13275

WATER FOR INDUSTRIAL DEVELOPMENT IN KEMPER, LEAKE, NESHOBA, NOXUBEE, AND WINSTON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 03E.
W72-13278

GEOHYDRAULICS AT THE UNCONFORMITY BETWEEN BEDROCK AND ALLUVIAL AQUIFERS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
J. P. Waltz, and D. K. Sunada.
Available from the National Technical Information Service as PB-211 664, $3.00 in paper copy, $0.95 in microfiche. Colorado Environmental Resources Center, Fort Collins Completion Report Series No 30, June 30, 1972. 169 p, 51 fig, 2 tab, 73 ref. OWRR B-022-COLO (1).

Descriptors: Groundwater management, *Groundwater movement, *Colorado, Geologic control, *Groundwater Basins, Hydrologic models, *Model studies, Hydrogeology, Darcys Law, Mass curves, *Base flow.
Identifiers: Bedrock-Alluvium contact, *Interbasin groundwater flux, Black Squirrel Basin, High Plains Basin, Kiowa Byon Basin.

Three legally designated groundwater basins in Colorado have been studied to determine the magnitude of groundwater flux into or out of the underlying bedrock. A numerical model based on Darcy's Law and the mass continuity equation was employed to describe the flow of groundwater within each basin. The model was applied to the analysis of interbasin groundwater flow by assuming that no leakage occurs at the base of the alluvial aquifer. Where leakage does occur, the model produces anomalous results in the form of erroneous water level elevations. The magnitude of the anomalies is used to calculate the rate of the interbasin groundwater flux. The model studies revealed the following interbasin groundwater fluxes: (1) Loss from Black Squirrel Basin is approximately 5,350 acre-feet/year. (2) Loss from High Plains Basin is approximately 75,000 acre-feet/year. (3) Gain to Kiowa-Bijou Basin is approximately 19,000 acre-feet/year. Data requirements for the application of the model to groundwater basin are presented and procedures for qualitative evaluation of interbasin groundwater flux are discussed.
W72-13352

SOURCE AREAS AND CLIMATIC EFFECTS IN CARBONATE GROUNDWATERS DETERMINED BY SATURATION INDICES AND CARBON DIOXIDE PRESSURES,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
E. T. Shuster, and W. B. White.
Water Resources Research, Vol 8, No 4, p 1067-1073, August 1972. 8 fig, 1 tab, 8 ref.

Descriptors: *Water chemistry, *Karst hydrology, *Limestones, *Carbonate rocks, *Pennsylvania, Dolomite, Leaching, Carbon dioxide, Springs, Groundwater, Geochemistry, Karst, *Pennsylvania.
Identifiers: *Nittany valley (Pa).

In 14 carbonate springs in Nittany valley in central Pennsylvania, the feeder system for the springs can be characterized as conduit flow or diffuse flow on the basis of the variability in water chemistry. Saturation indices and CO2 partial pressures were sorted into monthly groups and averaged. Conduit springwaters are always aggressive with respect to both calcite and dolomite. The high variability reflects mostly variation in recharge, short residence time, and slow kinetics of equilibration between water and rock. Diffuse springwaters are somewhat aggressive with respect to calcite during the growing season but become somewhat supersaturated during the winter. Waters from diffuse-flow springs in dolomite are nearly at saturation, whereas waters from diffuse-flow springs in limestone are always undersaturated with respect to dolomite. The equilibrium CO2 pressures of conduit springwaters show a regular seasonal trend having a pronounced maximum during the growing season. The CO2 content of diffuse-flow springs is highly variable, and although the summer maximum is present, the CO2 content also reflects variations in the CO2 production in the catchment areas of infiltrating waters. (Knapp-USGS)
W72-13465

UNSTEADY RADIAL FLOW IN AN UNCONFINED AQUIFER,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Water Resources Research, Vol 8, No 4, p 1059-1066, August 1972. 2 fig, 14 ref.

Descriptors: *Groundwater movement, *Drawdown, *Unsteady flow, *Water table, Equations, Saturated flow, Unsaturated flow, Storage, Permeability, Storage coefficient, Water level fluctuations, Numerical analysis.
Identifiers: *Unconfined aquifers.

Partial differential equations were written for unsteady radial flow to a well that is tapping an unconfined aquifer of infinite extent and discharging at a constant rate. Complete penetration of the aquifer by the well is assumed. Consideration is given to the observed head in a well that is screened throughout the unconfined aquifer, as well as to the head that corresponds to the free surface value. A relationship between the observed head and the free surface head is assumed to have the form of a vertical transfer linear equation. (Knapp-USGS)
W72-13466

DETERMINATION OF THE HYDRAULIC DIFFUSIVITY OF A HETEROGENEOUS CONFINING BED,
Geological Survey, Washington, D.C.
R. G. Wolff, and S. S. Papadopulos.
Water Resources Research, Vol 8, No 4, p 1051-1058, August 1972. 6 fig, 2 tab, 11 ref.

Descriptors: *Groundwater movement, *Diffusivity, *Aquicludes, *Aquitards, *Artesian aquifers, Permeability, Numerical analysis, Mathematical models, Piezometers, Groundwater, Confined water.
Identifiers: *Leaky artesian aquifers.

The hydraulic diffusivity of a confining bed exhibiting vertical heterogeneity was determined by field and laboratory tests. A thin sand aquifer was pumped, and head changes were observed in the aquifer and at three vertically separated piezometers in the overlying confining bed. A four-layer digital model was used to analyze the field data. Hydraulic diffusivities for each layer were adjusted in the model until calculated head changes in all piezometers closely matched those observed in the field. Laboratory-determined hydraulic diffusivities were several orders of magnitude smaller than the field-determined values. Interfingering of layers within the confining bed is believed to have caused this difference. Additional studies are needed before a general conclusion can be reached on the value of laboratory determinations of hydraulic parameters for heterogeneous confining beds. (Knapp-USGS)
W72-13467

NUMERICAL SIMULATION OF FLOW IN AN AQUIFER OVERLAIN BY A WATER TABLE AQUITARD,
Nevada Univ., Reno. Center for Water Resources Research.
R. L. Cooley.
Water Resources Research, Vol 8, No 4, p 1046-1050, August 1972. 1 fig, 9 ref.

Descriptors: *Groundwater movement, *Water table, *Compressibility, *Water level fluctuations, *Drawdown, Permeability, Storage coefficient, Numerical analysis, Unsaturated flow, Saturated flow, Mathematical models.
Identifiers: *Unconfined aquifers.

An extension of the convolution integral produced by 'delayed yield' theory describes vertical flow rate at the base of a unit such as an aquitard bounded at the top by a water table across which recharge is permitted and at the bottom by a variable drawdown boundary. The solution requires that the water table release water from storage instantaneously with a decline in head and that the compressibility of both the unit and the water in it be neglected. Application of the integral as an upper boundary condition for an aquifer underlying a water table aquitard allows approximation of the influence of the water table aquitard on the unsteady state head distribution in the aquifer. A simple, efficient procedure permits the use of a numerical approximation of the integral with a numerical groundwater flow model of the aquifer. An example solution demonstrates the high degree of accuracy of the method. (Knapp-USGS)
W72-13468

THEORY OF FLOW IN UNCONFINED AQUIFERS CONSIDERING DELAYED RESPONSE OF THE WATER TABLE,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
S. P. Neuman.
Water Resources Research, Vol 8, No 4, p 1031-1045, August 1972. 12 fig, 37 ref.

Descriptors: *Groundwater movement, *Water table, *Compressibility, *Water level fluctuations, *Drawdown, Permeability, Storage coefficient, Numerical analysis, Unsaturated flow, Saturated flow, Mathematical models.
Identifiers: *Unconfined aquifers.

A new analytical model is proposed for the delayed response process characterizing flow to a well in an unconfined aquifer. The present approach is based only on well-defined physical parameters of the aquifer system. Therefore it provides a possible physical explanation for the mechanism of delayed water table response. The process of delayed response in a homogeneous anisotropic phreatic aquifer can be simulated by using constant values of specific storage and

specific yield without recourse to unsaturated flow theory. In the absence of significant infiltration at the ground surface, compressibility may often be a much more important factor than unsaturated flow above the water table. (Knapp-USGS)
W72-13469

TEST-OBSERVATION WELL NEAR ODESSA, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04B.
W72-13571

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins, L. W. Gelhar, and J. L. Wilson, III.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9215, p 1701-1714, September 1972. 11 fig, 3 tab, 29 ref, append.

Descriptors: *Hydraulic models, *Hydrogeology, *Saline water instrusion, *Aquifers, *New York, Analog models, Water balance, Path of pollutants, Water table, Groundwater movement, Seepage, Saline water-freshwater interfaces, Saline water barriers.
Identifiers: *Hele-Shaw models.

An experimental study, using a vertical Hele-Shaw model, was undertaken to determine fresh and salt groundwater flow for various groundwater development schemes on Long Island, N. Y. To satisfy dynamic similitude, some portions of the model are anisotropic. To simulate stream base flow, an internal weir is incorporated in the model. Liquid silicones simulate fresh and salt water. Verification of the model is achieved by reproduction of long-term water table profiles, the stream base flow, and the double salt-water wedge structure (two salt-water wedges separated vertically by fresh water), south of the island. Response of the salt water to hydrologic transients on the island is slow. Recharge is effective in arresting or reversing salt-water movement. (Knapp-USGS)
W72-13578

GROUND-WATER RESOURCES OF BENSON AND PIERCE COUNTIES, NORTH-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13587

SALINE KARST (SOLYANOY KARST),
For primary bibliographic entry see Field 02K.
W72-13590

A HYDROGEOLOGICAL ZONING OF THE AFRICAN CONTINENT (GIDROGEOLOGICHESKOYE RAYONIROVANIYE AFRIKANSKOGO MATERIKA),
Ye. A. Vostokova, N. A. Marinov, and L. I. Flerova.
Akademiya Nauk SSSR Izvestiya, Seriya Geologicheskaya, No 2, p 102-110, February 1972. 1 fig, 12 ref.

Descriptors: *Africa, *Hydrogeology, *Groundwater, *Groundwater basins, *Zoning, Geomorphology, Structural geology, Petrology, Orography, Hydrography, Meteorology, Artesian aquifers, Geologic mapping, Atlantic Ocean, Indian Ocean.
Identifiers: *USSR, *Mediterranean Sea, *Artesian basins, Tectonics.

The physiography, rock characteristics, and tectonic structure of the African continent are examined in connection with a division of the land mass into hydrogeological provinces and regions. Five hydrogeological provinces are identified: (1) the Atlantic Ocean drainage, covering 30% of the continent and consisting of 7 hydrogeological regions, including 20 artesian basins; (2) the Mediterranean Sea drainage, covering 15% of the continent and representing 3 hydrogeological regions, including 13 artesian basins; (3) the Indian Ocean drainage, covering 18% of the continent and divided into 4 hydrogeological regions, comprising 9 artesian basins; and (4) and (5) the continental interior and Rift plateau covering 31% of the continent and consisting of 8 hydrogeological regions and 27 artesian basins. A sketch map shows the hydrogeological zoning of the continent and the geographic occurrence of groundwater. (Josefson-USGS)
W72-13592

MIGRATION OF SPRINGS AND THEIR CHANGES AT DISCHARGE POINTS OF CARBONATED WATER AS ILLUSTRATED BY ARTESIAN SYSTEMS IN THE PAMIRS AND TIEN SHAN MOUNTAINS (MIGRATSIYA ISTOCHNIKOV I IZMENENIYA V OCHAGAKH RAZGRUZKI UGLEKISLYKH VOD PAMIRA I TYAN'-SHANYA KAK PRIMER GEODINAMIKI VODONAPORNYKH SISTEM),
Tsentralnyi Nauchno-Issledovatelskii Institut Kurortologii i Fizioterapii, Moscow (USSR).
V. N. Disler.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1167-1170, 1971. 1 tab, 3 ref.

Descriptors: *Hydrogeology, *Springs, *Spring water, *Confined water, *Artesian aquifers, Travertine, Water temperature, Water quality, Discharge (Water), Orography, Mountains, Volcanoes, Gases, Hydrothermal studies, Variability.
Identifiers: *USSR, *Pamirs, *Tien Shan, *Carbonated springs, Geodynamics, Diastrophism, Seismism, Tectogenesis, Orogeny.

The changes occurring within artesian systems of the Pamirs and Tien Shan Mountains in central Asia can be assessed from the type of travertine deposited near springs. Genetically, the different forms of travertine can be classified as (1) vein travertine, filling cavities in hydrothermal channels; (2) sheet travertine, formed near springs; and (3) travertine redeposited as a result of the disintegration of the first two types. In terms of the nature of travertine formation and scale of its deposition, two types of migration of carbonated springs can be identified: (1) migration without substantial change in composition and temperature of spring water, as illustrated by migration of the Garm Chashma Spring in the southwestern Pamirs; and (2) migration with a sharp change in composition and temperature of spring water, as provided by the Sang Khok Springs on the Gissar Range, 90 km from Dushanbe in Tadzhikistan. Continuing diastrophism, high seismic activity, and increasing intensity of tectogenesis are major factors in the alteration of artesian systems in the Pamirs and Tien Shan and markedly affect composition and temperature of spring water, pressure in artesian systems and fluid flow characteristics. (Josefson-USGS)
W72-13595

2G. Water in Soils

INTERACTION OF HERBICIDES AND SOIL MICROORGANISMS.
Boyce Thompson Inst. for Plant Research Inc., Yonkers, N.Y.
For primary bibliographic entry see Field 05C.
W72-13044

ROLE OF QUINONE GROUPS IN SOLUBILITY AND COMPLEXING OF METALS IN SEDIMENTS AND SOILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology Div.
For primary bibliographic entry see Field 05B.
W72-13059

CORRELATIVE RELATIONSHIPS BETWEEN INFILTRATION AND SOIL PROPERTIES (KORRELYATIVNYYE SVYAZI MEZHDU VELICHINOY ILFIL'TRATSII I SVOYSTVAMI POCHVENNOGO POKROVA),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
A. M. Grin.
Akademiya Nauk SSSR Doklady, Vol 200, No 5, p 1207-1209, 1971. 1 tab, 6 ref.

Descriptors: *Correlation analysis, *Regression analysis, *Infiltration, *Infiltration rates, *Soil properties, Soil chemical properties, Soil physical properties, Soil density, Bulk density, Porosity, Aggregates, Organic matter, Variability, Equations, On-site investigations.
Identifiers: *European USSR, Multiple linear correlation, Curvilinear correlation, Correlation coefficients, Regression coefficients.

Investigations of quantitatively-determinate relationships between infiltration and soil properties were based on extensive experimental data for 27 places in steppe, forest-steppe, and southern forest zones in the European USSR and on American data for 68 places throughout the United States. On the basis of Soviet data, the correlation coefficient between rate of infiltration and organic-matter content in the upper 30 cm of soil reached 0.71, whereas the relationship between infiltration and bulk density was the same as that based on American data--minus 0.28. Introduction of additional variables does not necessarily improve the relationship. Close relationships exist between the infiltration rate and the principal soil physical and chemical properties, and the use of multiple linear correlation to find these relationships is justified. (Josefson-USGS)
W72-13070

COMPUTER SIMULATION ANALYSIS ON RECLAMATION OF SALT-AFFECTED SOILS IN SAN JOAQUIN VALLEY, CALIFORNIA,
California Univ., Davis.
For primary bibliographic entry see Field 03F.
W72-13115

VISIBLE AND NEAR INFRARED REMOTE-SENSING OF SOIL MOISTURE LEVELS,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 07B.
W72-13130

FLOW UNDER A WEIR ON SOIL UNDERLAIN BY SLOPING IMPERVIOUS LAYER,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
A. S. Reddy, G. C. Mishra, and K. Seetharamiah.
Journal of Hydraulic Research, Vol 10, No 1, p 77-91, 1972. 4 fig, 4 ref.

Descriptors: *Seepage, *Underseepage, *Numerical analysis, *Weirs, Porous media, Alluvial channels, Groundwater movement, Mathematical studies, Anisotropy, Leakage, Percolation.
Identifiers: Sheet piles.

Using the Schwarz-Christoffel transformation, an analysis is presented for finding the quantity of seepage, exit gradient and pressure distribution for a weir with an inclined sheet pile embedded in a homogeneous and isotropic porous medium underlain by an inclined impervious boundary. The inclination of the sheet pile has considerable in-

fluence on the quantity of seepage and exit gradient. The solution is useful for analysis of flow characteristics associated with a stepped weir having a vertical sheet pile in any anisotropic porous medium. (Knapp-USGS)
W72-13199

DETERMINATION OF CHANGES IN SOIL BULK DENSITY IN A RICE FIELD FOR ESTIMATION OF THE DESALINATION EFFECTS OF FLOODING (UCHET IZMENENIY OB'YEMNOGO VESA POCHVY RISOVOGO POLYA DLYA OTSENKI RASSOLYAYUSHCHEGO DEYSTVIYA ZATOPLENIYA),
Dagestanskii Nauchno-Issledovatelskii Institut Selskogo Khozyaistva, Makhachkala (USSR).
T. M. Gaziyeva, E. M. Mirzoyev, and S. F. Negovelov.
Pochvovedeniye, No 12, p 153-155, December 1971. 4 tab.

Descriptors: *Physical properties, *Bulk density, *Desalination, *Flood irrigation, *Rice, Salinity, Salts, Chlorides, Sulfates, Leaching, Variability, Sampling.
Identifiers: *USSR, *Dagestan ASSR, *Solonchaks.

The salt concentration in nonirrigated Solonchak in the Dagestan ASSR in May 1965 and in May 1969, four years after planting the field to rice, was investigated with and without accounting for changes in soil bulk density during flooding. The chloride content in 1969 was considerably reduced, while the sulfate content remained virtually unchanged. As a result of leaching of chlorides, the salinity level in the soil in 1969 decreased by 30%. Depending on computation techniques used, estimates of the effectiveness of desalination vary widely. (Josefson-USGS)
W72-13280

WATER PROPERTIES OF SOME SOILS IN THE TURKMEN SSR (O VODNYKH SVOYSTVAKH NEKOTORYKH POCHV I GRUNTOV TURKMENSKOY SSR),
Turkmenskii Gosudarstvennyi Pedagogicheskii Institut, Chardzhou (USSR).
O. Allakov, and Kh. Baydzhanov.
Pochvovedeniye, No 12, p 141-145, December 1971. 2 fig, 1 tab, 10 ref.

Descriptors: *Thermodynamics, *Physicochemical properties, *Water properties, *Soils, Sands, Clay loam, Clays, Bentonite, Soil density, Soil moisture, Moisture content, Hysteresis, Sorption, Adsorption, Humidity, Equations.
Identifiers: *USSR, *Turkmen SSR, *Heat of wetting, *Specific surface, Hygroscopicity, Desorption, Isotherms.

Physicochemical properties of sand, soil, clay loam, clay and bentonite in the Turkmen SSR were investigated for sorption and desorption isotherms, water-holding properties, heat of wetting, and density. S-shaped isotherms with a clearly expressed sorption hysteresis were obtained for the samples examined. For Oglanly bentonite and Kalinin and Kelyatinskaya clays, sorption hysteresis begins at a relative humidity of 10%. For soil of the Chardzhou agricultural experiment station, sorption hysteresis begins at a relative humidity of 40%-45% and for Bezmein clay loam and sand from the Kara Kum Desert it begins at 40% and 53%, respectively. Depending on the type of clay mineral in the colloidal fraction of soil material, specific-surface values obtained from heat of wetting and from a proposed equation vary between 12 sq m/liter for Kara Kum sand and 355 sq m/liter for Oglanly bentonite. Specific surface, heat of wetting, and water-holding properties of soil materials of different mineral composition differ significantly, depending on structural and geometric characteristics, degree of dispersion, and physicochemical nature of the solid-particle surface. (Josefson-USGS)
W72-13281

SOIL-RECLAMATION STUDIES IN THE POLISH PEOPLE'S REPUBLIC (POCHVENNO--MELIORATIVNYYE ISSLEDOVANIYA V POL'SKOY NARODNOY RESPUBLIKE),
For primary bibliographic entry see Field 04A.
W72-13282

DYNAMICS OF WATER-SOLUBLE SALTS UNDER ALFALFA IN A RICE CROP ROTATION (DINAMIKA VODNORASTVORIMYKH SOLEY POD LYUTSERNOY V RISOVOM SEVOOBOROTE),
For primary bibliographic entry see Field 03C.
W72-13284

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM--BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
V. S. Muratova, and V. Yu. Margulis.
Pochvovedeniye, No 12, p 87-99, December 1971. 2 fig, 6 tab, 21 ref.

Descriptors: *Water chemistry, *Aqueous solutions, *Saline soils, *Salts, *Gypsum, Sulfates, Chlorides, Ions, Moisture content, Soil moisture, Hygroscopic water, Field capacity, Soil profiles, Soil texture, Soil types, Sierozems, Salt tolerance, Land management, Regression analysis.
Identifiers: *USSR, *Kazakhstan, *Golodnaya Steppe, *Solonchaks, *Meadow soils, Soil samples, Soil solutions, Magnesium sulfate.

To determine the concentration of toxic salts in water extracts and soil solutions, 100 samples were taken from 8 profiles of saline, gypsum-bearing Sierozem-Meadow soils and Meadow-Mineral Solonchaks and 47 samples from 6 profiles of irrigated Light Sierozems in the southern part of the Golodnaya Steppe in southeast Kazakhstan. The content of toxic salts in water extracts always exceeds that in soil solutions, being 1-2 meq/100 g of soil higher in irrigated Light Sierozems having no visible gypsum accumulation and 3-5 meq/100 g of soil higher in gypsum-bearing Sierozem-Meadow soils. An excess concentration of 1-2 meq of sodium and magnesium sulfates in a water extract of a slightly saline gypsum-bearing soil corresponds to an increase of 0.06%-0.12% in the amount of toxic salts. The concentration of these salts in soil solutions can be determined from their concentration in water extracts with a maximum error of 2-3 g/liter for slightly saline soils, 5-7 g/liter for moderately and strongly saline soils, and 10-12 g/liter for Solonchaks. Salt-affected soils can be classified according to content of toxic salts in water extracts, provided the composition of water extracts and soil solutions are compared in terms of the effects of solution concentration on crop growth. (Josefson-USGS)
W72-13285

STABILITY OF WET AGGREGATES IN AN ARTIFICIAL SOIL STRUCTURE (DINAMIKA VODOPROCHNOSTI I MEKHANICHESKOY PROCHNOSTI ISKUSSTVENNOY STRUKTURY POCHV),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
B. I. Potapov.
Pochvovedeniye, No 12, p 79-86, December 1971. 2 fig, 2 tab, 17 ref.

Descriptors: *Soil physics, *Soil structure, *Soil aggregates, *Soil stability, *Soil strength, Shear strength, Bulk density, Soil moisture, Moisture content, Porosity, Pores, Polymers, Aqueous solutions, Soil analysis, Analytical techniques, Weather forecasting.
Identifiers: *USSR, *Soil samples, *Aggregation, Macroaggregates, Microaggregates, Sod-Podzolic soils, Polyacrylamide.

Analysis of the effects of soil moisture content on stability of wet aggregates in a soil macrostructure was based on a laboratory study of the interaction between Sod-Podzolic clay loam soil and polyacrylamide (PAA). Structure-forming polymers considerably improve the stability, strength, and porosity of soils and are effective when the newly formed macrostructure is dried and when it is kept at a high moisture content. A PAA solution can be used in a wide range of soil moisture contents prior to application. Since stability and strength of macroaggregates formed in the presence of PAA increase with time, short-range weather forecasts must be consulted before applying the structure-building polymer. When structure-forming polymer solutions are used, allowance must be made for the original soil moisture content and its change after aggregation to obtain the highest possible aggregating effect. At a constant soil moisture content, the strength of macroaggregates formed was high on the 5th and 7th day after addition of the PAA solution to the soil. (Josefson-USGS)
W72-13286

CONTROLLING WATER INFILTRATION IN BIMODAL POROUS SOILS: AIR-EARTH INTERFACE CONCEPT,
Agricultural Research Service, Reno, Nev.
R. M. Dixon.
In: International Association for Hydraulic Research and International Society of Soil Science, Proceedings of Second Symposium, Vol 1, p 102-117, August 1972.

Descriptors: *Air-earth interfaces, *Infiltration, *Soil water movement, *Porous media, Hydrologic properties, Soil surfaces, Pores, Hydraulic conductivity, Soil management, Watershed management, Cultivation, Mulching.
Identifiers: *Infiltration control, *Cultural practice design, Bimodal porous media, Macropores, Surface geometry, Surface cover, Soil air pressure, Soil air movement.

The air-earth interface concept sets forth the general principle that soil surface roughness and openness govern the flow of air and water in underlying macropore and micropore systems and thereby control infiltration of free surface water. If the soil surface is rough and open, interfacial exchange of air and water occurs freely and water infiltrates rapidly via the relatively short broad straight paths of the macropore system. In contrast if the surface is smooth and closed, surface exchange of air and water is greatly impeded and water infiltrates slowly via the relatively long narrow tortuous paths of the micropore system. To achieve a desirable rate and route of infiltration, cultural practices can be directed to creating appropriate levels of interfacial openness and roughness. These levels may be attained directly and quickly by using suitable tillage implements or indirectly and more slowly by guiding natural physical and biological processes. (ARS)
W72-13289

WATER INTAKE RATES ON A SILT LOAM SOIL WITH VARIOUS MANURE APPLICATIONS,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W72-13295

WATER TABLE CONTROL AND SUBSURFACE IRRIGATION IN MINERAL AND HIGH ORGANIC COASTAL PLAIN SOILS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 03F.
W72-13304

THE REDOX PROPERTIES OF SOLUTIONS IN PODZOLIC SOILS BY LYSIMETRIC DATA,
E. I. Shilova, and L. V. Kozlova.
Uch Zap Leningr Gos Univ. 348. p 164-173. 1969.
Identifiers: *Oxidation-reduction potential, Deficit, Forests, Grass M, Loam, Lysimetry, Oxygen, *Podzols, Soils, Solutions.

Soil solutions in the humus horizon contain less O2 and more ferrous-Fe and have smaller rH2 than in the podzol and illuvial horizons. The redox equilibrium of solutions in loamy soils is shifted more toward reducing conditions than in sandy soils. The O2 deficit in the solutions from loamy forest soils is usually most acute in summer and autumn, but has been noted in spring and summer under grasses.--Copyright 1972, Biological Abstracts, Inc.
W72-13367

CERTAIN TRAITS OF MOUNTAIN SOILS IN RELATION TO THE NATURAL ENVIRONMENT,
V. G. Kalmykova.
Izv Vses Geogr O-Va. Vol 102, No 2, p 124-128. 1970.
Identifiers: *Mountains, *Soil types, Environmental effects, Climate, Cover, Environment, Formation, Plants, Runoff, Salinity, Soils, Surface.

Mountain soil formation is controlled by the composition and properties of the soil-forming rocks; mountain soils are usually young, shallow, and physical weathering is pronounced. Examples of dissimilar soils in the Urals formed on different soil-forming rocks under very similar climatic conditions and plant covers are given. All mountain soils have high humus contents, increasing with elevation, and coarse humus. A predominance of surface runoff over seepage diminishes the salinity of mountain soils and retards processes of podzolization and bogging. The names of mountain soils should include a designation of the vertical plant zone and place of occurrence.--Copyright 1972, Biological Abstracts, Inc.
W72-13368

SOILS IN THE FLOODPLAIN OF THE AMUR RIVER WITHIN THE UDYL-KIZINSKAYA LOWLAND,
Y. I. Ershov.
Khabar Kompleksn Nauchno-Issled Inst Sib Otd Akad Nauk SSSR. 107 p. Khabarovsk. 1969.
Identifiers: *Soil properties, *Flood plains, Agriculture, Classification, Genesis, Udyl-Kizinskaya, Amur River, Soils, USSR.

The conditions of soil formation, the classification, genesis and evolution of the soils are described. The results of determination of various physicochemical properties and the possibilities of agricultural utilization of floodplain soils are presented.--Copyright 1972, Biological Abstracts, Inc.
W72-13372

TECHNIQUE OF SOIL STUDY OF THE ROUTES OF MOVEMENT OF LIQUID MOISTURE IN THE SOIL,
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
E. A. Dmitriev.
Biol Nauk. Vol 14, No 5, p 125-127. 1971. Illus.
Identifiers: *Soil water movement, *Soil investigations, Analytical techniques, Filtration, Iodine, Liquids, Moisture, Movement, Routes, Soils, Starch.

A 1-2.5% solution of soluble starch may be used to determine the routes of liquid moisture in the soil. A section of soil soaked in solution was sprayed with I water. The route of the filtration of the starch was found by the appearance of dark spots in the soil section.--Copyright 1972, Biological Abstracts, Inc.
W72-13373

CONTROLLING PRACTICES FOR WATER REGIME OF SANDY SOILS,
For primary bibliographic entry see Field 03F.
W72-13375

CERTAIN PROPERTIES OF SANDY AND SANDY LOAMY SOILS IN THE MESHCHERA LOWLAND ON BINARY DEPOSITS AND THEIR AGRICULTURAL VALUE,
For primary bibliographic entry see Field 03F.
W72-13377

WIND EROSION IN UZBEKISTAN AND SOME METHODS FOR ITS PREVENTION,
K. Mirzazhanov.
(Tr) Vses Nauchno-Issled Inst Khlopkovod. 16. p 237-253. 1970.
Identifiers: *Erosion control, *Wind erosion, Bogs, Cotton D, Erosion, Meadows, Soils, Soil texture, USSR, Uzbekistan, Soil chemical properties.

Erosion affects meadow saz (habitat with high and permanent water table in arid regions of Central Asia), bog meadow soils of various salinities, silted soils and solonchaks. Data are given on the texture and chemical composition of uneroded and eroded meadow saz soil, wind velocity over a vertical profile, quantity and composition of deflation products. Ninety-nine percent of the total transported matter is in the surface portion of wind flow, 0-1 m above the ground. Deflation occurs more readily from saline horizons. Soils are also drifted over by sand from the sand massifs of central Fergana. Data are given on the effect of wind erosion and mechanical protection upon the cotton yields. A testing system of erosion control measures is proposed.--Copyright 1972, Biological Abstracts, Inc.
W72-13378

MOISTURE TURNOVER WITHIN SEROZEMS AND CINNAMON SOILS,
E. N. Blagoveshchenskii.
Tr Nauchno-Issled Inst Pochvoved Tadzh SSR. Vol 13, No 1, p 176-194. 1969.
Identifiers: *Soil moisture, *Moisture content, Accumulation, Cinnamon soils, Gradients, Migration, Moisture, Serozems, Soils, Temperature, Trees.

Experiments were conducted in the Lyaur-Dangara and Tavil-Dara areas of the Tadzhik SSR, in 1962-1966. The maximum moisture turnover occurred in exposed soil monoliths, the minimum in those covered on top, while those covered at the bottom occupied an intermediate position. The highest moisture content (12.4%) in serozem occurred in the soil monolith covered at the bottom, and the lowest in the exposed soil monolith. The highest moisture content in the cinnamon soil occurred in the soil monolith covered at the bottom (18.8%), the lowest (15.1%) in the soil monolith covered on top, while the exposed soil monolith occupied an intermediate position in this respect. The observation methods are described. The soil moisture regime was determined not only by the precipitation regime, but also by the thermal regime in the soil. The downward migration of moisture actuated by the temperature gradient during the warm season revealed that large moisture accumulation was due to an insulating intercalation placed at a depth of 2 m. The strongest effect was achieved by inserting a water-impermeable material on top and another at the bottom, the former in the rows below the roots and the latter in the interrows. This practice is applicable to tree stands.--Copyright 1972, Biological Abstracts, Inc.
W72-13381

INFILTRATION PROPERTIES OF SOILS ON THE NORTHERN SLOPE OF TRANSILI ALA-TAU AND THE EFFECT OF MAN'S ECONOMIC ACTIVITIES,
V. P. Mochalov.
Sb Statei Aspir Soiskatelei Min Vyssh Srednego Spets Obraz Kaz SSR Biol Geogr. 4. p 157-161. 1968.
Identifiers: Agriculture, Annual, *Soil conservation, Cover, Economics, *Infiltration, Plants, Regeneration, Slopes, Soils, Trans-Ili, Ala-Tau, USSR.

The infiltration properties of soils were assessed from their infiltration parameter, characterizing the maximum possible infiltration. This parameter was reduced by a factor of 2-10 by man's activities. Measures are recommended for conservation of the soil cover and annual regeneration of the plant cover. Suspension of plowing and grazing is recommended for steep mountain slopes. It is suggested that the territory be utilized under orchards, vineyards, and hayfields, and irrigated by sprinkling when necessary.--Copyright 1972, Biological Abstracts, Inc.
W72-13383

REGULARITIES OF THE DYNAMICS OF SOIL MOISTURE RESERVES IN THE SOUTHERN UKRAINE,
A. V. Shvebs.
Meteorol Klimatol Gidrol Mezhved Nauchn Sb. 5. p 132-135. 1969. English summary.
Identifiers: *Soil moisture, Accumulation, Curves, Dynamics, *Moisture content, Reserves, Soils, Southern Ukraine, USSR.

Analysis of moisture accumulation curves for the soil reveals that 10-day precipitation totals of 5-15 mm do not increase the soil moisture content. The position of these curves is determined by the limit of possible moisture accumulation and is practically independent of the development phase of the crop. Concurrently constructed curves of the loss and the accumulation of soil moisture may be used for calculation and prediction of soil moisture reserves for individual farms.--Copyright 1972, Biological Abstracts, Inc.
W72-13384

STUDIES ON MINERALIZATION OF UREA IN SOME SOILS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Microbiology Dept.
For primary bibliographic entry see Field 05B.
W72-13385

SOILS OF THE GLENAVY-WILLOWBRIDGE DISTRICT, SOUTH CANTERBURY, NEW ZEALAND, AND THEIR SUITABILITY FOR IRRIGATION,
Department of Scientific and Industrial Research, Christchurch (New Zealand). Soil Bureau.
E. Griffiths.
N Z J Sci. Vol 14, No 3, p 524-553. 1971. Illus. Map.
Identifiers: Age, Drainage, *Irrigation, New Zealand, *Soils, Topography, South Canterbury (N.Z).

The soils are described and grouped according to parent material, age, and ground-surface. The soils, topography, and drainage are considered. Relic Fe cemented pans occur in the Steward and

Lismore soils, but as these soils are of limited areal extent the pans should not interfere with drainage of the whole area. Seventy percent of the soils are suitable for irrigation.--Copyright 1972, Biological Abstracts, Inc.
W72-13386

EFFECT OF SOIL TYPE AND IRRIGATION METHOD ON LATERAL MOVEMENT OF CYCLOATE,
Oregon State Univ., Corvallis. Dept. of Farm Crops.
For primary bibliographic entry see Field 05B.
W72-13388

RESIDUAL ACTIVITY OF PARAQUAT IN SOILS: II. ADSORPTION AND DESORPTION,
Ontario Agricultural Coll., Guelph.
For primary bibliographic entry see Field 05B.
W72-13409

DEGRADATION OF BROMOXYNIL IN REGINA HEAVY CLAY,
Department of Agriculture, Saskatoon (Saskatchewan); and Regina Research Station (Saskatchewan).
For primary bibliographic entry see Field 05B.
W72-13411

THE INFLUENCE OF LIQUID SURFACE TENSION AND LIQUID-SOLID CONTACT ANGLE ON LIQUID ENTRY INTO POROUS MEDIA,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
C. L. Watson, J. Letey, and M. A. Mustafa.
Soil Sci. Vol 112, No 3, p 178-183. 1971. Illus.
Identifiers: *Infiltration rates, *Surface tension, Capillary action, Infiltration, Media, Soils.

Liquid surface tension and liquid-solid contact angle parameters were used to estimate relative initial rates of liquid entry into soil as a function of surface tension. The method can predict the surface tension at which infiltration rate will be maximized, and this value is very readily found for water-repellent soils. Expected relative rates were derived as a function of surface tension for 2 water-repellent and 2 wettable soils and were compared with actual infiltration and capillary rise data for the same media using both a series of aqueous ethanol and surfactant solutions. There was reasonable agreement between expected and actual rates of entry of ethanol solutions using both infiltration and capillary rise techniques. However, actual infiltration data with surfactant solutions and repellent soils did not give the expected result. The anomaly was attributed to the absorption of surfactant by the soil with a resultant increase in surface tension. This effect was not a major factor for the Pachappa sandy loam, which gave good agreement between expected and measured data. Surface tension-contact angle relationships are therefore useful in predicting relative initial rates of solution entry into soil provided interaction between soil and solution does not appreciably change the surface tension of the applied solution.--Copyright 1972, Biological Abstracts, Inc.
W72-13427

WATER REGIME OF MOUNTAIN CINNAMON CALCAREOUS SOILS UNDER FOREST AND STEPPE,
G. T. Turdyev.
Tr Nauchno-Issled Inst Pochvoved Tadzh SSR. Vol 13, No 1, p 195-201. 1969.
Identifiers: *Soil-water-plant relationships, *Soil moisture, Bluestem M, Calcareous soils, Forests, Grasslands, Hawthorn D, Licorice D, Moisture, Mountains, Precipitation, Soils, Walnut D, Willow D.

Studies were made of the water regime of cinnamon light-loamy soils under steppe (forbs with predominance of licorice and bluestem) and forest (willow, hawthorn, walnut) in the Tavil-Dara area (Tadzhik SSR). The loss of moisture from the 2-4 m layer was less under steppe than under forest. The soil under forest, received up to 669 mm of precipitation and lost the same amount, while that of steppe (40 m from the forest) received only 546 mm of precipitation but lost more. The differences between the soil moisture contents were the most pronounced in Sept.-Dec. The differences were insignificant in the 0-50 cm layer.--Copyright 1972, Biological Abstracts, Inc.
W72-13428

THE INFLUENCE OF SOIL TEMPERATURE ON THE CHEMICAL KINETICS OF FLOODED SOILS AND THE GROWTH OF RICE,
International Rice Research Inst., Los Banos, Laguna (Philippines).
D. Y. Cho, and F. N. Ponnamperuma.
Soil Sci. Vol 112, No 3, p 184-194. 1971. Illus.
Identifiers: *Crop production, Flood -water, Soil chemical properties, Flooding, Growth, Rice M, Soils, *Soil temperature.

The influence of 4 soil temperature regimes on the kinetics of Eh, pH, specific conductance, CO2, volatile organic acids, Fe++, Mn++, NH4+, NO3- and SO4-- in the solutions of 8 flooded soils planted to rice was studied in the greenhouse. The rates of chemical and electrochemical changes during the first 8 wk were: 38 to 20C > 30C > 20C > 15 to 31 to 18C. In all regimes, the concentrations of CO2, organic acids, Fe++ and Mn++ increased after flooding, reached peak values, and then declined. In the 38 to 20C and 30C regimes the peaks were early, short, and sharp, while in the 20C and 15 to 31 to 18C regimes they were late, high, and broad. Growth and yield of rice were in the order: 38 to 20C > 30C > 15 to 31 to 18C > 20C. Growth retardation at low temperature was more severe in the acid soils than in the neutral soils and was associated with high concentrations of CO2, volatile organic acids, and Fe++ in the soil solutions.--Copyright 1972, Biological Abstracts, Inc.
W72-13430

A NEW HYDROMETER,
California Univ., Davis.
For primary bibliographic entry see Field 07B.
W72-13432

INFLUENCE OF A SOIL MICROFLORAL CRUST ON SELECT PROPERTIES OF SOILS UNDER PINYON-JUNIPER IN SOUTHEASTERN UTAH,
Utah State Univ., Logan.
W. L. Loope, and G. F. Gifford.
Journal of Soil and Water Conservation, Vol 27, No 4, p 164-167, July-August 1972. 3 fig, 2 tab, 9 ref.

Descriptors: *Infiltration, *Sediment yield, *Lichens, *Soil chemical properties, *Land management, Land clearing, Soil conservation, Juniper trees, Erosion control, Soil erosion, Land reclamation, Brush control, Soil surfaces, Vegetation effects, *Utah.
Identifiers: *Lichen crusts.

Cryptogamic soil crusts on the Colorado Plateau were studied to determine their effect on infiltration rates, potential sediment production, permeability, and several chemical properties of the soil. Six different crust stages were identified. Undisturbed soil cores were used to determine intrinsic permeability under three treatments and disturbed soil samples were analyzed for pH, percent organic matter, soil texture, calcium plus magnesium content, and total conductivity. Cryptogamic crust had little effect on soil chemical properties. Analysis of undisturbed soil core data indicated that high cryptogamic cover tended to reduce intrinsic permeability, an effect that was reinforced when cores were irrigated. Sites with any degree of cryptogamic cover had significantly higher infiltration rates than chained areas (no lichen cover). Patterns of sediment production revealed a potential for increased sediment once the crust had been disturbed. (Knapp-USGS)
W72-13454

WATERSHED PHYSICS: SOIL VARIABILITY CRITERIA,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 02A.
W72-13471

DYNAMICS OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS-FIR FOREST FLOOR,
Washington Univ., Seattle.
For primary bibliographic entry see Field 04A.
W72-13570

SALT DISPERSION COEFFICIENTS NEAR AN EVAPORATING SURFACE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
R. M. Todd, and W. D. Kemper.
Soil Science Society of America Proceedings, Vol 36, No 4, p 539-543, July-August 1972. 7 fig, 3 tab, 7 ref.

Descriptors: *Dispersion, *Evaporation, *Soil water movement, Ion transport, Diffusion, Mass transfer, Water chemistry, Convection, Salts, Diffusivity, Aqueous solutions.

A series of laboratory experiments was conducted to gain detailed information on water and salt movements near an evaporating surface. Columns instrumented with tensiometers and salinity sensors were used with coarse- and fine-textured soils. Water was supplied to a water table at the base of the columns and approximately steady state evaporation from the soil surface was established. Dispersion coefficients were calculated from salt gradients and evaporation rates in regions of the soil where suctions ranged from 0.1 to several bars. Dispersion increased solution flux and average solution velocity. Values obtained for dispersion coefficients corresponded closely with those obtained under more nearly saturated conditions at similar rates of solution flux. (Knapp-USGS)
W72-13577

SALT AND WATER MOVEMENT IN UNSATURATED FROZEN SOIL,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
J. W. Cary, and H. F. Mayland.
Soil Science Society of America Proceedings, Vol 36, No 4, p 549-555, July-August 1972. 6 fig, 1 tab, 16 ref.

Descriptors: *Diffusion, *Saline water, *Soil water movement, *Frost heaving, *Frozen soils, Leaching, Ion transport, Mass transfer, Ice, Frost, Freezing, Brines, Salinity, Unsaturated.
Identifiers: *Thermal diffusion, *Salt diffusion.

Salt and water movements were measured in unsaturated frozen soil columns incubated under a thermal gradient for 3, 6, or 9 weeks. Both water and salt moved from the warmer to cooler areas in the soil, creating a twofold concentration difference over a 24-cm distance. Movements of CaCl2, LiI, and K2SO4 were affected by cation exchange reactions and salt solubilities at high concentrations. Although mass flow of dissolved salts in a liquid film of water was the principal

transfer mechanism, both vapor and salt diffusion were sometimes significant. Thermal diffusion and salt sieving did not appear to be important. Because the vapor pressure of ice controls the water potential in frozen soil, the amount of unfrozen water and the matric suction could be calculated from a water release curve and from data of ice suspensions in salt solutions. Mass flow in the liquid phase is described by Darcy's law. Thus, salt flow as well as net water transfer can probably be predicted in unsaturated frozen soil using information available from unfrozen systems. (Knapp-USGS)
W72-13579

OBSERVED AND CALCULATED DISTRIBUTION OF LINDANE IN SOIL COLUMNS AS INFLUENCED BY WATER MOVEMENT,
California Univ., Riverside. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W72-13580

INFLUENCE OF WATER AND TEMPERATURE ON ADSORPTION OF PARATHION BY SOILS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 05B.
W72-13581

TRANSPORT NUMBERS AND MOBILITIES OF IONS IN BENTONITE MEMBRANES,
Negev Inst. for Arid Zone Research, Beersheva (Israel).
I. Shainberg, and W. D. Kemper.
Soil Science Society of America Proceedings, Vol 36, No 4, p 577-583, July-August 1972. 4 fig, 2 tab, 14 ref.

Descriptors: *Ion transport, *Osmosis, *Membrane processes, *Bentonite, *Adsorption, Soil water movement, Electrochemistry, Ion exchange, Aqueous solutions, Saline water systems.
Identifiers: *Wyoming Bentonite.

Na-clay was compacted by porous barriers between solutions of different concentrations. Conductance of the clay and electrical potentials across the clay were measured and used to calculate the transference numbers for the Na ion. The transference numbers calculated from conductivity studies were higher than those calculated from emf measurements. A qualitative explanation for the lower numbers estimated from potential measurement is proposed which involves osmotically induced convective movement. (Knapp-USGS)
W72-13582

HYDRAULIC CONDUCTIVITY EVALUATION OF THE SOIL PROFILE FROM SOIL WATER RETENTION RELATIONS,
Agricultural Research Service, Watkinsville, Ga. Soil and Water Conservation Research Div.
R. R. Bruce.
Soil Science Society of America Proceedings, Vol 36, No 4, p 555-561, July-August 1972. 10 fig, 3 tab, 14 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, *Unsaturated flow, *Moisture content, *Moisture tension, Particle size, Permeability, Percolation, Soil physics, Soil types, Retention.

The water content-suction relation applicable to field soil horizons that differ widely in texture was evaluated. Except for coarse-tectured, organic matter-deficient horizons, soil water retention of sieved samples is significantly modified and does not represent the natural soil volume. Water content-suction data from measurements on carefully procured core samples of each horizon of a Typic Hapludult adequately represent their water retention characteristics. Using appropriate water content-suction data, the hydraulic conductivity-water content relation calculated by published procedures was compared with hydraulic conductivity measured on similar samples by a transient outflow procedure. The calculated hydraulic conductivity-water content relations for coarse grained systems or systems having a relatively narrow range of pore size and well-defined bubbling pressure was sufficiently accurate for many purposes. However, to obtain a useful evaluation of the unsaturated hydraulic conductivity of fine-textured horizons with a very wide range of pore size and poorly defined bubbling pressure, the Marshall or Millington and Quirk methods had to be matched at a water content in the 0.1- to 0.3-bar range. Indiscriminate use of such methods of calculating hydraulic conductivity is inadvisable. (Knapp-USGS)
W72-13583

SOIL MORPHOLOGY AND WATER TABLE RELATIONS: I. ANNUAL WATER TABLE FLUCTUATIONS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, G. H. Simmons, and D. G. Watts.
Soil Science Society of America Proceedings, Vol 36, No 4, p 644-648, July-August 1972. 3 fig, 1 tab, 7 ref.

Descriptors: *Water table, *Water level fluctuations, *Mathematical models, *Water balance, *Soil properties, *Mathematical models, Soil types, Soil physics, Soil water movement, Drainage, Soil physical properties, *Oregon, Data collections.
Identifiers: *Willamette Valley (Oregon), *Water table model.

Water table positions were measured daily over a 2-year period at representative sites of five soil series comprising the Willamette association of nearly level soils with good to poor natural drainage. All soils had water tables present for some period during the winter. Perched water tables were present near the surface of the two most poorly drained series most of the winter. A mathematical model was developed for predicting water table positions on the basis of rainfall input and soil physical characteristics. The model was calibrated with measurements from the previous 29 years to reconstruct water table positions as they had occurred in the past. The computer procedure did not apply to the two poorly drained series because of the presence of an impermeable soil horizon near the surface. However, water table positions of these series were estimated satisfactorily by correlation with water table positions on the better-drained series. For a specific depth and month, the time the water table was above a given level increased as the natural drainage conditions became poorer. Thus, particular water table regimes are associated with drainage conditions of specific soil series. (Knapp-USGS)
W72-13584

SUBSTANCES CONTRIBUTING TO FIRE-INDUCED WATER REPELLENCY IN SOILS,
Northern Arizona Univ., Flagstaff. Dept. of Chemsitry.
S. M. Savage, J. Osborn, J. Letey, and C. Heaton.
Soil Science Society of America Proceedings, Vol 36, No 4, p 674-678, July-August 1972. 5 fig, 2 tab, 8 ref.

Descriptors: *Wettability, *Soil water movement, *Infiltration, *Burning, *Organic matter, Soil physical properties, Soil chemical properties, Forest fires, Gas chromatography.
Identifiers: *Water-repellent soils, *Soil hydrocarbons.

A soil susceptible to heat-induced water repellency was heated at several temperatures and oxygen concentrations. The materials emanating from the heated soil were captured and their mass determined. The greatest quantity of products was captured at temperatures above 300C. Increasing amounts of material were produced with increasing oxygen concentrations up to 20%. From 0.3% to 1.75% of the total soil was captured as products. Fractionation of these captured products by adsorption chromatography resulted in the isolation of several different components. Three of these components were capable of causing extreme water repellency in sand if the treated sand were heated. Some evidence suggested that the heating of these substances on the sand surfaces altered their structure. These three effective components represented from 25-50% of the total materials collected from the soil. Elemental and spectroscopic analyses of the effective components indicated them to be basically aliphatic hydrocarbons. The undecomposed and partially decomposed plant materials present in the soil were determined to be the primary source of the products coming from the heated soils. (Knapp-USGS)
W72-13585

SOIL MORPHOLOGY AND WATER TABLE RELATIONS: II. CORRELATION BETWEEN ANNUAL WATER TABLE FLUCTUATIONS AND PROFILE FEATURES,
Oregon State Univ., Corvallis. Dept. of Soil Science.
G. H. Simonson, and L. Boersma.
Soil Science Society of America Proceedings, Vol 36, No 4, p 649-653, July-August 1972. 4 fig, 4 tab, 8 ref.

Descriptors: *Water table, *Water level fluctuations, *Water balance, *Soil properties, Soil types, Soil physics, Soil water movement, Drainage, Soil physical properties, *Oregon, Data collections.
Identifiers: *Munsell value and chroma.

The frequency of occurrence of water tables at certain depths below the soil surface and the length of time water tables remained at or above these depths were calculated on the basis of rainfall records from a 29-year period. Results were correlated with soil morphological features. The average depth below the surface to the midpoint of the uppermost mottled horizon increased as the drainage condition of the series improved. At the depth of a given degree of mottling, the percentage of time a soil was submerged was essentially the same in a given month for all series. The size and abundance of iron and manganese concretions increased in a consistent manner in the sequence from well-drained to poorly-drained soils. The sequence of bleached A2 horizons over 'clay pan' horizons was specifically related to the perched water tables of the Dayton and Concord series. When color features were considered jointly, the morphological assessment of natural drainage class was found consistent with the water table regimes of the soils. (Knapp-USGS)
W72-13586

2H. Lakes

IRON AND MANGANESE PROFILES IN A COASTAL POND WITH AN ANOXIC ZONE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W72-13057

LAKE WATER QUALITY PREDICTIONS,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05C.
W72-13060

ICE FORMED BEACH FEATURES FROM LAKE ST. JEAN, QUEBEC,
Centre de Recherche Forestiere des Laurentides, Quebec.
For primary bibliographic entry see Field 02C.
W72-13062

INVESTIGATION TECHNIQUES OF HYDROGEODYNAMIC PROCESSES IN THE LAKE BAYKAL AND ANGARA RIVER BASINS (GIDROGEODINAMICHESKIYE PROTSESSY V BASSEYNE BAYKALA I ANGARY I METODY IKH ISSLEDOVANIYA).

Izdatel'stvo 'Nauka', Moscow, V. I. Astrakhantsev, editor, 1971. 104 p.

Descriptors: *Hydrology, *Geology, *Engineering geology, *Lake basins, *River basins, Reservoirs, Reservoir construction, Reservoir operation, Shores, Waves (Water), Winds, Erosion, Mudflows, Geomorphology, Photogrammetry, Surveys, Investigations, Analytical techniques, Computers, Equations.
Identifiers: *USSR, *Siberia, Lake Baykal, Angara River, Sayan Mountains, Wind waves.

This collection contains 6 papers devoted to a study of hydrogeodynamic and hydrologic processes in the Lake Baykal and Angara River basins in southern Siberia and to development of a genetic classification of geologic and hydrophysical processes. Erosion, mudflow, channel, and shore phenomena are examined in the hydrogeodynamic category of geologic factors. Specific topics covered include: (1) construction and operation of reservoirs on the Angara River; (2) engineering-geologic conditions in the vicinity of the Ust'-Ilim reservoir; (3) mudflows in Eastern Sayan; (4) application of stereophotogrammetry to investigation of shore processes and wind waves on water bodies; (5) use of computers to calculate the wave-velocity field; and (6) investigation of the effects of wave runup on a shoreline. (Josefson-USGS)
W72-13069

TISSUE HEAT RESISTANCE OF PLANARIA AND ASELLUS OF LAKE OHRID IN YUGOSLAVIA,
Akademiya Nauk SSSR, Leningrad. Institut Tsitologii.
B. P. Ushakov, M. Milanovich, and S. Khadzhishche.
Dokl Akad Nauk SSSR Ser Biol. Vol 199, No 1, p 208-211. 1971. Illus.
Identifiers: Aquatic animals, *Asellus, *Heat resistance, *Lake Ohrid, *Planaria, Tissues, *Yugoslavia.

Lake Ohrid, like Lake Baikal, is one of the earth's few ancient lakes whose fauna is very rich with endemic species of animals. Experiments with Planaria and Asellus showed that the endemic species have a low tissue heat resistance, which is in accord with the relatively low temperature of their habitat. Differences in heat resistance of the tissue between endemic species and systematically close species of Planaria and Asellus inhabitating neighboring springs are insignificant.--Copyright 1972, Biological Abstracts, Inc.
W72-13105

DIATOMS OF THE AUVERNIER NEOLITHIC STATION (LAKE NEUCHATEL), (LES DIATOMEES DE LA STATION NEOLITHIQUE D' AUVERNIER (LAC DE NEUCHATEL)),
Neuchatel Univ. (Switzerland). Institut de Zoologie.
M. Wuthrich.
Schweizerische Zeitschrift fur Hydrologie, Vol 33, No 2, p 533-552, December 31, 1971. 8 fig, 14 ref.

Descriptors: *Diatoms, *Systematics, Chrysophyta, Sediments, Beds (Stratigraphic), Stratigraphy.
Identifiers: *Lake Neuchatel, Amphora ovalis var pediculus, Hantzschia amphyoxis, Navicula scutelloides, Gyrosigma attenauatum, Cocconeis spp., Cyclotella comensis, Melosira italica, Stephanodiscus astrae var minutula, Cyclotella stelligera, Cyclotella stelligerioides, Fragilaria spp., Achnanthes spp., Cocconeis semiaperta, Mastogloia smithii var lacustris, Caloneis lepidula, Anomoeoneis exilis, Anomoeoneis styricca, *Navicula spp., Amphora veneta, Ostrupia zachariasi, Cymbella spp., Gomphonema spp.

Substrata samples were taken from a Neolithic station at Lake Neuchatel (Switzerland) and analyzed for the presence of diatoms. No specific excavation data accompanied the samples when sent for examination and identification. Only whole specimens are figured and some species were identified from small fragments. Some of the species found are being reported for the first time in Lake Neuchatel. (Holoman-Battelle)
W72-13143

LOCALIZATION OF FISH-LICE AND LEECHES IN CARPS DURING THE AUTUMN FISHING,
Vysoka Skola Veterinarni, Brno (Czechoslovakia).
K. Bazal, Z. Lucky, and V. Dyk.
Acta Vet. Vol 38, No 4, p 533-544. 1969.
Identifiers: *Fish parasites, Argulus foliaceus, Argulus japonicus, Autumn, *Carps, Czechoslovakia, Fin, Fish lice, Fishing, Infestation, Leeches, Localization, Piscicola geometra.

Two species of fish-lice (Argulus japonicus and A. foliaceus) and the fish leech (Piscicola geometra) were located on 300 leather and mirror carps from 3 ponds of the State Fishery in Pohorelice and on 350 common carps from 5 ponds of different production types (3 with market fish, 2 with stock fish) of the State Fishery in Benesov near Prague during the autumn of 1963. In ponds with weeds both species of lice were found, in pure cultures of stock fish only Argulus foliaceus localized on the caudal fin, 16.28% on the sides, 14.15% on the back and the least number was found on the anal fin (1.30%). Dyk's directive on the conclusive evidence of the caudal fin when detecting generative carps is supported. Of the total number of fish leeches that were isolated in the Pohorelice region, 32.71% were found on the head, 30.86% on the abdomen, 17.90% on the tail and caudal fin and no leeches were found on the pelvic fin. In the Benesov region most of the parasites were found on the abdomen (40.63%), 27.72% on the head, 10.60% on the tail and caudal fin and the least were found on the anal fin (0.90%). These results might lead to the conclusion that the predominant localization is different on common carps (Abdomen), but the influence of exterior factors such as the preparation of the ponds for fishing, its duration, the eutrophication, the economic condition, water sources, nitrogen balance during carp fishing, etc., cannot be underestimated, so the problem of the usual localization of leeches cannot yet be completely concluded.--Copyright 1972, Biological Abstracts, Inc.
W72-13155

COMPARISON OF RIDGE AND RUNNEL SYSTEMS IN TIDAL AND NON-TIDAL ENVIRONMENTS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13191

COASTAL PROCESSES AND NEARSHORE SAND BARS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13192

SURFACE SEDIMENTS IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 02J.
W72-13196

IMMEDIATE AND REMOTE DATA PROCESSING SYSTEM FOR LAKE CHAMPLAIN,
Vermont Univ., Burlington. Lake Champlain Studies Center.
For primary bibliographic entry see Field 07B.
W72-13262

GROWTH AND MINERAL ACCUMULATION OF SUBMERSED VASCULAR HYDROPHYTES IN PLEIOEUTROPHIC ENVIRONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 05C.
W72-13294

A PREDICTIVE MODEL FOR THERMAL STRATIFICATION AND WATER QUALITY IN RESERVOIRS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons' Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 05B.
W72-13309

CHANGES IN THE PHYTOPLANKTON OF THE DEVELOPING VOLTA LAKE,
Volta Lake Research Project, Akosombo (Ghana).
For primary bibliographic entry see Field 05C.
W72-13339

COMPARISON OF MERCURY LEVELS IN AN OLIGOTROPHIC AND A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W72-13340

HETEROTROPHIC MICROFLORA OF AMU DARYA RESERVOIRS AND ITS ROLE IN MINERALIZATION OF ORGANIC MATTER,
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 05C.
W72-13341

TOTAL BACTERIAL NUMBER IN RYBINSK RESERVOIR,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W72-13342

THE EFFECTS OF VARIATIONS IN OXYGEN TENSION ON CERTAIN ASPECTS OF RESPIRATORY METABOLISM IN PACIFASTACUS LENIUSCULUS (DANA) (CRUSTACEA:DECAPODA),
California Univ., Davis. Dept. of Zoology; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W72-13350

BENTHIC MACROINVERTEBRATES OF LAKE KOJIMA, WITH PARTICULAR REFERENCE TO POLLUTION EFFECTS OF INDUSTRIAL AND MUNICIPAL WASTES,
Ehime Univ., Matsuyama (Japan). Inst. of Biology.

For primary bibliographic entry see Field 05C.
W72-13366

THE IMPORTANCE OF AERIAL PHOTOGRAPHY IN ESTABLISHING MORPHOGENETIC CLASSES OF BOG AREAS AND SYSTEMS,
For primary bibliographic entry see Field 07B.
W72-13369

CORRELATION BETWEEN PRIMARY PRODUCTION, PLANKTON GROWTH AND LIGHT IN THE KUMMEROWER LAKE (MECKLENBURG),
Rostock Univ. (East Germany). Institut fuer Hygiene.
L. Kalbe, and H.-A. Schulze.
Z Gesamte Hyg Grenzgeb, Vol 17, No 9, p 658-664, 1971, Illus, Map.
Identifiers: *Limnology, Lakes, Abundance, Bream, Eels, Germany, Growth, *Kummerower lake, Light, Mecklenburg, Pikes, *Plankton, Primary productivity, Roach.

The plankton productivity of the lake was studied by the C14 method. The yearly average primary productivity of the lake amounts to 10,000 tons of photosynthetically bound C. The volume/O2 (V/O) quotient is 61%, indicating good trophic conditions. The lake water is a transparent yellow; at the short wave end of the visible spectrum there is a precipitous drop. The mean vertical light transmission coefficient is between 0.851 and 1.755; the photosynthetic compensation point is about 4.50 m. The abundance of fish such as roach, bream, eel, pike, etc., is listed for 1966-69.--Copyright 1972, Biological Abstracts, Inc.
W72-13401

THE VERTICAL DISTRIBUTION OF THIAMINE, BACTERIA AND PHYTOPLANKTON IN THREE LAKES IN EAST HOLSTEIN,
Muenster Univ. (West Germany). Botanisches Institut und Botanischer Garten.
For primary bibliographic entry see Field 05C.
W72-13402

THE GROWTH OF THE BREAM (ABRAMIS BRAMA (L.)) IN SELECTED LOCALITIES OF CENTRAL AND EASTERN EUROPE (PISCES, CYPRINIDAE),
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
J. Poupe.
Vestn Cesk Spol Zool, Vol 35, No 4, p 297-310, 1971, Illus.
Identifiers: Fish, *Abramis brama, *Bream, Cyprinidae, Czechoslovakia, *Fish growth, Localities, Pisces, USSR.

An evaluation is made on the growth of 1392 specimens of A. brama from 2 reservoirs situated in Czechoslovakia, one in the USSR and another from the Danube river. Good growth was observed of the fish coming from the Slapy reservoir, while less favorable growth was found in the Lipno reservoir. Likewise, growth was good in the Rybinsk basin and unfavorable in the Danube river.--Copyright 1972, Biological Abstracts, Inc.
W72-13404

THE GROWTH OF TENCH TINCA TINCA (L.), ROACH RUTILUS RUTILUS (L.) AND RUDD SCARDINIUS ERYTHRO-PHTHALMUS (L.) FROM THE LIBISZOWSKIE LAKES BEFORE SUPPLYING THE WATERS FROM THE WIEPRZ-KRZNA CANAL,
Wyzsza Szkola Rolnicza, Lublin (Poland).
R. Stronski.
Rocz Nauk Roln Ser H Rybactwo, Vol 93, No 2, p 67-85, 1971, Illus, Map, English summary.
Identifiers: *Fish populations, Growth, *Libiszowskie lakes, Poland, *Roach, *Rudd, Rutilus rutilus, Scardinius erythrophthalmus, Tench, Tinca tinca.

Age and growth of tench, roach and rudd from the Libiszowskie lakes are recorded under existing environmental conditions to provide data on the ecological effects of waters from the newly built Wieprz-Krzna canal which will be directed in the areas samples.--Copyright 1972, Biological Abstracts, Inc.
W72-13407

STRUCTURE OF THE PERCH POPULATIONS OF SOME PONDS IN FINLAND,
O. Sumari.
Ann Zool Fenn, Vol 8, No 3, p 406-421, 1971, Illus, Map.
Identifiers: Biomass, Burbot, *Finland, *Perches, Pikes, Ponds, *Fish populations, Roach.

The fish populations of 32 oligotrophic Finnish ponds, 0.6-64 ha in size and most of them without outlets, were poisoned by rotenone, and the numbers and biomasses of the fish species were calculated. Age determinations of perch, made chiefly by the scale method, proved difficult, but the mean lengths of 1-, 2-, and 3-summer-old perch were estimated as 5.6, 9.5, and 12.4 cm, respectively. In 1 pond all the perch were 6 yr old and of the same size. In others, the age groups were uniformly represented. During the first few summers the growth rate is the same as in larger waters, but later on it slows down and may nearly cease. The very different growth rates are probably correlated with the availability of food. Since the growth rate of older perch was high if young perch were available, it is concluded that the young form an important part of the food. The average biomass of perch in the ponds investigated was 11.9 (1.8-41.3) kg/ha. In ponds with a high number of 1-summer-old perch the biomass was smaller on the average than in ponds with few or no young. A new age group usually forms when there are few mature perch. The biomass of perch was significantly smaller in ponds with a reproducing roach population than in ponds without roach. The biomass of perch tends to decrease with increasing number of fish species. It is concluded that the size of each age group and the variation in the perch biomass mainly depend on the size and composition of the populations of perch and other fish. Although many mechanisms may be involved, the main factor affecting the perch populations in the ponds studied are biotic-predation upon perch young by perch, roach, pike and burbot, and the availability of suitable food.--Copyright 1972, Biological Abstracts, Inc.
W72-13417

SEASONAL FLUCTUATION OF PHYTOPLANKTON COMPOSITION, DIVERSITY, AND PRODUCTION IN A FRESHWATER LAKE,
North Carolina Univ., Chapel Hill. Dept. of Botany.
K. A. Meyer, and J. F. McCormick.
J Elisha Mitchell Sci Soc. Vol 87, No 3, p 127-138. 1971. Illus. Map.
Identifiers: Ankistrodesmus falcatus, Cyclotella stelligera, Dinobryon spp., Fragilaria, Lakes, *North Carolina, Nutrients, Oocystis lacustris, *Phytoplankton production, *Seasonal, Trachelomonas volvocina, Freshwater lakes.

A seasonal study of phytoplankton composition and production in a small freshwater lake in the Piedmont of North Carolina showed that the lake is oligotrophic, although average gross production was higher than that reported for other oligotrophic systems. Net production and phytoplankton abundance were maximal in the winter. Definite seasonal variations were noted in the phytoplankton populations. A base flora consisting of widely tolerant species (Oocystis lacustris, Trachelomonas volvocina, Ankistrodesmus falcatus) was dominant during most of the year. Ephemeral species including Dinobryon spp., Fragilaria sp., and Cyclotella stelligera exhibited brief dominance over the base flora when nutrient concentrations were lowest and light penetration relatively high. In particular, these factors most influenced the relative dominance of O. lacustris and Dinobryon bavaricum. Species diversity indicated the occurrence of a moderately complex system.--Copyright 1972, Biological Abstracts, Inc.
W72-13419

LAKE SUPERIOR--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-211 666, Price $3.00 paper copy: $0.95 microfiche. Water Resources Scientific Information Center Report WRSIC 72-213, July 1972. 127 p.

Descriptors: *Bibliographies, *Abstracts, *Information retrieval, Hydrology, *Lake Superior, Data storage and retrieval, Documentation, Indexing, Publications, Hydrologic data, Reviews, *Great Lakes, *Eutrophication, Water quality, Water pollution, *Lake sediments, Michigan.

This is one in a series of bibliographies in water resources produced from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 42,920 abstracts covering SWRA through June 15, 1972 (Volume 5, Number 12). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. A comprehensive index represents all of the descriptors and identifiers by which each paper in this bibliography has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending accession number order. An author index is included. (Woodard-USGS)
W72-13480

LAKE MICHIGAN--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-211 667, Price $3.00 paper copy; $0.95 microfiche. Water Resources Scientific Information Center Report WRSIC 72-211, August 1972. 264 p.

Descriptors: *Bibliographies, *Abstracts, Hydrology, *Lake Michigan, *Information retrieval, Publications, Data storage and retrieval, Documentation, Indexing, Reviews, Hydrologic data, *Eutrophication, Great Lakes, Illinois, Pollution abatement, Sewage effluent, Wisconsin, Lake sediments, Water pollution, Water quality.
Identifiers: *Chicago.

This is one in a series of planned bibliographies in water resources produced from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 42,920 abstracts covering SWRA through June 15, 1972 (Volume 5, Number 12). Abstracts with full bibliographic details are listed in ascending accession number order. An author index is included. A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. (Woodard-USGS)
W72-13481

LAKE HURON--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va 22151 as PB-211 668; Price $3.00 paper copy; $0.95 microfiche. Water Resources Scientific Information Center Report WRSIC 72-210, July 1972. 95 p.

Descriptors: *Information retrieval, Hydrology, *Lake Huron, *Abstracts, *Bibliographies, Data storage and retrieval, Hydrologic data, Publications, Documentation, Reviews, Indexing, Great Lakes, Michigan, *Eutrophication, Water pollution, Water quality.

This is one in a series of planned bibliographies in water resources produced from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 42,920 abstracts covering SWRA through June 15, 1972 (Volume 5, Number 12). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper in this bibliography has been indexed. These descriptors represent weighted terms that best describe the information content and are indicated by asterisks. A comprehensive index represents all the descriptors and identifiers by which each paper in this bibliography has been indexed. Through permutation, each work in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending accession number order. An author index is included. (Woodard-USGS)
W72-13482

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VI. THE AQUATIC FLORA OF CONESUS LAKE,
State Univ. Coll., Geneseo, N.Y.
For primary bibliographic entry see Field 05C.
W72-13487

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VIII. ALGAE OF CONESUS LAKE, LIVINGSTON COUNTY, NEW YORK: INITIAL REPORT,
State Univ. Coll., Geneseo, N.Y.
For primary bibliographic entry see Field 05C.
W72-13488

A STOCHASTIC APPROACH TO THE STUDY OF EVAPORATION FROM LAKE ONTARIO,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 02D.
W72-13495

COMPARISONS OF TWO ANTARCTIC LAKES WITH DIFFERENT TROPHIC STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 05C.
W72-13511

INTERDISCIPLINARY INVESTIGATIONS OF THE CASPIAN SEA (KOMPLEKSNYYE ISSLEDOVANIYA KASPIYSKOGO MORYA).
Moscow State Univ. (USSR).

Izdatel'stvo Moskovskogo Universiteta, Moscow, Leont'yev, O. K., and Mayev, Ye. G., editors, 1971. 144 p.

Descriptors: *Limnology, *Lakes, *Lake morphology, *Lake shores, *Lake sediments, Geology, Geomorphology, Topography, Geophysics, Seismic studies, Mineralogy, Geochemistry, Diagenesis, Palynology, Biology, Shoreline cover, Vegetation, Organic matter, Water types, Salinity.
Identifiers: *USSR, *Caspian Sea, Mangyshlak Peninsula, Buzachi Peninsula, Paleogeography, Paleobotany.

This collection of 13 papers presents the results of investigations conducted in the region of the Caspian Sea in 1967-68 by the departments of geography, geology, and soil biology of Moscow State University. New information on the geology, paleogeography, and topography of areas bordering the Caspian Sea is based on analysis of geological, geomorphological, and paleobotanical data. The geomorphology of the Mangyshlak Peninsula and its shores is described in conjunction with the geochemistry, diagenesis, and engineering-geologic properties of Caspian Sea bottom sediments. Water types of the northern Caspian are analyzed together with the spatial distribution and temporal variability of sound intensity in sea water. The scope of investigations will make the book useful to those interested in the study of the Caspian Sea and in the utilization of its natural resources. (Josefson-USGS)
W72-13591

2I. Water in Plants

SOME STRUCTURAL FEATURES OF WATER IN PLANT TISSUES BASED ON INFRARED SPECTROSCOPY DATA,
Kazan State Univ. (USSR).
For primary bibliographic entry see Field 03F.
W72-13116

INDUCTION OF ROOT-PROMOTING SUBSTANCES IN EUONYMUS ALATUS 'COMPACTUS' BY INTERMITTENT MIST,
Cornell Univ., Ithaca, N.Y.
C. I. Lee, and H. B. Tukey, Jr.
J Am Soc Hort Sci. Vol 96, No 6, p 731-736. 1971. Illus.
Identifiers: *Root development, *Mist, Accumulation, Compactus, Cuttings, *Euonymus alatus D, Flavonoids, Induction, Leaves, Phenolic compounds, Root systems, Rutin, Senescence.

When the plants were grown under intermittent water mist during Sept., leaf senescence and onset of dormancy were delayed and natural root-inducing phenolic and flavonoid compounds accumulated in the leaf tissues. Consequently, stem cuttings taken from misted Euonymus rooted easily, whereas cuttings from non-misted plants rooted with greater difficulty. In addition, cuttings from misted stock plants rooted better in Oct. than did cuttings from non-misted plants in early summer. When rutin, a flavonol similar to those which accumulated in misted leaves, was supplied exogenously with IBA to stem cuttings taken from non-misted Euonymus, the cuttings rooted as well as cuttings from misted plants. Many substances in addition to auxins and rooting cofactors may play a significant role in root initiation.--Copyright 1972, Biological Abstracts, Inc.
W72-13125

WATER REQUIREMENTS OF THE CASSAVA PLANT (MANIHOT ESCULENTA),
Centro de Investigaciones Agronomicas, Maracay (Venezuela).
J. Garcia Benavides, and A. Montaldo.
Agron Trop (Maracay). Vol 21, No 1, p 25-31. 1971. Illus. English summary.
Identifiers: *Crop production, *Cassava D, Manihot esculenta D, Plants, *Water requirements.

The water requirements, as well as the intervarietal differences of M. esculenta, are presented. The water balance in the soil was analyzed.--Copyright 1972, Biological Abstracts, Inc.
W72-13136

THE EFFECT OF RAINFALL AND ALTITUDE ON THE YIELD OF PYRETHRINS FROM PYRETHRUM FLOWERS IN KENYA,
Pyrethrum Research Station, Molo (Kenya).
J. E. Parlevliet.
Pyrethrum Post. Vol 10, No 3, p 20-26. 1970. Illus.
Identifiers: *Altitude, Flowers, Kenya, *Pyrethrins, Pyrethrum D, *Rainfall.

Fresh pyrethrum flower yields in Kenya show a clear periodicity within the picking season. Three yield peaks are normally discerned, usually in June-July, Oct. and Jan.-Feb., respectively. Rainfall and temperature seem to govern these flower flushes. The pyrethrins per flower head, the pyrethrin content and the flower size increase and the dry matter content decreases with rainfall and higher altitude. Drought and lower altitudes have the reverse effect. Most clones vary in the same way, the interaction effect being very small compared to the total variation.--Copyright 1972, Biological Abstracts, Inc.
W72-13140

A STUDY OF SOME CHARACTERS OF METABOLISM OF SCOTCH PINE SEEDS DURING STORAGE IN SNOW,
V. I. Mosin.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 62. p 185-189. 1968.
Identifiers: Accumulation, Carbohydrates, Catalase, Decomposition, Energy, Fats, Glucose, Metabolism, *Pine-G, Proteins, *Seeds, *Snow, Storage, Sugars.

Storage of seeds in snow intensifies the hydrolytic decomposition of fats and activates lipase. In germinating seeds, fats are reduced by 24%. The hydrolysis of fats is accompanied by an accumulation of carbohydrates. In germinating seeds stored in snow, invert sugar increases 80% and glucose increases more than 120%. Protein molecules are changed into smaller units, and into a more mobile state. Nonprotein N is increased by 23%. During the storage of seeds in snow the activity of enzymes increases. The catalase activity rises to 17.41, and the kinetic energy of the reaction is reduced to 8527 calories; the thermal coefficient drops to 1.65. The highest activity of metabolic processes occurs during the storage of germinating or soaked seeds in snow. The positive effect of storage in snow is minimal at the time of sowing, because the dried radicle breaks.--Copyright 1972, Biological Abstracts, Inc.
W72-13154

STUDIES ON THE REDUCTION OF THE TRANSPLANTING INJURY IN DECIDUOUS FRUIT TREES WITH SPECIAL REFERENCE TO THE JAPANESE PERSIMMON (III), (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
M. Izaki.
Sci Rep Fac Agr Ibaraki Univ. 17. p 85-105. 1969. Illus. English summary.
Identifiers: *Vegetation regrowth, *Deciduous trees, Fruit crops, Growth, Injury, Moisture, *Persimmon D, Pruning, Root systems, Soils, *Transplanting.

One of the main causes of transplanting injury in Japanese persimmon trees is root pruning accompanied by transplanting. The tree's fibrous roots are easily injured, and new root and shoot growth are markedly decreased under dry soil conditions. Selection or breeding of rootstocks should be performed to develop vigorous new roots among Japanese persimmon seedlings.--Copyright 1972, Biological Abstracts, Inc.
W72-13157

WATER BALANCE OF TISSUE SEGMENTS FROM LEAVES OF DIFFERENT INSERTION LEVELS,
Ceskoslovenska Akademie Ved, Prague. Ustav Experimentalni Botaniky.
J. Pospisilova.
Biol Plant (Praha). Vol 13, No 3, p 193-199. 1971. Illus.
Identifiers: *Plant tissues, *Water balance, Absorption, Brassica oleracea D, Climates, Deficit, Heterogeneity, Insertion, Leaves, Nicotiana tabacum D, Rates, Saturation, Segments, *Transpiration, Transport.

The heterogeneity of indicators of water balance was studied on tissue segments from leaves of Brassica oleracea L. var. acephala and Nicotiana tabacum L. under controlled conditions. Maximal values of transpiration rate, water absorption rate, water transport rate and low values of WSD (water saturation deficit) at the same time were observed at an initial WSD of 0% in segments from middle leaves and at an initial WSD of 20% mostly in segments from upper leaves. Although the properties of leaf tissue itself were probably the basic factors determining the actual heterogeneity of indicators of water balance, without connection with all other factors (e.g., various microclimates, supply of water) heterogeneity did not appear to a full degree.--Copyright 1972, Biological Abstracts, Inc.
W72-13236

WATER RETENTION PROPERTIES OF LEAVES,
Ministry of Works, Wellington (New Zealand).
G. J. Blake.
Hydrological Research Progress Report No 4, (1971), 11 p, 4 fig, 3 ref, append.

Descriptors: *Leaves, *Moisture content, *Retention, Investigations, Analytical techniques, Plant groupings, Wettability, Trees, Shrubs, Grasses, Measurements.
Identifiers: Leaf roughness, Angle measurements, Repellent surfaces.

Leaves of plants retain varying amounts of water, depending on their position relative to the horizontal and on their surface morphology. By measuring the contact angle of a water droplet of constant size, a wetting index was developed for different leaf surfaces. A profile projector was used to provide a silhouette of the leaf and droplet cross section on a screen. The angles between the droplet and the leaf surface were measured with a protractor and averaged. The 30 fresh samples included 20 tree and shrub species endemic to New Zealand, 8 exotic tree and shrub species, and 2 exotic grasses. The number of angle measurements for grasses was limited by the extremely water-repellent surfaces of some leaves (e.g. Anthoxanthum odoratum). While grasses (Lolium perenne and Dactylis glomerata) produce obtuse contact angles greater than 100 deg, 60% of the samples had acute angles between 50 deg and 70 deg, and no species had an angle less than 30 deg. All angles quoted are the arithmetic means of the respective samples. (Woodard-USGS)
W72-13261

MIGRATION RESPONSE OF JUVENILE CHINOOK SALMON TO SUBSTRATES AND TEMPERATURES,
Idaho Univ., Moscow. Water Resources Research Inst.
C. F. Morrill, and T. C. Bjornn.
Available from the National Technical Information Service as PB-211 608, $3.00 in paper copy, $0.95 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1972. 27 p, 5 fig, 8 tab. OWRR A-038-IDA (1).

Descriptors: *Fish migration, *Chinook salmon, *Water temperature, Juvenile fish, Fish behavior.
Identifiers: *Substrates.

Downstream migration of age 0+ chinook salmon from stream channels with rock and rubble (good) or gravel or shale (poor) substrates and constant or declining water temperatures was assessed during the fall months of 1970 and 1971. As water temperatures declined, juvenile chinook left stream channels with gravel or shale substrates or moved into available hiding spaces in stream channels with rock and rubble substrate. Fish initially emigrated as temperatures declined below 10C. The number of emigrants reflects the holding capacity of the substrate and the density of the fish population. The migration response varied with size and race of fish. Most of the response difference between races is attributed to differences in fish size. Juvenile spring chinook find rock and rubble substrate an important component of their winter habitat.
W72-13293

PHYSIOLOGICAL RESPONSES OF SORGHUM AND MAIZE LEAVES TO DROUGHT: IV. RESISTANCE OF LEAF TISSUES TO DEHYDRATION BY DETERMINING SUBLETHAL WATER DEFICIENCIES,
Consejo Superior de Investigaciones Cientificas, Madrid (Spain). Instituto de Edafologia y Biologia Vegetal.
For primary bibliographic entry see Field 03F.
W72-13380

THE DETERMINATION OF FLUORINE IN PLANTS WITH THE FLUORIDE ION SELECTIVE MEMBRANE ELECTRODE,
Ghent Rijksuniversiteit (Belgium). Dept. of Agricultural Science.
For primary bibliographic entry see Field 05A.
W72-13391

COLORIMETRIC DETERMINATION OF TOTAL PROTEIN AND NONPROTEIN NITROGEN IN PLANTS,
For primary bibliographic entry see Field 05A.
W72-13392

STIMULATION OF WITCHWEED GERMINATION BY RUN-OFF WATER AND PLANT TISSUES,
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
J. E. Dale, and G. H. Egley.
Weed Sci. Vol 19, No 6, p 678-681. 1971.
Identifiers: *Germination, Runoff, Striga lutea D, Plant tissues, *Witchweed, *North Carolina.

Water from several bodies of surface water and sections from several plants were collected from eastern North Carolina, and bioassayed for stimulation of witchweed (Striga lutea Lour.) seed germination. Stimulatory activity was detected in water from 22 of 29 different ponds, streams, and lakes and in sections from 118 (57 families) of 163 plant species. Witchweed germination stimulants evidently occur widely in nature.--Copyright 1972, Biological Abstracts, Inc.
W72-13398

SOME ASPECTS OF THE LEAF TEMPERATURES OF SOME PLANTS OF THE XEROPHYTIC REGION OF SANTA MARTA (COLOMBIA),
Universidad Nacional de Columbia, Bogota. Dept. of Biology.
For primary bibliographic entry see Field 03B.
W72-13403

OXYGEN CONSUMPTION DURING THE EARLY STAGES IN SOME SELECTED BREEDS OF CARP IN COMPARISON WITH A LOCAL NONSELECTED BREED,
Alexandru Ion Cuza Univ., Iasi (Rumania).
P. Jitariu, M. Badilita, and E. Costea.
Stud Cercet Biol Ser Zool, Vol 23, No 3, p 213-217, 1971, Illus, English summary.
Identifiers: *Oxygen requirements, *Oxygenation, Breeds, *Carps, Fisheries.

A study was made on the intensity of O2 consumption of 3 races of carp, selected for pisciculture and compared to the local unselected race. The Yugoslavia race (third generation) had the highest O2 consumption equal to 569,305 mm3/g/hr, the improved race with scales had 467,090 mm3 O2/g/hr, the Ucraina race had 417,120 mm3 O2/g/hr, whereas the native race had a consumption of only 326,458 mm3 O2/g/hr. These differences indicate different resistance to conditions of water oxygenation.--Copyright 1972, Biological Abstracts, Inc.
W72-13405

MIGRATION OF SALMON SMOLT (SALMO SALAR L.) FROM THE DRAWA RIVER TO THE SEA,
Instytut Rybactwa Srodiadowego, Oliva (Poland).
R. Bartel.
Rocz Nauk Roln Ser H Rybactwo, Vol 93, No 2, p 7-11, 1971, Map, English summary.
Identifiers: *Fish migration, Poland, Drawa River (Poland), *Salmo salar, *Salmon, Smolt.

Results are given of observations made on the seaward movement of salmon smolts which were introduced in the Drawa River, Poland, during springtime.--Copyright 1972, Biological Abstracts, Inc.
W72-13406

RELATIVE HUMIDITY IN THE BREEDING SITES OF GLOSSINA MORSITANS WESTW. IN NORTHERN BOTSWANA,
Agricultural Research Station, Malkerns (Swaziland).
P. R. Atkinson.
Bull Entomol Res, Vol 61, No 2, p 241-246, 1971.
Identifiers: *Insects, Botswana, Breeding, *Glossina morsitans, *Humidity, Sites.

Humidity measurements in air spaces in the soil of G. morsitans breeding sites during the hot-dry season in northern Bostwana proved that ground holes were significantly more humid than tree holes, fallen logs or leaves. Site humidity decreased between Sept. and Oct. but did not differ significantly between riverine and mopane woodlands. Pupal mortality data demonstrated an apparent advantage in the dry season shift of breeding to holes. The evidence is only circumstantial that humidity is involved in site selection.--Copyright 1972, Biological Abstracts, Inc.
W72-13412

FECUNDITY OF THE YELLOW PERCH, PERCA FLAVESCENS MITCHILL, IN THE PATUXENT RIVER, MARYLAND,
Maryland Univ., Solomons. Natural Resources Inst.
C-F Tsai, and G. R. Gibson, Jr.
Chesapeake Sci, Vol 12, No 4, p 270-274, 1971, Illus.
Identifiers: *Fecundity, *Maryland, *Patuxent River, Perca flavescens, Perches, *Yellow perch.

The fecundity of 114 female yellow perch was studied during the 1969 spawning run (20 through 25 March) in the Patuxent River, Maryland. The fecundity was proportional to the total weight and gutted weight, respectively, as expressed by the regression equations $Y = 150.55730 X - 1424.0878$ ($r = 0.88$) for the former, and $Y = 217.65656 X - 2387.9915$ ($r = 0.87$) for the latter, (Y, fecundity; X, either total weight or gutted weight). It was nearly proportional to the quadruplicate of fork length as expressed by the regression equation, $\log Y = 3.7179 \log X - 1.50917$ ($r = 0.90$). This quadruplicate phenomenon was due in part to the

heavier proportionate increase in body weight and the visceral space available for egg development as the fish length increased.--Copyright 1972, Biological Abstracts, Inc.
W72-13413

AGE, GROWTH, YEAR CLASS STRENGTH AND SURVIVAL RATES OF THE WHITE PERCH MORONE AMERICANA (GMELIN) IN THE DELAWARE RIVER IN THE VICINITY OF ARTIFICIAL ISLAND,
Eastern Michigan Univ., Ypsilanti. Dept. of Biology.
D. C. Wallace.
Chesapeake Sci, Vol 12, No 4, p 205-218, 1971, Illus.
Identifiers: Age, Artificial Island, *Delaware River, Growth, *Morone americana, *Perches, Rates, Strength, Survival.

More than 1400 white perch were studied to determine growth, year class strength and survival rates in a section of the Delaware River. Except for young of the year, all specimens were collected with trawl and trap nets. There was no difference in size selection using these 2 methods. The annulus is a valid year mark. Most individuals had completed the annulus by mid-June. However, the period of annulus completion extended from at least the first wk in May to the end of July with older individuals completing the annulus later. In their first yr white perch attained approximately 40% of the length attained by the 8th yr. Young-of-the year continue growth through the month of Nov. while older fish grew little after Sept. Up to their 5th yr, females grew somewhat faster than males. Based on the 1960 through 1964 year classes males had higher survival rates than females. In general, growth rates were lower in this section of the river than was previously reported for the Patuxent or Delaware Rivers. For both sexes growth rates were greater in the east side of the river than in the west. This was not due to differences in mean temperatures. The 1964 and 1966 year classes were relatively strong compared with others. The relatively good growth in 1965 probably contributed to a higher number of recruit spawners in 1966. The number of fish older than age group III increased in July and Aug. collections and decreased progressively from Sept. through Nov. Very few fish older than age group VIII were captured.--Copyright 1972, Biological Abstracts, Inc.
W72-13415

MODELLING OF THE PRODUCTIVE PROCESS OF THE PLANT COVER,
A. Laisk, K. Moldau, T. Nil'Son, Y. Ross, and K. Tooming.
Bot Zh. Vol 56, No 6, p 761-776. 1971. Illus. English summary.
Identifiers: *Model studies, Photosynthesis, *Plant growth, Solar radiation, Respiration, Moisture stress, Adaptation.

Models of the radiation regime, productivity and growth, as well as those of the quantitative treatment of adaptation to radiation and to the water deficit of plants elaborated by the authors during the last few years are included. Fundamentals of the quantitative theory of productivity, solar radiation in plant stands, photosynthesis, respiration and its relationship with photosynthesis, growth, productivity, adaptation to radiation and adaptation to water deficit are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13426

THE INDICATION OF THE SEEDS AND FRUITS OF COMMON SCOTTISH AQUATIC HERBS,
West of Scotland Agricultural Coll., Auchincruive (Scotland).
J. T. Swarbrick.
Bot Soc Edinburgh Trans. Vol 41, No 1, p 9-25. 1970.
Identifiers: *Aquatic plants, Fruits, *Herbs, Identification, Scotland, Seeds.

Keys, descriptions, and enlarged sketches are provided for seeds (or indehiscent fruits) of 46 species of common, widespread, and representative Scottish freshwater aquatic herbs.--Copyright 1972, Biological Abstracts, Inc.
W72-13438

PRELIMINARY DATA ON THE POPULATION OF THE ZONE OF PERMANENT CIRCULATION OF A KARSTIC MASSIF,
Centre National de la Recherche Scientifique, Moulis (France). Laboratoire Souterrain.
F. Lescher-Moutoue, and N. Gourbault.
C R Hebd Seances Acad Sci Ser D Sci Natur (Paris). Vol 271, No 16, p 1416-1419. 1970.
Identifiers: Circulation, Crustaceans, Gastropoda, *Karstic massif, Oligochaeta, Ostracoda, Plecoptera, Tricladida, *Aquatic life, *Hypogeous.

The Goueil di-Her grotto (Upper Garonne, France) was used for this study in which passages located in the permanent zone of water circulation in karsts are inhabited. Although subjected to violent floods, this cavity is populated by a rich association of aquatic species. The interstitial environment composed of the most stable biotope had the most abundant populations. The Goueil di-Her cave offers an example of passive transportation of certain species to the interior of karstic systems. A total of 28 spp., 14 of which were hypogeous were found. These included 10 spp. of Harpacticidae, 9 Cyclopidae, 2 Amphipoda, and 2 of Isopoda; 1 sp. of each of the following was also found: Tricladida, Oligochaeta, Gastropoda, Ostracoda, and Plecoptera.--Copyright 1972, Biological Abstracts, Inc.
W72-13448

INVESTIGATIONS OF SEAS BORDERING CENTRAL AMERICA (ISSLEDOVANIYA TSENTRAL'NO-AMERIKANSKIKH MOREY).
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 02L.
W72-13589

2J. Erosion and Sedimentation

MEASURED MOVEMENTS OF CLAY SLOPES IN THE OTTAWA AREA,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
R. J. Mitchell, and W. J. Eden.
Canadian Journal of Earth Sciences, Vol 9, No 8, p 1001-1013, August 1972. 11 fig, 2 tab, 8 ref.

Descriptors: *Mass wasting, *Clays, *Landslides, *Canada, Mudflows, Erosion, Movement, Surveys, Data collections.
Identifiers: Ottawa (Ontario).

Natural degradation of slopes is normally considered to involve surficial displacements resulting mainly from frost action, erosion, and downhill creep. Measurements from inclinometer installations in a variety of slope profiles in the Ottawa area show that significant deep-seated movements may occur in these slopes. These movements are associated with seasonal peaks in groundwater pressures within the slope and may contribute to the long term degradation of the slope. While the factor of safety against catastrophic failure of a slope is of prime importance, the possible effects of deep-seated slope movements should not be disregarded when considering adjacent land use. (Knapp-USGS)
W72-13056

ORGANIC MATTER IN RED SEA SEDIMENTS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
J. D. Saxby.
Chemical Geology, Vol 9, No 4, p 233-240, June 1972. 1 fig, 3 tab, 12 ref.

Descriptors: *Organic matter, *Bottom sediments, *Brines, *Water chemistry, Carbon radioisotopes, Carbon, Hydrogen, Nitrogen, Oxygen, Sulfur, Sampling, Sulfides, Pyrite, Sulfates, Sulfur bacteria.
Identifiers: *Red Sea.

Organic matter constitutes up to 1% of the sediments sampled in the hot-brine area of the Red Sea. A soluble fraction can be extracted from the salt-free sediment with benzene-methanol, and after chemical treatment with hydrochloric acid, hydrofluoric acid and lithium aluminum hydride, an insoluble organic sample is also obtained. An average composition of the latter is: C, 67%; H, 6%, N, 4%; O, 20%; S, 3%. Values obtained from the carbon isotope measurements are in the range expected for marine organic material. The amount and nature of the organic matter and its relation to sulfide minerals (mainly pyrite) indicate that: (1) Metal sulfide formation is principally a non-biological process in the Atlantis II Deep, whereas in other areas including the Discovery Deep, sulfate-reducing bacteria play a dominant role; (2) diagenesis of the organic material increases with depth in the core recovered from the Atlantis II Deep, suggesting sediment temperatures higher than in other parts of the hot brine area. (Knapp-USGS)
W72-13058

ICE FORMED BEACH FEATURES FROM LAKE ST. JEAN, QUEBEC,
Centre de Recherche Forestiere des Laurentides, Quebec.
For primary bibliographic entry see Field 02C.
W72-13062

A MICROSPLITTER FOR SUBSAMPLING SMALL PARTICULATE SAMPLES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
R. Brewer, and K. J. Barrow.
Journal of Sedimentary Petrology, Vol 42, No 2, p 485-487, June 1972. 2 fig, 1 tab, 1 ref.

Descriptors: *Sampling, *Equipment, *Sedimentology, Particle size, Analytical techniques.
Identifiers: *Sample splitters.

A microsplitter was designed for subsampling small particulate samples. The splitting device rotates during operation. The present model can handle samples up to about 1.0 g in the size range 200 microns to 10 microns in a single operation. The principle could be used to construct a device to handle samples of any reasonable weight and grainsize. The microsplitter does not introduce a significant error in grain counts of mixtures of hornblende and quartz in the size range 20-50 microns. (Knapp-USGS)
W72-13183

A NEW FILTERING WATER BOTTLE,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel, E. W. Schiemer, T. W. Kana, and G. M. Schmidt.
Journal of Sedimentary Petrology, Vol 42, No 2, p 482-484, June 1972. 2 fig, 1 ref. NSF Grant GA-28276.

Descriptors: *Sampling, *Equipment, *Suspended load, Oceanography, Filtration, Water analysis.

A new filtering water bottle may be used for studies of suspended sediment. The bottle, made

from cast acrylic tubing, utilizes solid gum rubber balls as stoppers. After collection of a water sample one of the balls is removed, the bottle is fitted with a filter holder containing a pre-weighed filter, and connected to a vacuum system. No transfer of the water sample is required, thus decreasing the chances of ship-derived contamination. (Knapp-USGS)
W72-13184

A MULTIPLE GROUPING METHOD FOR THE CHOICE OF ISOPLETH VALUES OF MINERAL DISTRIBUTION MAPS,
LeNickel (Australia) Exploration Party Ltd., Perth.
S. B. Devine, P. E. Schilling, and R. E. Ferrell, Jr.
Journal of Sedimentary Petrology, Vol 42, No 2, p 476-481, June 1972. 5 fig, 1 tab, 5 ref. USGS Contract 14-08-001-10877.

Descriptors: *Sedimentology, *Statistical methods, *Mineralogy, *Mapping, Provenance, Variability, Contours, *Illite, *Gulf of Mexico.
Identifiers: *Isopleth values.

Grouping of means of mineral percentage determinations into subsets by Duncan's multiple range test may be used to obtain isopleth intervals for regional distribution maps. Isopleth values determined by this test have the advantage that a degree of confidence can be provided for defining significantly different areas. By comparison, arbitrarily chosen contour intervals may not define areas that are different. This is especially true when the data are imprecise. (Knapp-USGS)
W72-13185

A QUANTITATIVE X-RAY DIFFRACTION TECHNIQUE APPLIED TO FINE-GRAINED SEDIMENTS OF THE DEEP GULF OF MEXICO,
LeNickel (Australia) Exploration Party Ltd., Perth.
S. B. Devine, R. E. Ferrell, Jr., and G. K. Billings.
Journal of Sedimentary Petrology, Vol 42, No 2, p 468-475, June 1972. 3 fig, 3 tab, 16 ref. USGS Contract 14-08-001-10877.

Descriptors: *Mineralogy, *Sedimentology, *X-ray diffraction, Crystallography, Sediments, Analytical techniques, *Gulf of Mexico.

A quantitative X-ray diffraction technique enables the mineralogical analysis of fine-grained sediments with few errors due to sample preparation and conditions of analysis. Computation of linear interaction coefficients reduces the possibility that the change in the weight percent of one mineral will cause unreal variations in the abundance of others. The main advantage of the technique is that the use of peak intensity ratios modified by experimentally determined coefficients of interaction help eliminate differences between samples produced by the method of calculation. Comparison of the results of X-ray analyses of bulk sediments and size-fractionated ones from the surficial sediments of the deep Gulf of Mexico illustrate the technique. (Knapp-USGS)
W72-13186

SEDIMENTARY COMPONENTS OF NORTHWEST PACIFIC PELAGIC SEDIMENTS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
R. K. Oser.
Journal of Sedimentary Petrology, Vol 42, No 2, p 461-467, June 1972. 4 fig, 1 tab, 26 ref. Project NR 083-102. ONR Contract N00014-67-A-0369-0007.

Descriptors: *Bottom sediments, *Particle size, *Statistics, *Pacific Ocean, *Provenance, *Clays, Clay minerals, Analytical techniques, Frequency analysis, Sampling.
Identifiers: *Pelagic sediments.

Many sediments, including the fine-grained pelagic deposits, possess polymodal grain size distributions. Resolution of individual modes shows them to be related either to compositional fractions or to depositional processes or both, and sometimes permits the tracing of dispersal patterns. The sedimentation balance provides a means of obtaining continuous cumulative size distribution curves of fine-grained sediments. The resultant cumulative curve is processed by computer to yield a size frequency curve which is often polymodal. This frequency curve is resolved into its individual components by analog computer. The method is discussed briefly and illustrated by a study of pelagic sediments from the Northwest Pacific. Samples collected nearest land have the most components and the best sorted components. Fifteen modes were decanted from five samples and X-rayed. Components from different samples were found to have similar compositions when plotted on a feldspar-kaolinite-mica ternary diagram. Based on like composition and nearly identical mean size values, it is possible to trace the sedimentary components from sample to sample. (Knapp-USGS)
W72-13187

INTRAGRANULAR GROWTH OF MARINE ARAGONITE AND MG-CALCITE: EVIDENCE OF PRECIPITATION FROM SUPERSATURATED SEAWATER,
Uppsala Univ. (Sweden). Dept. of Historical Geology and Paleontology.
For primary bibliographic entry see Field 02K.
W72-13188

ROUNDNESS-MINERALOGICAL RELATIONS OF SOME INTERTIDAL SANDS,
Illinois Univ., Urbana. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W72-13189

MAP PATTERN RECONSTRUCTION FROM SAMPLE DATA: MISSISSIPPI DELTA REGION OF SOUTHEAST LOUISIANA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
R. B. McCammon.
Journal of Sedimentary Petrology, Vol 42, No 2, p 422-424, June 1972. 2 fig, 1 tab, 4 ref.

Descriptors: *Mapping, *Sedimentology, *Louisiana, *Sampling, *Data collections, *On-site data collections, Deltas, Aerial photography, Surveys, Mississippi River, Statistics, Statistical methods, Sedimentation, Correlation analysis, Geomorphology, Sediments, Stratigraphy.

In many sedimentologic investigations, the primary aim in an area is to ascertain the underlying pattern of sedimentation and this includes usually the preparation of maps that depict the areal distribution of sediment types. Because sediments for the most part are covered by water and therefore not exposed to view, such maps are based on a limited number of samples collected at different geographic localities. The problem arises then as to how many samples should be taken in order to reconstruct the underlying pattern. A 10% random sample was found adequate to reconstruct the sedimentary environmental pattern of the Mississippi Delta region of southeast Louisiana. This result is based on visual interpretation of proximal maps and a statistic utilizing the Goodman-Kruskal measure of association for cross classification. (Knapp-USGS)
W72-13190

COMPARISON OF RIDGE AND RUNNEL SYSTEMS IN TIDAL AND NON-TIDAL ENVIRONMENTS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
R. A. Davis, Jr., W. T. Fox, M. O. Hayes, and J. C. Boothroyd.
Journal of Sedimentary Petrology, Vol 42, No 2, p 413-421, June 1972. 11 fig, 19 ref. USACE Contract DACW72-67-C--0004.

Descriptors: *Sand bars, *Beaches, *Sediment transport, *Geomorphology, *Surf, Winds, Waves (Water), Weather, Tides, Littoral drift, Ocean waves, Sand waves, Sands, Rip currents, Coasts, Currents (Water), *Lake Michigan.
Identifiers: Coastal geomorphology.

Beach and inner nearshore areas of Lake Michigan are basically the same as those of northern Massachusetts except for scale of the morphologic features and tidal range; in Lake Michigan spring tides reach 0.25 feet whereas in Massachusetts they reach 13 feet. Ridge and runnel topography is developed in the inner nearshore zone at both locations and is the result of storm activity. These ridges migrate shoreward during low energy conditions and eventually weld onto the beach. Overall morphology, surface features and internal structures are quite similar in both areas. The only appreciable differences between the two areas are the scale and rate of migration. Apparently tides have no appreciable affect on the sediment sequence that accumulates as ridges weld to the beach although tides are significant in determining the rate at which the shoreward migration of the ridges takes place. (Knapp-USGS)
W72-13191

COASTAL PROCESSES AND NEARSHORE SAND BARS,
Western Michigan Univ., Kalamazoo. Dept. of Geology.
R. A. Davis, Jr., and W. T. Fox.
Journal of Sedimentary Petrology, Vol 42, No 2, p 401-412, June 1972. 7 fig, 31 ref. ONR Contract 388-092.

Descriptors: *Sand bars, *Beaches, *Sediment transport, *Geomorphology, *Surf, Winds, Waves (Water), Weather, Tides, Littoral drift, Ocean waves, Sand waves, Sands, Rip currents, Coasts, Currents (Water), *Lake Michigan.
Identifiers: Coastal geomorphology.

In beaches and inner nearshore areas without tides, detailed daily topographic maps indicate a cyclic pattern in sedimentary processes. This pattern is the result of complex interaction between changes in shoreline configuration, discontinuous nearshore sand bars, and environmental variables such as barometric pressure, wind velocity, breaker height, and longshore currents. Of the 18 variables measured, barometric pressure provides the best index for changes in coastal processes. As a low pressure system approaches the coast there is an increase in wind velocity, breaker height, and longshore current velocity as barometric pressure drops. When the low pressure system passes, barometric pressure rises and there is reversal of wind direction with an accompanying reversal of longshore current direction. This cycle in conditions is accompanied by a pattern of responses in the position of morphology of the shoreline and sand bars. During low energy conditions shallow discontinuous sand bars have regularly spaced rip channels. Under high-energy conditions, rapid longshore currents are deflected by the sinuous shoreline, so that strong rip currents are formed. These rip currents pass over sand bar crests and excavate channels. At the same time new bars are forming as sediment accumulates in relatively quiet areas between rip channels. As a result there is apparent migration of the bar form. The return to low energy conditions yields a pattern much like that during the previous time of low energy. (Knapp-USGS)
W72-13192

PLEISTOCENE SEDIMENTOLOGY, CREDIT RIVER, SOUTHERN ONTARIO: A NEW COMPONENT OF THE BRAIDED RIVER MODEL,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.

W. R. Costello, and R. G. Walker.
Journal of Sedimentary Petrology, Vol 42, No 2, p 389-400, June 1972. 9 fig, 2 tab.

Descriptors: *Sedimentary structures, *Pleistocene epoch, *Glacial drift, *Alluvial channels, *Braiding, Sediment load, Sediment transport, Deposition (Sediments), Sands, Gravels, Silts, Clays, Paleohydrology.
Identifiers: *Outwash channels, *Credit River (Canada).

Studies of modern and Pleistocene braided rivers complement each other. The advantage of modern studies is that flow parameters can be measured, and the advantage of Pleistocene studies in most North American areas is that exposure of flat-lying beds persists over a wider area, and that vertical sections can be studied unhampered by river stage and water table. Braided outwash streams deposited sands and gravels during the withdrawal of ice sheets from the Credit River Valley of Southern Ontario. The gravels are crossbedded on a scale of several feet, and fine upward into sandy cross-laminated and tabular cross-bedded facies. Within the sandy facies are several newly recognized coarsening-upward sequences. These begin with very fine clay, coarsening upward into faintly cross-laminated silts and ripple-drafted sands. Above the sands there is normally an erosive surface, then tabular cross-bedded coarse and pebbly sands. Above a second erosive surface lies large scale cross-bedded sandy gravels. The sequence is a channel fill. The clay represents overband flooding into an old disused channel within the braided system. As the flood stage rises, more and more suspended sediment is washed overbank, and flow within the channel gives rise to the cross-laminated silts and sands. The tabular cross-bedded coarse and pebbly sands indicate bed load material being washed into the new channel, and the uppermost erosion surface, followed by cross-bedded sandy gravels, suggests levee-breaching, and final incorporation of the old channel into the active part of the braided system. (Knapp-USGS)
W72-13193

PEBBLE ORIENTATION IN FLUVIAL SEDIMENTS,

Ottawa Univ. (Ontario). Dept. of Geology.
B. R. Rust.
Journal of Sedimentary Petrology, Vol 42, No 2, p 384-388, June 1972. 2 fig, 2 tab, 16 ref.

Descriptors: *Sedimentary structures, *Paleohydrology, *Alluvium, *Alluvial channels, *Gravels, Sedimentology, Channels, Deltas, Braiding, Sediment transport, Sedimentation, Bed load, Petrofabrics.
Identifiers: *Paleocurrent analysis, *Pebble orientation (Sedimentology).

Pebble orientation is an important paleocurrent indicator for those coarse fluvial gravels and conglomerates in which directional structures are rare, or confined to minor sand bodies. Field observations were made on the Donjek, a glacially-fed braided river in the Yukon, Canada. The highest degree of preferred orientation is obtained from populations of large pebbles isolated on sand beds. Smaller size or increased concentration of the pebbles reduces the degree of preferred orientation. With flat pebbles, a stronger upstream imbrication mode is developed when the pebbles are in contact. The method to be adopted for determining paleocurrents from gravel fabric should vary according to the nature of the gravel. The method of general applicability is based on the dip direction of the AB plane, which is especially useful when a high concentration of flat pebbles increases the degree of directional imbrication. However, when the pebbles are isolated on sand beds the paleocurrent can be more easily determined from the A axis orientations of elongate pebbles, using the imbrication of discs to distinguish upstream from downstream and longitudinal from transverse orientations. In this case, selection of larger pebbles will give a higher degree of preferred orientation, and a smaller sample may be measured without reducing the significance of the resulting paleocurrent vector. (Knapp-USGS)
W72-13194

FLUME EXPERIMENTS ON THE DURABILITY OF MUD CLASTS,

Illinois Univ., Chicago. Dept. of Geological Sciences.
N. D. Smith.
Journal of Sedimentary Petrology, Vol 42, No 2, p 378-383, June 1972. 6 fig, 12 ref.

Descriptors: *Erosion, *Mud, *Sedimentary structures, *Bottom sediments, Sedimentology, Sediment transport, Hydraulic models, Flumes, Clays.
Identifiers: *Mud clasts.

Erosion of cohesive mud is accomplished both by removal of individual mud grains and by plucking of larger aggregates which may then be transported as individual clasts. These aggregates occur in a wide range of shapes and sizes. Mud clasts may occur in any aqueous environment where velocities are sufficiently variable to deposit mud at one time and erode it later. A series of flume experiments was undertaken to investigate the origin and morphological development of mud aggregates. Mud clasts of three different sediment samples and varying water contents were eroded in a sand-bottomed flume at velocities of 25 cm/sec and 60 cm/sec. Clay-rich and initially plastic clasts resist erosion the best, but all clasts abrade and round quickly if velocities are high enough to transport them. This suggests that desiccation cracks are insignificant sources of natural mud clasts, and most mud intraclasts in sedimentary deposits probably underwent little transportation from their site of origin. (Knapp-USGS)
W72-13195

SURFACE SEDIMENTS IN LAKE TAHOE, CALIFORNIA-NEVADA,

California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Zoology.
J. E. Court, C. R. Goldman, and N. J. Hyne.
Journal of Sedimentary Petrology, Vol 42, No 2, p 359-377, June 1972. 7 fig, 3 tab, 30 ref. FWQA Contract 16010 DBU.

Descriptors: *Bottom sediments, *Lakes, *Nevada, *California, Provenance, Glacial drift, Diatoms, Mud, Sands, Sedimentation, Stratigraphy, Erosion, Organic matter, Sedimentology, Sediment transport.
Identifiers: *Lake Tahoe (Nev-Calif).

Samples from 40 sites in Lake Tahoe and from six major tributaries were analyzed for mineral and biogenic components and for texture. The areal distribution of volcanic constituents of sand and gravel fractions reflects volcanic sources in the north and northwest parts of the basin. Volcanic areas contribute montmorillonite to clay fractions whereas vermiculite and chloritic intergrades are characteristic weathering products of granitic sources. Two distinct types of sediment are present. Pollen-rich diatomaceous ooze (organic ooze) is characterized by: (a) abundant diatoms and pollen; (b) chloritic intergrades in the clay fraction; and (c) all from flat-lying, well stratified beds. The other sediment type (non-organic) is typified by: (a) diatoms and pollen rare or absent; (b) vermiculite/mica/montmorillonite clay fraction; (c) not present in flat-lying beds; and (d) texturally more varied than organic ooze. Non-organic samples represent still-exposed depositional products of the Tioga glaciation, reflecting relatively rapid erosion and slumping into deeper parts of the basin. The principal source of non-organic material was the west side where volcanic rocks constitute about half of the area. In contrast, organic ooze samples result from relatively passive post-glacial fluvial erosion. The relative abundance of biogenic components in organic ooze reflects low depositional rates and the clay fraction, rich in chloritic intergrades points to the dominance of granitic source rocks in the present basin-wide source. (Knapp-USGS)
W72-13196

SURFACE DIAGENESIS OF LIMESTONE,

Houston Univ., Tex. Dept. of Geology.
H. S. Chafetz.
Journal of Sedimentary Petrology, Vol 42, No 2, p 325-329, June 1972. 6 fig, 15 ref.

Descriptors: *Weathering, *Diagenesis, *Limestones, *Dolomite, Carbonate rocks, Sedimentary rocks, Stratigraphy, *Texas, Calcite, Magnesium carbonate, Calcium carbonate, Leaching.
Identifiers: *Morgan Creek (Tex).

Surface diagenesis caused by weathering of the Morgan Creek Limestone of central Texas resulted in dedolomitization, silicification, and aggradational recrystallization. Horizons displaying similar diagenetic properties in subsurface carbonate strata are indicative of superjacent unconformities. (Knapp-USGS)
W72-13197

RANDOM WALK MODEL FOR MOTION OF A SOLID PARTICLE IN TURBULENT OPEN--CHANNEL FLOW,

Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
M. Bayazit.
Journal of Hydraulic Research, Vol 10, No 1, p 1-14, 1972. 8 fig, 2 tab, 8 ref.

Descriptors: *Stochastic processes, *Simulation analysis, *Sedimentation, *Settling velocity, *Sedimentation rates, Particle size, Settling basins, Desilting, Probability, Statistical models, Model studies.
Identifiers: *Random walk models.

The settling of a solid particle in a turbulent flow can be treated as a stochastic process. A random walk model is especially suitable for this kind of analysis. Such a study was carried out for fully developed turbulent uniform open-channel flow at low Reynolds numbers and small depths. On a computer, the probability distribution of the settling length can be determined for various conditions. Results are useful in studying the settling phenomenon in models of settling basins. The macroscale turbulence was not taken into account, since a time interval is used that is related to the microscale eddies. Therefore, results are applicable only to the case of fine grains and relatively weak turbulence, which prevail in settling basins. A rough comparison with the distances at which the initial value of the concentration is reduced by half shows, however, that the stochastic method leads to significantly larger settling lengths than yielded by nonstochastic analyses. (Knapp-USGS)
W72-13201

A PRELIMINARY STUDY OF THE DISTRIBUTION AND MORPHOLOGY OF THE CAMINADA/MOREAU SAND RIDGES,

Aberdeen Univ. (Scotland).
W. Ritchie.
Southeastern Geology, Vol 14, No 2, p 113-125, June 1972. 7 fig, 12 ref.

Descriptors: *Deltas, *Beaches, *Mississippi River, *Provenance, Sedimentation, Erosion, Beach erosion, Deposition (Sediments), Sediment transport, Geomorphology, *Louisiana.
Identifiers: *Mississippi Delta, *Caminada/Moreau sand ridges.

The Caminada/Moreau sand ridges of south Louisiana are types of accretion ridges deposited near a

former outlet of the Mississippi River. The area of ridges, intervening swale lakes and marsh may be divided into four systems. The analysis of the form, orientation and sedimentary characteristics indicates a genetic difference between the oldest group of ridges and the remainder. The oldest ridges are distributary mouth accretion ridges; the younger are beach ridges. The field evidence suggests a relatively recent origin of the ridges. The relative positions of systems II, III and IV show a progressive shift eastward and suggest a littoral current coming from the northeast with a sediment source being located in the general vicinity of west Barataria Bay. Alternatively, the sediment source could have been highly localized near the present outlet of Bayou Lafourche and Bayou Moreau and brought to the coastline from the east as a result of a local cell-circulation such as exists at present near the Mermentau River. The present beach cuts the older ridge systems at an angle of approximately 30 deg and represents current processes and a recent history of subsidence and large scale coastline retreat in this area of south Louisiana. This coastal retreat is symptomatic of an insufficient input of beach materials to keep pace with deltaic plain subsidence. (Knapp-USGS)
W72-13203

EROSION OF SOME BULGARIAN SOILS BY IRRIGATION (IRRIGATSIONNAYA EROZIYA PRI SAMOTECHNOM OROSHENII NEKOTORYKH POCHV BOLGARII),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
V. S. Tatarova-Krysteva.
Pochvovedeniye, No 12, p 107-115, December 1971. 2 fig, 5 tab, 9 ref.

Descriptors: *Soil erosion, *Land management, *Irrigated land, *Irrigation water, *Irrigation, Furrow irrigation, Furrow drainage, Drainage water, Sediments, Sediment discharge, Organic matter, Humus, Nitrogen compounds, Phosphorus compounds, Nutrient removal, Soil properties, Soil aggregates, Soil groups, Soil types, Mineralogy.
Identifiers: *Bulgaria, *Smolnitzas, Microaggregates, Erosion hazard.

To study erosion of soils by irrigation water, investigations were carried out in 1965-1969 on Chernozems, Chernozem-Smolnitzas, and Gray and Cinnamon-Brown Forest soils in different administrative regions of Bulgaria. Chernozem-Smolnitzas in southwest Bulgaria and Chernozems in northern Bulgaria are less erodible than Cinnamon-Brown Forest soils in southern Bulgaria. Leached Chernozem-Smolnitzas are least erodible, while Chernozem-Smolnitzas transitional to Cinnamon-Brown Forest soils, and Calcareous and Typical Chernozems are most erodible. Depending on soil conditions and irrigation practices, the critical rate of flow of irrigation water varies widely, between 0.2 and 1.5 liter/sec. Soil erodibility can be reduced by increasing the length of furrows. An increase in furrow length from 20 m to 30 m reduces erosion by 71.8% and a 3- to 6-fold increase in furrow length to a maximum of 120 m reduces erosion by 42%. Particles 0.05-0.01 mm in diameter predominate in the sediment discharge, and the average organic-matter content in sediments is 0.47% higher than in the plowed layer. The amount of total nitrogen and readily-soluble P205 removed in surface drainage averages 0.5 mg/liter and 0.2 mg/liter, respectively. (Josefson-USGS)
W72-13283

ANALYSIS OF TOTAL WEIGHT OF HOLOCENE DEPOSITS IN THE SEA OF AZOV (ANALIZ ABSOLYUTNYKH MASS GOLOTSENOVYKH OTLOZHENIY AZOVSKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopayemykh.
For primary bibliographic entry see Field 02L.
W72-13287

LATE QUATERNARY SEDIMENTATION IN THE ARGENTINE BASIN (OSOBENNOSTI POZDNECHETVERTICHNOGO OSADKOOBRAZOVANIYA V ARGENTINSKOY KOTLOVINE),
Akusticheskii Institut, Moscow (USSR).
I. I. Shurko.
Akademiya Nauk SSSR Doklady, Vol 198, No 3, p 696-698, 1971. 2 fig, 1 tab, 4 ref.

Descriptors: *Oceanography, *Atlantic Ocean, *Sedimentation, *Geologic time, Quaternary period, Recent epoch, Glaciation, Deposition (Sediments), Sedimentation rates, Sediment sorting, Particle size, Mineralogy, Aquatic life, Diatoms, Neritic, Littoral, Cores.
Identifiers: *USSR, *Argentine basin, *Oozes, Foraminifera, Terrigenous material, Concretions, Interglacial.

The Argentine basin is one of the largest but least studied deep-sea basins in the Atlantic Ocean. The sediment in mid-basin areas is a homogeneous, oily, greenish-gray ooze and differs from red clay in both color and composition. The principal sediment-source area in this part of the ocean is the coast of South America. The predominant heavy minerals are black ore minerals, hornblende, augite, and hypersthene. Of the 48 species of diatoms detected in the surface sediments, 10 are freshwater species, 6 are redeposited Tertiary species, and 16 are niritic sublittoral species. Analysis of a 260-cm long bottom core reveals that sedimentation conditions in the basin have changed repeatedly in the last 20 to 30 thousand years. In terms of grain size, the core can be divided into 4 units corresponding, on the Quaternary scale, to the Holocene epoch, the Wurm Glaciation, the Riss-Wurm Interglacial, and the Late Riss Glaciation. On the basis of this division, the rate of deposition of ooze in the basin in postglacial time can be estimated at 2 to 3.5 cm per 1,000 years. (Josefson-USGS)
W72-13288

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta, Environmental Resources Center.
For primary bibliographic entry see Field 02K.
W72-13299

SEDIMENTATION AND CONTAMINANT CRITERIA FOR WATERSHED PLANNING AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 04C.
W72-13353

RESULTS OF SOIL EROSION STUDIES IN THE CHUVASH ASSR,
F. Y. Mikhailov, and S. V. Petrov.
Soobshch Chuv Zony Agrokhim Lab. 1. p 43-51. 1969.
Identifiers: *Soil erosion, *Soil investigations, Chuvash-ASSR, Erosion, Soils.

Identification and description of 7 soil erosion districts, with a schematic map are given.--Copyright 1972, Biological Abstracts, Inc.
W72-13370

SEDIMENT TRANSPORT AND ACCUMULATION IN A FJORD BASIN, GLACIER BAY, ALASKA,
Alaska Univ., College. Dept. of Geology; and Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02L.
W72-13456

SOME PROPERTIES OF LINK MAGNITUDE FOR CHANNEL NETWORKS AND NETWORK PATTERNS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02E.
W72-13458

EROSION OF SAND BEDS AROUND SPUR DIKES,
Ministry of Natural Resources, Sokoto (Nigeria).
M. A. Gill.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9198, p 1587-1602, September 1972. 7 fig, 3 tab, 17 ref, append.

Descriptors: *Erosion, *Scour, *Dikes, *River training, *Alluvial channels, Sands, Bottom sediments, Diversion structures, Turbulent flow, Sediment transport, Shear stress, Vortices, Eddies, Bed load, Channel erosion.
Identifiers: *Spur dikes.

The present status of research on erosion of sand beds around spur dikes is briefly reviewed. The experimental results of erosion of two different sizes of nearly uniform sand are presented. It is shown that a rather simple kinematic model for erosion of sand beds in a long contraction, first proposed by Straub, can be modified for application to erosion around spur dikes. The equilibrium depth of scour depends on the size of the sand and the flow depth upstream of the location of the spur dike. This is consistent with Laursen's observations around bridge piers. (Knapp-USGS)
W72-13572

CONTROL OF SEDIMENT IN CANALS.
For primary bibliographic entry see Field 04D.
W72-13576

INTERDISCIPLINARY INVESTIGATIONS OF THE CASPIAN SEA (KOMPLEKSNYYE ISSLEDOVANIYA KASPIYSKOGO MORYA).
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02H.
W72-13591

DISCOVERY OF MIOCENE MARINE SEDIMENTS ON THE CONTINENTAL SLOPE OF PETER THE GREAT BAY IN THE SEA OF JAPAN (OTKRYTIYE MORSKIKH MIOTSENOVYKH OTLOZHENIY NA KONTINENTAL'NOM SKLONE ZALIVA PETRA VELIKOGO (YAPONSKOYE MORE)),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
For primary bibliographic entry see Field 02L.
W72-13593

RELATION OF SUSPENDED ORGANIC MATTER, BOTTOM SEDIMENTS, AND BENTHOS TO BIOLOGICAL PRODUCTION (SVYAZ' ORGANICHESKOGO VESHCHESTVA VZVESI, DONNYKH OSADKOV I BENTOSA S BIOLOGICHESKOY PRODUKTIVNOST'YU),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
Ye. A. Romankevich.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1199-1202, 1971. 2 fig, 1 tab, 11 ref.

Descriptors: *Oceanography, *Marine geology, *Bottom sediments, *Organic matter, *Benthos, Aquatic productivity, Aquatic microorganisms, Phytoplankton, Carbohydrates, Suspended load, Suspension, Pacific Ocean, Continental shelf, Continental slope, Correlation analysis.
Identifiers: *USSR, *Pelagic, *Terrigenous, Biogenous components, Photic zone, Euphotic zone.

Data on distribution of phytoplankton production, organic matter, and benthos were obtained in biologic, hydrochemical and lithologic studies in the southeastern Pacific. A linear correlation with a correlation coefficient of 0.9 exists between the concentration of suspended carbohydrates in the surface layer of bottom sediments and phytoplankton production. As depth increases, the concentration of suspended carbohydrates at most stations decreases. The pelagic distribution of organic matter is inherited from the distribution of organic matter in the photic region, particularly in the upper 200-m zone. The quantity of heterotrophic microorganisms is closely related to organic production and to concentration of suspended carbohydrates. Changes in total organic matter and carbohydrates in sediments are accompanied by a change in the abundance and biomass of the benthos. For the southeastern Pacific as a whole, the correlation coefficient of benthic biomass and organic-carbon content in sediments is +0.76; the correlation between benthic biomass and carbohydrates is +0.84. No correlation was found between ocean depth and the abundance and biomass of the benthos, the correlation coefficients being 0.02 and 0.08, respectively. (Josefson-USGS)
W72-13594

URANIUM IN OOZE SOLUTIONS OF THE SOUTHEASTERN ATLANTIC (URAN V ILOVYKH RASTVORAKH OSADKOV YUGO--VOSTOCHNOY ATLANTIKI),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
G. N. Baturin.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1186-1188, 1971. 1 tab, 10 ref.

Descriptors: *Geochemistry, *Atlantic Ocean, *Sediments, *Uranium radioisotopes, Hydrogen ion concentration, Oxidation-reduction potential, Moisture content, Organic matter, Sea water, Continental margin, Diagenesis, Cores.
Identifiers: *USSR, *Ooze, *Pelagic, *Terrigenous.

Ooze solutions from sediment cores collected from the southeastern Atlantic in 1968 were investigated for uranium concentration, pH, Eh, and moisture content of sediments. The uranium concentrations is ooze solutions ranges from 1.3 to 650 micrograms/liter and in most samples is considerably higher than that in sea water. Uranium is uniformly distributed in waters of the southeastern Atlantic where its concentration is 3.2 micrograms/liter. Moisture content of the sediments ranges from 51% to 88% and does not affect the uranium content in ooze solutions. The Eh is highly variable and ranges from +500 mV in oxidized red clay to minus 200 mV in reduced sediments of the continental shelf and slope. The pH of sediments ranges from 7.10 to 8.06. Because of sharp differences in the lithologic composition of the sediments analyzed, there is generally no correlation between uranium content and pH or Eh. (Josefson-USGS)
W72-13596

HIGH MERCURY AND ANTIMONY CONCENTRATIONS IN CRETACEOUS AND PALEOGENE SEDIMENTS IN THE SOUTHERN KIRGIZ SSR (O POVYSHENNYKH SODERZHANIYAKH RTUTI I SUR'MY V MELOVYKH I PALEOGENOVYKH OTLOZHENIYAKH YUZHNOY KIRGIZII),
Akademiya Nauk Kirgizskoi SSR, Frunze. Institut Geologii.
Z. N. Polyarkova.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1189-1191, 1971. 4 tab, 3 ref.

Descriptors: *Geochemistry, *Sediments, *Metals, *Mercury, *Geologic time, Paleozoic era, Mesozoic era, Cenozoic era, Age, Rocks, Petrology, Stratigraphy, Chemical analysis.
Identifiers: *USSR, *Kirgiz SSR, *Antimony, *Cretaceous period, *Paleogene period, Paleogeography, Dispersion halos, Mineralization.

Cretaceous and Paleogene rock specimens collected from the Transalay and Alay Mountain ranges and Fergana in the Kirgiz SSR were investigated for mercury and antimony concentrations. The relatively high mercury and antimony concentrations are not associated with any specific genetic or lithologic rock type and are commensurate with the concentrations generally found in primary dispersion halos over these metal deposits. This supports earlier hypotheses regarding the possible occurrence of younger Mesozoic and Cenozoic mercury-antimony mineralization in the southern part of the Republic, in addition to the late Paleozoic mineralization already known. (Josefson-USGS)
W72-13597

2K. Chemical Processes

ORGANIC MATTER IN RED SEA SEDIMENTS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 02J.
W72-13058

ROLE OF QUINONE GROUPS IN SOLUBILITY AND COMPLEXING OF METALS IN SEDIMENTS AND SOILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology Div.
For primary bibliographic entry see Field 05B.
W72-13059

INTRAGRANULAR GROWTH OF MARINE ARAGONITE AND MG-CALCITE: EVIDENCE OF PRECIPITATION FROM SUPERSATURATED SEAWATER,
Uppsala Univ. (Sweden). Dept. of Historical Geology and Paleontology.
T. Alexandersson.
Journal of Sedimentary Petrology, Vol 42, No 2, p 441-460, June 1972. 11 fig, 1 tab, 100 ref.

Descriptors: *Calcite, *Chemical precipitation, *Diagenesis, *Mineralogy, Magnesium carbonate, Calcium carbonate, Petrofabrics, Saturation, Sea water, Water chemistry, Sedimentology, Sedimentation, Crystal growth.
Identifiers: *Aragonite.

Nonskeletal aragonite and Mg-calcite is formed in the interior of hollow particles, such as shells, in West Indian and Mediterranean nearshore calcareous sediments. The calcite has 15 to 17 mole percent MgCo3 in solid solution. The intragranular fillings are best developed in sediments from turbulent environments; the carbonate is an addition to the particles, not reorganized initial grain substance. The growth processes represent slow precipitation under supersaturated conditions. The time needed for precipitation is estimated to be 100-1,000 years. Four kinds of fabric are found: ordered arrangement in monomineralic fringes of aragonite; random arrangement in Mg-calcite micrite, and in aragonite clusters. Changes in mineralogy during growth are from Mg-calcite to aragonite; changes in fabric are from ordered to random arrangement. Mineralogy and fabric vary on a microscopic scale, and the two polymorphs are evidently formed from natural seawater under the same general conditions. One important controlling factor is the growth substrate; biogenic aragonite induces nucleation and growth of aragonite, while biogenic calcite favors precipitation of Mg-calcite. The organic calcification matrices in the biogenic carbonates are probably active in the process. The intragranular precipitate is related in fabric and ultrastructure to various other shallow-marine carbonates, such as: beachrock cement; shallow submarine cement; and internal cement in reef-algal frameworks. Also the secondary carbonate in micrite envelopes appears to have the same properties. (Knapp-USGS)
W72-13188

SURFACE DIAGENESIS OF LIMESTONE,
Houston Univ., Tex. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-13197

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA: II. BASIC NON-LINEAR PROBLEM,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02F.
W72-13270

A REVIEW OF CARBON MONOXIDE SOURCES, SINKS, AND CONCENTRATIONS IN THE EARTH'S ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W72-13273

WATER PROPERTIES OF SOME SOILS IN THE TURKMEN SSR (O VODNYKH SVOYSTVAKH NEKOTORYKH POCHV I GRUNTOV TURKMENSKOY SSR),
Turkmenskii Gosudarstvennyi Pedagogicheskii Institut, Chardzhou (USSR).
For primary bibliographic entry see Field 02G.
W72-13281

DYNAMICS OF WATER-SOLUBLE SALTS UNDER ALFALFA IN A RICE CROP ROTATION (DINAMIKA VODNORASTVORIMYKH SOLEY POD LYUTSERNOY V RISOVOM SEVOOBOROTE),
For primary bibliographic entry see Field 03C.
W72-13284

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM--BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 02G.
W72-13285

EFFECT OF FOREIGN COMPONENTS ON THE PRECIPITATION OF PHOSPHATE BY ALUMINUM,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 05D.
W72-13290

DIFFUSIVITY OF BISULFIDE ION IN AQUEOUS SOLUTION,
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 01B.
W72-13292

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta, Environmental Resources Center.
K. C. Beck.
Available from the National Technical Information Service as PB-211 611, $3.00 in paper copy, $0.95 in microfiche. Georgia Environmental

Resources Center, Report ERC-0872, July 1972, 96 p., 8 fig, 10 tab, 75 ref. OWRR B-033-GA (2).

Descriptors: *Water chemistry, *Organic compounds, *Inorganic compounds, *Cation exchange, *Clay minerals, Chemical processes, Montmorillonite, Estuaries, Cation adsorption, Salinity, Georgia, Sediments, Southeast U.S.
Identifiers: Georgia Coastal plains - Satilla River, Ohoopee River, Canoochee River, Altamaha River, and Oconee Rivera, Southeastern U.S.

The objective was to determine how and to what extent the chemistry of fresh and saline waters is controlled by clay minerals and associate organic matter. Information is presented separately on Coastal Plain rivers and estuaries. Georgia Coastal Plain streams are characterized by low suspended load, low ionic strength, low pH, high PC02, dominance of Na-Cl over the more usual Ca-HC03-S04, relatively high proportions of Si02, Al, and Fe and high dissolved organic content. The streams chemistry is controlled by atmospheric input, weathering of the soils, and by organic compounds produced on decay of vegetation in swampy terrain. Hydrologic conditions control the relative importance of these factors. The lower Coastal Plain streams have an inorganic anion deficiency and charge balance is attained by organic anions. The streams chemistry departs markedly from that of the world average river. Estuaries of Coastal Plain streams normally exhibit simple river water-sea water mixing of major dissolved constituents. With the introduction of low pH, low Si02 waters by flushing of swamps during heavy rains, silicate minerals in the estuaries interact to modify water chemistry. Montmorillonite, with Mg (++) as the dominant exchange cation, appears to be involved, either absorbing H (+) and releasing Mg (++) and Si02 to form kaolinite or dissolving incongruently. Estuarine levels of Al and Fe appear to be controlled by pH-dependent precipitation reactions in addition to mixing. (Conway - Ga. Tech)
W72-13299

PLANT PHYSIOLOGY: ON THE DEUTERIUM CONTENT OF ORANGE JUICES,
Institut de Recherches Appliquees du Beissons, Montreuil (France).
J. Bricout, and L. Merlivat.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris), Vol 273, No 12, p 1021-1023, 1971.
Identifiers: *Plant physiology, Absorption, Deuterium, Juices, *Orange D.

The study of water formation in orange fruits by an analysis of its deuterium content was studied. The values of deuterium concentration in juice from oranges of different origins (Corsica, Morocco, Spain, Israel, Florida, and France) and the description of the technique of the analysis were given. The results indicated that the water of orange juice was richer in deuterium than the water absorbed by the orange-trees, a fact which involves a phenomenon of isotopic enrichment. Vacuum concentration of orange juice produces a further increase in its deuterium content. However, dilution of the concentrate by ordinary drinking water brings this level below the value obtained for the initial juice.--Copyright 1972, Biological Abstracts, Inc.
W72-13334

THE STRUCTURE AND SYNTHESIS OF A TETRAHYDRO-BETA-CARBOLINE ALKALOID FROM PHALARIS ARUNDINACEA: SOME NEW TETRAHYDRO-BETA-CARBOLINES,
University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Chemistry.
P. V. R. Shannon, and W. M. Leyshon.
J Chem Soc Sect C Org Chem. 16. p 2837-2839. 1971.
Identifiers: Alkaloids, Carbolines, *Phalaris arundinacea M, Structure, Synthesis, *Tetrahydro-beta-carbolines.

The original structure of 2.9-dimethyl-6-methoxy-1,2,3,4-tetrahydro-beta-carboline for a new alkaloid from Phalaris arundinacea was shown to be incorrect by synthesis. 6-Methoxy-2-methyl-1,2,3,4-tetrahydro-beta-carboline was synthesized and is suggested as an alternative.--Copyright 1972, Biological Abstracts, Inc.
W72-13390

RADIOMETRIC DETERMINATION OF TRACE AMOUNTS OF ANIONIC SURFACTANTS IN GROUND WATER AND POTABLE WATER,
Liverpool Polytechnic (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13457

SOURCE AREAS AND CLIMATIC EFFECTS IN CARBONATE GROUNDWATERS DETERMINED BY SATURATION INDICES AND CARBON DIOXIDE PRESSURES,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 02F.
W72-13465

DYNAMICS OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS-FIR FOREST FLOOR,
Washington Univ., Seattle.
For primary bibliographic entry see Field 04A.
W72-13570

SALT DISPERSION COEFFICIENTS NEAR AN EVAPORATING SURFACE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W72-13577

TRANSPORT NUMBERS AND MOBILITIES OF IONS IN BENTONITE MEMBRANES,
Negev Inst. for Arid Zone Research, Beersheva (Israel).
For primary bibliographic entry see Field 02G.
W72-13582

SUBSTANCES CONTRIBUTING TO FIRE-INDUCED WATER REPELLENCY IN SOILS,
Northern Arizona Univ., Flagstaff. Dept. of Chemsitry.
For primary bibliographic entry see Field 02G.
W72-13585

SALINE KARST (SOLYANOY KARST),
G. V. Korotkevich.
Izdatel'stvo 'Nedra', Leningrad, 1970. 256 p.

Descriptors: *Karst, *Karst hydrology, *Salts, *Geochemistry, Water chemistry, Topography, Geomorphology, Geology, Hydrodynamics, Hydrogeology, Groundwater, Brines, Limestones, Gypsum, Mineralogy, Saline lakes, Caves, Weathering, Solubility, Cycles.
Identifiers: *USSR, *Rock salt, *Karst topography, Karstic rocks, Karst lakes, Karst windows.

This monograph, which consists of 7 chapters, is devoted to investigation of saline karst and the hydrogeologic and hydrodynamic conditions essential to its development. The hydrogeology, evolution, and geologic role of saline karst are examined in connection with the geomorphic significance of weathering and solution and the concept of a distinct cycle of land-form evolution in rock-salt terrains. Existing and proposed methods are outlined for controlling saline karst in the exploitation of salt deposits. (Josefson-USGS)
W72-13590

URANIUM IN OOZE SOLUTIONS OF THE SOUTHEASTERN ATLANTIC (URAN V ILOVYKH RASTVORAKH OSADKOV YUGO--VOSTOCHNOY ATLANTIKI),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W72-13596

HIGH MERCURY AND ANTIMONY CONCENTRATIONS IN CRETACEOUS AND PALEOGENE SEDIMENTS IN THE SOUTHERN KIRGIZ SSR (O POVYSHENNYKH SODERZHANIYAKH RTUTI I SUR'MY V MELOVYKH I PALEOGENOVYKH OTLOZHENIYAKH YUZHNOY KIRGIZII),
Akademiya Nauk Kirgizskoi SSR, Frunze. Institut Geologii.
For primary bibliographic entry see Field 02J.
W72-13597

2L. Estuaries

EFFECTS OF TIDAL FLATS ON ESTUARINE WATER QUALITY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05B.
W72-13063

POPULATION DYNAMICS AND LIFE HISTORY OF CREPIDULA CONVEXA SAY (GASTROPODA: PROSOBRANCHIA) IN DELAWARE BAY,
Connecticut Univ., Storrs.
G. Hendler, and D. R. Franz.
Biol Bull (Woods Hole). Vol 141, No 3, p 514-526. 1971.
Identifiers: *Crabs, *Crepidula convexa, *Delaware Bay, Development, Dispersal, Dynamics, Evolution, *Gastropods, Population, Prosobranchia, Sexuality, Life history studies.

The significance of protandric sexuality, direct development and phoretic dispersal for the population dynamics of C. convexa is described. An unusual egg mass structure is illustrated. When reproduction is maximal the population consists primarily of females which must be fertilized by a relatively smaller number of mobile males. The production of several broods of eggs result in an influx of juveniles. These develop shortly into males which transform to females by the following spring. C. convexa living on small hermit crabs rather than flat substrates form a dwarf population with a different morphology, mating behavior, breeding cycle and maturation rate. These differences are attributed to areal limitation of the substrate. Exchange of individuals between substrate subpopulations is facilitated by phoresis on hermit crabs. The high mobility of males, which makes phoresis possible, facilitates dispersal in the absence of planktonic larval stages and permits fertilization of a predominantly female population. It is suggested that, in C. convexa, a mating system involving motile males was preadaptive for the evolution of direct development.--Copyright 1972, Biological Abstracts, Inc.
W72-13127

ROUNDNESS-MINERALOGICAL RELATIONS OF SOME INTERTIDAL SANDS,
Illinois Univ., Urbana. Dept. of Geology.
R. J. Balazs, and G. DeVries Klein.
Journal of Sedimentary Petrology, Vol 42, No 2, p 425-433, June 1972. 11 fig, 6 tab, 34 ref. NSF Grant GA-21141.

Descriptors: *Particle shape, *Sands, *Intertidal areas, Beaches, Sediment transport, Tides, Tidal effects, Sedimentology, Sedimentation.
Identifiers: *Arkosic sands, *Bay of Fundy (Nova Scotia).

Medium to coarse-grained arkosic sands on an intertidal sand body in the Minas Basin, Bay of Fundy, Nova Scotia, show texturally supermature rounding. Average roundness is 0.49; 86 percent of all quartz grains are characterized by rounding in excess of 0.35. Quartz sand not only shows higher values of roundness (mean of 0.53) than associated orthoclase, plagioclase and recognizable rock fragments, but also shows a decrease in roundness with decreasing particle size. These intertidal sands are characterized also by higher values of roundness than their parent material (Triassic sandstone and basalt, and Pleistocene fluvioglacial drift). The higher degree of roundness of the intertidal sands is attributed to predicted high rates of grain collision known to occur during bedload transport by tidal currents. Intertidal sand bodies are characterized by equilibrium sand transport patterns through alternating flood-dominated and ebb-dominated portions of the sand body. As a consequence, a long distance of grain transport is predicted within a limited geographic area in response to such a transport mode. This limited geographic area may be located close to source terrains. High values of roundness therefore are a consequence of prolonged abrasion on such sand bodies. In comparison to known values of fluvial, beach, inland dune and coastal dune sands, intertidal sands are characterized by higher roundness values. High roundness values, associated with other sedimentary features, may indicate a similar transport history. (Knapp-USGS)
W72-13189

ANALYSIS OF TOTAL WEIGHT OF HOLOCENE DEPOSITS IN THE SEA OF AZOV (ANALIZ ABSOLYUTNYKH MASS GOLOTSENOVYKH OTLOZHENIY AZOVSKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geologii i Razrabotki Goryuchikh Iskopayemykh.
I. A. Aleksina, and Z. P. Yedigaryan.
Akademiya Nauk SSSR Doklady, Vol 198, No 3, p 653-656, 1971. 1 fig, 2 tab, 14 ref.

Descriptors: *Sedimentation, *Deposition (Sediments), *Bottom sediments, *Weight, *Recent epoch, Geologic time, Sediment distribution, Sedimentation rates, Erosion, Carbonates, Benthos.
Identifiers: *USSR, *Sea of Azov, *Holocene sediments, *Deep-sea sediments, *Oozes, Terrigenous material, Biogenous material, Autochthonous, Allochthonous, Isobaths.

Holocene deposits in mid-sea areas of the Sea of Azov bounded by the 10-m isobath were investigated for total thickness of bottom sediments and their specific weights. Maximum weight of paleo-Azov deposits, composed of 27.5% carbonate shell material and 72.5% terrigenous and other components and confined to the southern part of the sea, is 1,627 g/sq cm. The oozes, represented primarily by clayey and silty-clayey varieties, constitute 40% of the total sediments and gravitate toward the southern and southwestern parts of the sea. Maximum weight of neo-Azov deposits, composed of 31.2% carbonate shell material and 68.8% terrigenous and other components and confined to the south-central part of the sea, is 1,190 g/sq cm. The oozes, amounting to 44.1% of the total weight, also occur in the southern and southwestern parts of the sea. The total annual amount of sedimentary material deposited in neo-Azov time over mid-sea areas (equal to 50% of the area of the sea) was 24.2 million metric tons. The sedimentation rate in mid-sea areas in neo-Azov time was 2.3 mm/yr and in paleo-Azov time, 1.4 mm/yr. (Josefson-USGS)
W72-13287

LATE QUATERNARY SEDIMENTATION IN THE ARGENTINE BASIN (OSOBENNOSTI POZDNECHETVERTICHNOGO OSADKOOBRAZOVANIYA V ARGENTINSKOY KOTLOVINE),
Akusticheskii Institut, Moscow (USSR).
For primary bibliographic entry see Field 02J.
W72-13288

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta, Environmental Resources Center.
For primary bibliographic entry see Field 02K.
W72-13299

MERCURY IN SEDIMENTS FROM THREE VIRGINIA ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 05B.
W72-13336

PHYTOPLANKTON PRODUCTION AND THE DISTRIBUTION OF NUTRIENTS IN A SHALLOW UNSTRATIFIED ESTUARINE SYSTEM NEAR BEAUFORT, N.C.,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W72-13337

COMPARISONS OF ENVIRONMENTAL ORDINATIONS WITH PRINCIPAL COMPONENT VEGETATIONAL ORDINATIONS FOR SETS OF DATA HAVING DIFFERENT DEGREES OF COMPLEXITY,
Great Lakes Forestry Research Center, Sault Sainte Marie (Ontario).
J. K. Jeglum, C. F. Wehrhahn, and J. M. A. Swan.
Can J For Res. Vol 1, No 2, p 99-112. 1971. Illus.
Identifiers: Environment, Fens, Marshes, Meadows, *Shrub types, *Vegetation, *Principal component analysis.

Data from a survey of lowland, mainly peatland, vegetation were subjected to environmental ordination based on measurements of water level and water conductivity, and to vegetational ordination derived from principal component analysis (PCA). Analyzed were the total set of the data (all types), half sets (nonwoody and woody types) and quarter sets (stands of marshes, meadows, shrub fens, and other woody types); the number of distinct physiognomic groups in a set of data, and presumably the amount of contained heterogeneity, decreased at each segmentation. The effectiveness of the ordination models was tested by correlating measured distances in 2-dimensional ordination models with 2W/ (A + B) indices of vegetational similarity for randomly selected pairs of types or stands. As the physiognomic complexity decreased, the effectiveness of the PCA vegetational ordination increased whereas that of the environmental ordination decreased. The environmental ordination seemed most appropriate to the date encompassing high complexity (total data set), while the PCA vegetational ordination seemed most appropriate to data with low complexity (quarter sets of the data).--Copyright 1972, Biological Abstracts, Inc.
W72-13421

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS - II, ESTUARIES AND COASTAL WATERS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-13437

THE ROLE PLAYED BY THE FISHERIES RESEARCH BOARD OF CANADA IN THE 'RED' HERRING PHOSPHORUS POLLUTION CRISIS IN PLACENTIA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05C.
W72-13439

STUDIES ON THE SHINER PERCH, CYMATOGASTER AGGREGATA GIBBONS, IN UPPER NEWPORT BAY, CALIFORNIA,
Long Island Univ., Southampton, N.Y. Southampton Coll.
G. Bane, and M. Robinson.
Wasmann J Biol. Vol 28, No 2, p 259-268. 1970. Illus. Map.
Identifiers: *Life history studies, Algae, Newport Bay, California, Crustaceans, Cymatogaster aggregata, Fish diets, *Perches, Fish reproduction, Fish behavior.

Life history studies were made on C. aggregata, a common bay fish in southern California. From specimens collected and analyzed over a 3 yr period in Newport Bay and closely adjoining areas, it was found that: C. aggregata is omnivorous, eating mostly small crustaceans and algae; the Newport Bay population is composed mostly of juvenile and 1-yr old adults; 2-year old fish emigrate to the ocean. Juvenile growth is rapid and adult size is reached within 1 yr when growth diminishes. Males are sexually mature at birth, and are distinguished from the females by dark breeding coloration and the presence of a copulatory structure on the anterior portion of the anal fin. Females are sexually responsive soon after birth and breeding occurs during the first summer. In 1 yr old adults, breeding occurs in the spring. Fetal development is in the oviduct and the young are nourished by the ovarian fluid. An average of 8 young are born in the spring. After mating, the adults leave Newport Bay and go into the ocean, returning to the shallow water the next spring to give birth.--Copyright 1972, Biological Abstracts, Inc.
W72-13453

SEDIMENT TRANSPORT AND ACCUMULATION IN A FJORD BASIN, GLACIER BAY, ALASKA,
Alaska Univ., College. Dept. of Geology; and Alaska Univ., College. Inst. of Marine Science.
C. M. Hoskin, and D. C. Burrell.
Journal of Geology, Vol 80, No 5, p 539-551, September 1972. 12 fig, 31 ref.

Descriptors: *Sediment transport, *Fjords, *Alaska, *Suspended load, Deposition (Sediments), Sedimentation, Stratified flow, Flocculation, Suspension, Mud, Density currents, Bed load, Deltas, Sedimentology.
Identifiers: *Glacier Bay (Alaska).

Sediment transport and accumulation were studied over several years to define the sedimentary environment in a fan-terminated, active valley glacier and adjacent fjord at Queen Inlet, Glacier Bay National Monument, Alaska. Recently exposed ice-contact sediment at the glacier snout is entrained during summer and early fall by meltwater streams crossing a subaerial-intertidal outwash fan. Suspended sediment in the meltwater (sediment loads exceed 1 g/liter at the inlet head) subsequently yields a cold, surface sediment plume overlying warmer saline water in the fjord basin. Mixing of these layers produces flocculation and settling occurs in discrete layers; each layer represents one tidal cycle. No gravel is present in fjord floor sediment, although both colluvium and outwash fan sediments contain gravel. This gravel distribution eliminates sliding, slumping of the outwash fan, and ice rafting as major contributors to fjord basin sediment in Queen Inlet. Piston cores of muddy fjord basin sediment show annual, cyclical, thin, black horizons. Spacing of these marker

horizons indicates that sediment accumulation may exceed 1 m/year at the inlet head. The fjord floor is cut by sinuous valleys with natural levees, terraces, and sandy silt axial sediment. These valleys are the result of sediment-transporting bottom currents. (Knapp-USGS)
W72-13456

ON AN AERIAL MEASUREMENT OF RADIATIVE TEMPERATURE PATTERNS OVER THE THERMAL POLLUTED WATER (IN JAPANESE),
Toba Merchant Marine Coll. (Japan).
For primary bibliographic entry see Field 05B.
W72-13483

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 02F.
W72-13578

INVESTIGATIONS OF SEAS BORDERING CENTRAL AMERICA (ISSLEDOVANIYA TSENTRAL'NO-AMERIKANSKIKH MOREY).
Institute of Biology of the Southern Seas, Sevastopol (USSR).

Izdatel'stvo 'Naukova Dumka', Kolesnikov, A. N., editor, 1971. 140 p.

Descriptors: *Data collections, *Investigations, *Hydrobiology, *Aquatic life, Aquatic animals, Aquatic plants, Aquatic algae, Aquatic microorganisms, Aquatic bacteria, Benthos, Plankton, Plankton nets, Aquatic productivity, Biomass, Organic matter, Organic compounds, Inorganic compounds, Paints, Bathymetry, Maps.
Identifiers: *USSR, *Central America, *Cuba, *Caribbean Sea, *Gulf of Mexico, Biocenoses, Bathometers.

This book, containing 10 papers, is the third and last in the series of publications devoted to the results of biological investigations conducted by the Soviet-Cuban Marine Expedition in 1964-65. Attention is focused on the planktonic and benthic animal and plant life of the Caribbean Sea and Gulf of Mexico. Growth of heterotrophic bacteria on the surface of Soviet and Cuban antifouling paints submerged to a depth of 1 m in the Gulf of Mexico is compared with the development of bacteria colonies on the surface of Soviet paints submerged in the vicinity of Sevastopol Bay in the Black Sea. (Josefson-USGS)
W72-13589

DISCOVERY OF MIOCENE MARINE SEDIMENTS ON THE CONTINENTAL SLOPE OF PETER THE GREAT BAY IN THE SEA OF JAPAN (OTKRYTIYE MORSKIKH MIOTSENOVYKH OTLOZHENIY NA KONTINENTAL'NOM SKLONE ZALIVA PETRA VELIKOGO (YAPONSKOYE MORE)),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
B. I. Vasil'yev, and N. P. Vasil'kovskiy.
Akademiya Nauk SSSR Doklady, Vol 198, No 5, p 1195-1198, 1971. 1 fig, 4 ref.

Descriptors: *Oceanography, *Marine geology, *Continental slope, *Sediments, *Tertiary period, Quaternary period, Age, Mud, Rocks, Mineralogy, Protozoa, Diatoms, Geological surveys, Palynology.
Identifiers: *USSR, *Soviet Far East, *Sea of Japan, *Miocene epoch, Pliocene epoch, Tuffite, Radiolaria, Foraminifera.

Miocene sediments in Peter the Great Bay and adjoining areas of the Sea of Japan were discovered during marine geological surveys conducted in 1969 by the Pacific Division of the P. P. Shirshov Institute of Oceanography. Between the Tyumen'-Ula Estuary and Point Gamov, the Continental slope lies at depths of 130 to 3,000 m and is 10- to 12-km wide. The slope in this area is dissected by submarine canyons. A 10- to 30-cm thick layer of greenish-gray silty mud is found at a depth of 130 m as well as along the canyon sides and on the continental slope. At depths of 130 to 150 m, this mud is underlain by boulder and pebble beds, which most likely correlate with the widespread Suyfun suite of Pliocene age in the basin of the Suyfun River flowing into the Amur Bay. Below the boulder-pebble horizon, the continental slope consists of Miocene silty tuffite, covered by a 30-cm thick layer of Quaternary silty mud with pebbles and grit. Tuffite and tuffaceous limestone are considered to be the bedrock in this part of the slope and abound in radiolaria, foraminifera, and diatoms. The most representative diatoms consist of typically marine Miocene species and of examples of Pliocene flora. The diatom species identified correlate with the assemblage of diatoms in Mayamrafskaya and diatom suites of Sakhalin and in Miocene sediments of other regions of the Far East. (Josefson-USGS)
W72-13593

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INVESTIGATION OF METALLIDE COATINGS FOR SEAWATER PUMP COMPONENTS,
Little (Arthur D), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 08G.
W72-13141

DESALTING,
National Water Commission, Arlington, Va. Engineering and Environmental Div.
V. A. Koelzer.
Available from the National Technical Information Service as PB-209 942, $5.45 in paper copy, $0.95 in microfiche. National Water Commission Report NWC-EES 72-045, May 1972, 134 p.

Descriptors: *Desalination, *Desalination processes, *Cost analysis, *Water costs, *Water supply, *Water purification, Economic feasibility, Environmental effects, Economies of scale, Maintenance costs, Technical feasibility, Brine disposal, Distillation, Crystallization, Membrane processes, Geothermal studies, Energy, Osmosis, Forecasting.
Identifiers: *Energy costs, *Water markets.

Based on a comprehensive review of desalting literature and interviews with experts in the field, the state of the art of desalting technology is evaluated. Progress on desalting technology is summarized, and applicability of distillation, crystallization, membrane and chemical processes is described. In an attempt to evaluate the markets for desalted water, water costs, economies of scale and other marketing factors are considered. Applications of desalting technology are considered for incremental supply, to improve quality of supply, for intermittent operations, in dual-purpose plants, to renovate water for reuse, and for agriculture. The report concludes that desalting is presently a technically feasible source of new water for situations of specialized need, and makes research recommendations. (NWC)
W72-13354

REVERSE OSMOSIS SEPARATIONS USING A TREATED POLYAMIDE MEMBRANE,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
L. A. Cescon, and H. H. Hoehn.
U. S. Patent No. 3,551,331, 17 p, 16 fig, 11 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 2027, December 29, 1970.

Descriptors: *Patents, *Membranes, *Desalination, Salt water, Brackish water, *Reverse osmosis, Water quality, Potable water, Resins, Thin films, Permeability, Separation techniques, Treatment.

A process is disclosed for the separation of a liquid mixture containing at least about 25% by weight water. Emphasis is on the linear aliphatic polyamide resin membrane. The membrane is about 2-75 microns thick and when dry has a wide angle X-ray diffraction pattern indicating a high degree of crystallinity. The small angle X-ray diffraction pattern has an extrapolated intercept scattering intensity at zero scattering angle of about 50-220. The water permeability of the membrane is 50-50,000. Effective treating agents include protonic acids, specified Lewis acids and selected lyotropic salts. The membrane may be a flat film or hollow fiber. (Sinha-OEIS)
W72-13527

APPARATUS FOR COMBINING VAPORS,
Saline Water Conversion Corp., Oradell, N.J. (assignee).
J. Lichtenstein.
U. S. Patent No. 3,551,298, 5 p, 3 fig, 1 tab, 17 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 2020, December 29, 1970.

Descriptors: *Patents, *Desalination, Sea water, *Evaporation, *Condensation, Vaporization, *Flash distillation, Equipment, Separation techniques.

A flash type evaporation process approaches an ideal reversible process. The energy contained within the flash is preserved with a high degree of efficiency. Vapor streams of each step are combined in a remote nozzle system which utilizes the respective pressure differentials between the respective steps to bring all the vapor streams to a common flow velocity in a common stream. The kinetic energy is recompressed in a diffusor into corresponding pressure for condensation. (Sinha-OEIS)
W72-13528

PERMEABLE MEMBRANE AND METHOD OF MAKING AND USING THE SAME,
Amicon Corp., Cambridge, Mass. (assignee).
For primary bibliographic entry see Field 05D.
W72-13535

TREATMENT OF WATER,
For primary bibliographic entry see Field 05F.
W72-13539

MULTISTAGE DISTILLATION FOR DESALINIZING SALINE WATER,
J. P. Hingst, and G. D. Heidelbaugh.
U. S. Patent No. 3,527,676, 3 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 878, No. 2, p 425, September 8, 1970.

Descriptors: *Patents, *Desalination, Sea water, Potable water, *Distillation, Vaporization, *Heat transfer, Separation techniques, Equipment, *Condensation.

The saline water is preheated by passing it through the condensate coil in the plant's final stage. The preheated saline water is passed into the first stage and then successive stages. Each stage is of lower pressure than the preceding stage. In stage one the saline water is heated further and vaporized at a temperature below the rapid scaling temperature. The vapor is condensed on the exterior of a unique heat transfer percolation coil and the condensate is

collected as potable water. Similar condensation occurs at several stages and finally all condensates are combined. (Sinha-OEIS)
W72-13547

3B. Water Yield Improvement

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICULTURE,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and F. A. Huff.
Available from NTIS, Springfield, Va 22151 as PB-206 250, Price: $3.00 paper copy; $0.95 microfiche. Final Contract Report, Part II, Appendix, October 31, 1971. 59 p, 73 tab. USBR Contract 14-06-D/-6843.

Descriptors: *Agroclimatology, *Weather modification, *Cloud seeding, *Crop response, *Illinois, Corn (Field), Soybeans, Model studies, Regression analysis, Rainfall, Summer, Hydrologic data, Soil properties, Crop production, Agriculture, Agronomy, Costs, Economics.
Identifiers: Crop yield increases.

An investigation was made on the potential effects of modifying growing-season rainfall on the yields and economic benefits of the two major Illinois crops, corn and soybeans. Crop yield and weather data for the 38-yr period, 1931-1968, were used to develop multiple regression equations relating crop yield to technology trends and various temperature and precipitation parameters. This was done for each of 13 regions with similar yield characteristics. Hypothetical seeding models were then used with the appropriate regional equation to evaluate the effects of seeding-induced changes in July-August rainfall on crop yield. Frequency distributions were developed to define expected gains or losses from seeding under assumed seeding operations lasting 1, 2, 3, and 5 yrs. In most of the regions, corn and soybean crops would be benefited in the growing seasons through a cloud seeding program. Reaction to the potential seeding varied substantially between regions with the same seeding model because of differences in soil properties and climatic variations. Furthermore seeding effectiveness may vary considerably from year to year with the same model in the same region due to the temporal variability in daily rainfall distribution characteristics. (Woodard-USGS)
W72-13053

HYGROSCOPIC SEEDING IN OKLAHOMA: VOLUMES I AND II,
Flight Test Research, Inc., Long Beach, Calif.
P. B. MacCready, Jr.
Available from NTIS, Springfield, Va 22151 - Vol 1, PB-205 361; Vol 2, PB-205 362. Price $3.00 each, paper copy; 95 cents microfiche. Final Contract Report to U S Bureau of Reclamation, 2 Vol, October 31, 1971. Vol 1 - 40 p, 10 fig, 1 tab, 9 ref; Vol 2 - 30 p, 1 fig, 1 tab. USBR Contract 14-06-D-7190.

Descriptors: *Cloud seeding, *Artificial precipitation, *Oklahoma, Droughts, Aircraft, Clouds, Nitrogen compounds, Rainfall intensity, Rain gages, Data collections, Precipitation (Atmospheric).
Identifiers: Hygroscopic materials.

In July 1971, because of apparent drought in southwest Oklahoma, a rainfall augmentation program was organized under the direction of the Division of Atmospheric Water Resources Management of the Bureau of Reclamation with funding provided by the Federal Office of Emergency Preparedness. Seeding flights were accomplished on 10 days during the period from mid-August to early October, with a record wet September for Oklahoma. The program is described and many of the concepts and factors behind hygroscopic seeding are examined. Field notes and daily plots of flights made during the rainfall augmentation program are included. (Woodard-USGS)
W72-13065

SOME ASPECTS OF THE LEAF TEMPERATURES OF SOME PLANTS OF THE XEROPHYTIC REGION OF SANTA MARTA (COLOMBIA),
Universidad Nacional de Columbia, Bogota. Dept. of Biology.
R. Schnetter.
Mitt Inst Colombo-Aleman Invest Cien Punta De Betin. 5. p 31-36, 1971, Illus, English summary.
Identifiers: *Plant physiology, Leaves, Boerhavia erecta D, Calotropis procera, Climate, Colombia, Heliotropium angiospermum-D, Ipomoea, Carnea D, Pereskia colombiana D, Plants, Prosopis juliflora D, Santa Marta (Colombia), *Temperature, Tribulus cistoides.

Leaf temperatures of several plant species (Boerhavia erecta, Heliotropium angiospermum, Tribulus cistoides, Calotropis procera, Ipomoea carnea, Pereskia colombiana and Prosopis juliflora) of the xerophytic vegetation near Santa Marta (Colombia) were studied during the dry and the wet season. The leaves of species growing in a cactus thorn scrub reached very high temperatures, especially in the dry season, while leaf temperatures of plants in the area of a semi-deciduous seasonal forest were lower because of more favorable conditions of water supply and microclimate.--Copyright 1972, Biological Abstracts, Inc.
W72-13403

3C. Use of Water of Impaired Quality

DETERMINATION OF CHANGES IN SOIL BULK DENSITY IN A RICE FIELD FOR ESTIMATION OF THE DESALINATION EFFECTS OF FLOODING (UCHET IZMENENIY OB'YEMNOGO VESA POCHVY RISOVOGO POLYA DLYA OTSENKI RASSOLYAYUSHCHEGO DEYSTVIYA ZATOPLENIYA),
Dagestanskii Nauchno-Issledovatelskii Institut Selskogo Khozyaistva, Makhachkala (USSR).
For primary bibliographic entry see Field 02G.
W72-13280

DYNAMICS OF WATER-SOLUBLE SALTS UNDER ALFALFA IN A RICE CROP ROTATION (DINAMIKA VODNORASTVORIMYKH SOLEY POD LYUTSERNOY V RISOVOM SEVOOBOROTE),
N. F. Reshetnyak.
Pochvovedeniye, No 12, p 100-106, December 1971. 3 tab, 5 ref.

Descriptors: *Water chemistry, *Salinity, *Salts, *Alfalfa, *Land management, Rotations, Agronomic crops, Rice, Plant growth, Root systems, Soil profiles, Soil types, Chestnut soils, Groundwater, Water table, Excess water (Soils), Sulfates, Chlorides, Bicarbonates, Mapping.
Identifiers: *USSR, *Ukraine, *Solonetzes, *Meadow soils, Soil samples, Magnesium sulfate, Mineralization.

The relation of groundwater depth to salt content of residually solonetzic Meadow-Chestnut medium loam soils on rice fields in the southern Ukraine is examined. Very rapid secondary salinization of the plowed horizon under alfalfa occurs when mineralized groundwater rises substantially above the critical level. The maximum amount of water-soluble salts is found in the lower part of the soils' illuvial horizon and directly below. Sodium, magnesium, and calcium sulfates and bicarbonates predominate, while the content of chlorides is insignificant. In the nature and extent of its root system, alfalfa is unable to prevent salinization under high water-table conditions. Excess wetting and salt accumulation in the plowed horizon impair alfalfa growth, reducing its potentialities by 20%-25%. (Josefson-USGS)
W72-13284

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM-BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 02G.
W72-13285

AMELIORATION OF SALINE SOILS IN THE FLOODPLAIN AND DELTA OF THE VOLGA RIVER,
A. V. Berdnikova.
Uch Zap Astrakh Gos Pedagog Inst. 16: p 83-102. 1969.
Identifiers: *Saline soils, *Soil treatment, Amelioration, Drainage, Flooding, Paddy M, Volga River, Soils, Trigonella D, USSR.

Successful development of soils in the Volga delta for paddy fields can only be achieved by desalination and drainage. Good tillage practices and the sowing of Trigonella are also recommended.--Copyright 1972, Biological Abstracts, Inc.
W72-13374

CHANGES IN INTRARUMINAL FUNCTION OF SHEEP WHEN DRINKING SALINE WATER,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Nutritional Biochemistry.
B. J. Potter, D. J. Walker, and W. W. Forrest.
Br J Nutr. Vol 27, No 1, p 75-83. 1972.
Identifiers: *Animal physiology, Flora, Rumen, *Saline water, *Sheep.

A study was made of the changes in electrolyte concentrations and ruminal function which resulted from the provision of 1.3% sodium chloride (NaCl) solutions instead of freshwater to sheep consuming roughage rations in chaffed and in ground pelleted forms. Significantly higher osmotic pressures were observed in the rumen fluid of the sheep drinking saline water, the change being especially marked when the ration was ground and pelleted. Of the individual electrolytes measured, Cl showed a larger rise in concentration than did Na plus K and it appeared that the Na and Cl ions in the ingested saline water were differentially removed from the rumen. Provision of 1.3% NaCl solution in place of freshwater resulted in greater voluntary intakes of fluid and consequently in greater flows of fluid through the rumen. Based upon measurements of DNA and polysaccharide, there appeared to be a tendency for the total microbial populations in the rumens of sheep drinking 1.3% NaCl solution to be smaller than for the sheep drinking freshwater. The total metabolic activity of the rumen flora, measured calorimetrically, was not appreciably changed when saline water was drunk and the chaffed ration eaten, but was significantly reduced when the ration was ground and pelleted. Adaptation of the rumen microflora to high concentrations of NaCl was demonstrated in animals accustomed to drinking 1.3% NaCl solution.--Copyright 1972, Biological Abstracts, Inc.
W72-13429

3D. Conservation in Domestic and Municipal Use

AN ALGORITHM FOR OBTAINING OPTIMAL LOOPED PIPE DISTRIBUTION NETWORKS,
Parsons, Brinckerhoff, Quade and Douglas, New York. Water Resources Systems Group.
For primary bibliographic entry see Field 08A.
W72-13042

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS OF THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington. Water Quality Control Div.
For primary bibliographic entry see Field 05G.
W72-13049

CONSUMER WILLINGNESS TO PAY FOR POLLUTION ABATEMENT,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05G.
W72-13085

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS, 1966-69,
Geological Survey, Austin, Tex.
R. K. Gabrysch.
Texas Water Development Board Report 152, June 1972. 24 p, 18 fig, 3 tab.

Descriptors: *Groundwater resources, *Water wells, *Water supply, *Hydrogeology, *Texas, Aquifer characteristics, Pumping, Withdrawal, Water yield, Water quality, Salinity, Water level fluctuations, Drawdown, Hydrologic data, Water utilization.
Identifiers: *Houston (Tex).

Total withdrawals of groundwater in the Houston, Texas, district increased from about 412 mgd in 1966 to 507 mgd in 1969. Almost all of the increase occurred in the Daty, Pasadena, and Houston areas. Pumpage in the Nasa area has become significant in the past few years, increasing from 5.3 mgd in 1966 to 11.2 mgd in 1969. Small increases occurred in the Baytown-La Porte and Texas City areas, but pumpage remained almost constant in the Alta Loma area. Water-level declines continued, generally, at a greater rate than before 1966. The greatest declines in the past several years were in the Houston area, but the center of decline is still in the Pasadena area. Although saltwater encroachment is probable in the district, no large increases in chloride were measured at the monitoring points. (Woodard-USGS)
W72-13264

AN ANALYSIS OF THE DEMANDS FOR WATER FROM THE PRIVATE SECTOR IN A SUB-ARCTIC URBAN AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 06C.
W72-13298

THE INTERGRATION OF MULTIPLE OBJECTIVES IN URBANIZING WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 06B.
W72-13303

WASTE WATER RECLAMATION SYSTEM,
G. Kesselman.
U. S. Patent No. 3,550,778, 3 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 1902, December 29, 1970.

Descriptors: *Patents, Reclamation, Water quality, Impaired water use, *Reclaimed water, *Water reuse, Recirculated water, Water treatment.
Identifiers: *Car wash installations.

The reclamation system for car wash installations comprises a catch basin for receiving waste water and a device for conducting the waste water to a lint trap. After lint removal the water is passed through a sand filter tank, a flow meter and a pair of activated charcoal filter tanks before it enters a clearwell for collecting reusable water. (Sinha-OEIS)
W72-13530

WORLD AND WATER IMPERATIVES: WORLD CITY OF THE FUTURE,
Doxiadis Associates, Athens (Greece).
For primary bibliographic entry see Field 05G.
W72-13549

WATER-CAPACITY PLANNING FOR METROPOLITAN AREAS - THE CASE OF MONROE COUNTY, N.Y.,
Rochester Univ., N.Y. Center for Naval Analyses.
C. H. Piersall, Jr., and S. F. Platt.
Journal of the American Water Works Association, Vol. 63, No. 2, p 89-94, February 1971. 2 fig, 3 tab, 6 ref.

Descriptors: *City planning, *Water supply, *Water pollution, Long-term planning, Benefits, Pricing, Consolidation, *New York.
Identifiers: *Monroe County (N.Y.), *Monroe County Water Authority (MCWA), Policy making.

The case of Monroe County, New York is used to make specific proposals about problems of water supply and water pollution. The long-range water facilities construction plans of the City of Rochester and the Monroe County Water Authority (MCWA) are examined for possible net benefits from the establishment of various levels of system consolidation. After examining pricing policies the following conclusions were made: (1) the use of a 25% summer price rate differential would result in a net benefit to the region through reduced construction requirements; (2) the current methods of block pricing and the granting of quantity discounts to large users are out of line with the production and distribution costs, and a rate system that provides a fixed charge for connecting to the water system and a separate rate for usage is recommended; (3) the econometric model established that the important variables are the maximum daily flow of water, the average daily flow per zone, and the percentage of population served within the pressure zone boundaries. The adoption of the recommendations described on system consolidation and on peak seasonal pricing differential will yield net benefits to the region of $28,064,000 in 1970 dollars, which represents an amount equal to approximately two year total operating costs for both the Rochester City Water Bureau and the MCWA. Since the demand for each of the total independent water districts is incorporated in the consolidation demand, further saving will accrue when these districts are absorbed. (Strachan-Chicago)
W72-13550

CRISIS IN MUNICIPAL WATER SUPPLIES,
Taylor and Smith, San Bernardino, Calif.
E. F. Taylor.
Journal of the American Water Works Association, Vol. 63, No. 5, p 269-280, May 1971. 5 photo, 103 ref.

Descriptors: *Municipal water, *Water supply, *Water quality control, Maintenance, Financing, Law enforcement, State governments, Local governments, Planning, Legislation.
Identifiers: *Water quality improvement, Operating perogatives.

Improvement in water quality depends upon money and enforcement of laws. State laws relating to water pollution, the appropriation of water resources, and the operating perogatives of municipal water works are discussed. At least 35 states have adopted far-reaching water pollution control legislation. These state laws generally establish boards, organized on a regional basis, and charge them with developing comprehensive programs to eliminate pollution, determine permissible limits of discharges, abate pollution, and regulate any new or increased discharges under control permits. This system has failed in many instances. Specific state laws are reviewed. Cities, counties, and districts have undertaken the bulk of construction, operation, and maintenance of water quality facilities. A series of court decisions on water quality are discussed. Fixing rates, conditions for service, water contracts and conveyances, and water stock questions are examined in relation to the municipal role in maintaining water quality. (Strachan-Chicago)
W72-13553

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Department of Housing and Urban Development, Washington, D.C. Community Resources Development Administration.
For primary bibliographic entry see Field 06E.
W72-13555

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Farmers Home Administration, Washington, D.C. Community Services Div.
For primary bibliographic entry see Field 06E.
W72-13556

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Economic Development Administration, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-13557

POPULATION GROWTH AND NONINDUSTRIAL WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-13558

COSTS AND QUALITY OF WATER IN OHIO CITIES,
Ohio State Univ., Columbus; Ohio Agricultural Research and Development Center, Columbus; and Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 05G.
W72-13561

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (THE TRINITY RIVER BASIN, TEXAS),
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 04A.
W72-13609

3E. Conservation in Industry

EXTERNALITIES AND THE RACE FOR ECONOMIC GROWTH IN THE USSR: WILL THE ENVIRONMENT EVER WIN,
Wellesley Coll., Mass.
For primary bibliographic entry see Field 05G.
W72-13088

THE ECONOMICS OF GEOTHERMAL POWER,
For primary bibliographic entry see Field 06C.
W72-13092

ENVIRONMENTAL REPERCUSSIONS AND TRADE THEORY,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05G.
W72-13093

SALT WATER IS A MINERAL: OWNERSHIP OF A NATURAL RESOURCE OF INCREASING IMPORTANCE IN OIL PRODUCING STATES,
L. Hudson.
Texas Law Review, Vol 50, p 448-461, 1972. 62 ref.

Descriptors: *Texas, *Saline water, *Subsurface waters, *Mineralogy, Mining, Drilling, Oil industry, Saline water systems, Subsurface flow, Legal aspects, State governments, Legal review, Water law, Domestic water.
Identifiers: *Surface estate, *Mineral estate, Mineral rights.

History, legal precedent, and policy are analyzed to show why salt water should be considered as a mineral subject to ownership as such. The problems in defining salt and domestic water are analyzed. A legal distinction between surface and subsurface water is legally more significant. The historical interrelation of salt water and petroleum is traced to show that the two occur together and that in Eastern states the salt lease was the forerunner of the oil and gas lease. The construction of the phrase 'oil, gas, and other minerals' is discussed as cases have defined it. It is concluded that salt water is included in the term 'other minerals', and that the following results arise if salt water is regarded as a mineral: the confusion in cases holding that water belongs to the surface estate would be eliminated since cases holding salt water belongs to the mineral estate would be explainable; it would become readily apparent that the surface estate and not the mineral estate should lease domestic water; royalty provisions for sale of salt water would become enforceable; making salt water a mineral subjects it to the states' duty to conserve natural resources; salt water production could be taxed; and the state of Texas will be declared owner of salt water under much land. (Grant-Florida)
W72-13225

WATER FOR INDUSTRIAL DEVELOPMENT IN KEMPER, LEAKE, NESHOBA, NOXUBEE, AND WINSTON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
R. E. Taylor, and F. H. Thomson.
Mississippi Research and Development Center Report, 1972. 63 p, 31 fig, 12 tab, 33 ref.

Descriptors: *Water resources development, *Industrial water, *Groundwater, *Surface waters, *Mississippi, Water quality, Water supply, Water utilization, Aquifer characteristics, Water yield, Pumping, Drawdown, Streamflow, Flow rates, Flow characteristics, Flood data, Hydrologic data, Data collections, Water level fluctuations, Sediment transport.
Identifiers: *Kemper County (Miss), *Leake County (Miss), *Neshoba County (Miss), Noxubee County (Miss), *Winston County (Miss).

Large quantities of water are available for industrial and other uses in Kemper, Leake, Neshoba, Noxubee, and Winston Counties in east-central Mississippi. About 7.3 million gallons per day of groundwater, a fraction of the potential yield, is presently withdrawn for industrial, municipal, and rural use. No surface-water supplies have been developed. The chemical quality of surface water is adequate to meet most industrial requirements; however, high summertime water temperatures may preclude some uses. Large quantities of water are available from Cretaceous and Tertiary aquifers. The base of fresh water ranges from about 200 feet above sea level to about 2,700 feet below sea level. Efficient wells could produce more than 2,500 gallons per minute. Regional water-level decline in the aquifers averages about half a foot per year. Groundwater of good quality is available throughout the area except in southeastern Kemper County. Water from the Cretaceous aquifers is alkaline, high in dissolved solids, and low in iron content. Tertiary aquifers contain soft acidic water, low in dissolved-solids content, and high in iron. (Woodard-USGS)
W72-13278

SAVE WATER: AIR CONDENSE STEAM,
Lummus Co., Bloomfield, N. J.
For primary bibliographic entry see Field 05G.
W72-13311

COOLING TOWER SITE CONSIDERATIONS,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-13314

THE CRISIS IN POWER-PLANT SITING,
Oak Ridge National Lab. Tenn.
For primary bibliographic entry see Field 05B.
W72-13321

NUCLEAR POWER PLANTS: FEWER AND FARTHER BETWEEN.
For primary bibliographic entry see Field 05B.
W72-13324

MANAGING THE POWER SUPPLY AND THE ENVIRONMENT.
For primary bibliographic entry see Field 06G.
W72-13332

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.
For primary bibliographic entry see Field 05B.
W72-13355

WASTEWATER UTILIZATION IN THE POTATO PROCESSING INDUSTRY,
Washington State Univ., Pullman. Coll. of Engineering Research Div.; and Washington State Univ., Pullman. Radioisotopes and Radiations Lab.
For primary bibliographic entry see Field 05D.
W72-13505

INDUSTRIAL WATER FORECASTS,
Hazen and Sawyer, New York.
R. H. Stewart, and I. Metzger.
Journal of the American Water Works Association, Vol. 63, No. 3, p 155-157, April 1971. 1 tab, 6 ref.

Descriptors: *Industrial water, *Forecasting, *Water resources development, Projections, Planning, Equations, Costs.

The planning of water resource developments has focused attention on the need for accurate forecasting of industrial water demands. These studies have demonstrated the differences between projection methods commonly used for the development of public water utilities and procedures appropriate for projecting industrial use. 90% of the total industrial water demands are self-supplied from private systems at relatively low cost. A forecasting method for industrial water considers factors related to industrial process water utilization in addition to measurements of production. It is considered to give more reasonable forecasts than are obtained when recirculation and technological change are neglected. The basic data required for the proposed equation can be obtained or easily developed for the employment, output, and recirculation terms. Additional research is required to establish the most probable values of the technological change term. The expected magnitude of US industrial water needs in the future indicates that substantial efforts spent to develop technology to reduce unit process-water use will benefit both industry and the general public. (Strachan-Chicago)
W72-13551

SIMULATION MODEL FOR THE ECONOMIC EVALUATION OF PUMPED-STORAGE,
Electricite de France. Paris.
For primary bibliographic entry see Field 04A.
W72-13566

ECONOMICS OF PUMPED STORAGE IN NEW ENGLAND,
Alexander Kusko, Inc., Needham Heights, Mass.; and Massachusetts Ins. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 04A.
W72-13567

ECONOMIC ANALYSIS OF SWISS PUMPED STORAGE SCHEMES FOR VARIOUS PARAMETERS OF OPERATION AND ENERGY COSTS,
Maggia, Locarno (Switzerland).
For primary bibliographic entry see Field 04A.
W72-13568

3F. Conservation in Agriculture

EFFECTS OF NONIONIC SURFACTANTS ON MONOCOTS,
California Univ., Riverside. Dept. of Plant Pathology; and California Univ., Riverside. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 05C.
W72-13050

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICULTURE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 03B.
W72-13053

FINANCING IRRIGATION,
T. Milligan.
Irrigation Age, Vol 6, No 9, p 10-14, 47, 55, April 1972.

Descriptors: *Irrigation, *Irrigation programs, *Financing, Financial feasibility, Loans, Cost-benefit analysis, Water supply, Taxes, Agriculture, *Nebraska.

Nebraska has established the goal of doubling the irrigated acreage in the state by 1980. Studies have indicated that Nebraska has enough water to irrigate four times the number of acres now under irrigation. Furthermore, the state has some 19.2 million acres of land suitable for irrigation, with slightly more than 4 million acres currently being irrigated. Thus, the only major constraint facing Nebraska is a financial one; that is, the expansion will be very costly. However, a recent workshop on financing arrived at the consensus that there will be adequate money for financing private

development as long as sound propositions are presented to the lender by the landowner or tenant. Some of the factors which determine the financial soundness of an irrigation project are (1) the dependability of water supply over an extended period of time, (2) the cost of the system, including initial investment, maintenance, and operating expenses, and (3) the magnitude of the benefit-cost ratio. Tax exempt type financing may not be readily available in many areas because of the urban congressman's reluctance to help boost farm production when expanded output may not be needed. (Settle-Wisconsin)
W72-13090

COMPUTER SIMULATION ANALYSIS ON RECLAMATION OF SALT-AFFECTED SOILS IN SAN JOAQUIN VALLEY, CALIFORNIA,
California Univ., Davis.
K. K. Tanji.
Soil Science Society of America Proceedings, Vol 36, No 1, p 127-133, Jan-Feb 1972. 9 fig, 3 tab, 34 ref.

Descriptors: *Saline soils, *Leaching, *Computer models, *Simulation, Sodium, Gypsum, Boron, Land reclamation, Percolation, Field data, California, Bibliographies, Analysis, Drainage effects, Drainage.
Identifiers: *Salt removal, San Joaquin Valley (Calif.), Soluble salts.

A computer land reclamation model was applied to a field leaching study of moderately salt-affected profiles. Leaching was accomplished by ponding 15 cm of water intermittently in 3-m by 3-m basins every 1 to 2 weeks. Computer predictions on the degree of reclamation were compared with measured changes in soluble salts, soluble boron, and the sodium adsorption ratio to soil depths of 274 cm. The differences between computed and measured field data were no more than the horizontal variations found in salt-affected lands in this area and elsewhere. Predicted drainage water quality and a method for computing gypsum requirements of sodium-affected profiles are reported. Computer programming techniques provide a better understanding of the complex salt problem in irrigated lands. (USBR)
W72-13115

SOME STRUCTURAL FEATURES OF WATER IN PLANT TISSUES BASED ON INFRARED SPECTROSCOPY DATA,
Kazan State Univ. (USSR).
N. V. Sedykh.
Dokl Akad Nauk SSSR Ser Biol. Vol 198, No 4, p 951-953. 1971. Illus.
Identifiers: *Plant tissues, *Assimilation, Bean D, Hydrogen bonding, Onion M, Plants, *Infrared spectroscopy.

A detailed analysis of numerous IR absorption spectra of onion and bean tissues showed the presence of a number of special features in the balance absorption bands of tissue water in comparison with water in vitro. The results of calculating the values of the half-widths of the lines, peaks of the stretching vibrations, first overtone of deformation vibrations, and energies of the H bonds in tissue water are presented. It is concluded that water with a higher degree of structural organization should be assimilated by an organism more quickly and better than water whose structure is less ordered.--Copyright 1972, Biological Abstracts, Inc.
W72-13116

THE EFFICIENCY OF PRODUCTION OF FLOWER CULTURES BY OPEN HYDROPONICS,
N. G. Sarukhanyan, and A. K. Vartanyan.
Biol Zh Arm. Vol 24, No 3, p 30-41. 1971.
Identifiers: *Hydroponics, *Crop production, *Asparagus M, Aster D, Cultures, Dianthus caryophyllus D, Flowers, Gladiolus hybridus M, Growth, Hyacinth M, Open, Production, Reproduction, Tulip M.

Cultures of gladiolus, goldcrest, aster, common asparagus, tulip, and hyacinth were grown by open hydroponics on gravel, volcanic slag and a mixture (3:2) in a standard nutrient medium. Asparagus plants grew better under these conditions than control plants in soil. Dianthus caryophyllus Schabaut (goldcrest) also showed better growth, the number of blossoms being higher by 88%. Gladiolus hybridus had similar growth characteristics in both cases; the plants grown by hydroponics, however, were bigger. Hydroponic corms or control corms in hydroponic medium showed a higher germination rate. The reproduction period was shortened by 1-2 yr, the production of high-quality corms being preserved.--Copyright 1972, Biological Abstracts, Inc.
W72-13122

IRRIGATION OF GRAIN SORGHUM AND WINTER WHEAT IN ALTERNATING DOUBLE--BED STRIPS,
Agricultural Research Service, Bushland, Tex.
J. T. Musick, and D. A. Dusek.
Journal of Soil and Water Conservation, Vol 27, No 1, p 17-20, Jan-Feb 1972. 2 fig, 3 tab, 8 ref.

Descriptors: *Irrigation practices, *Strip cropping, *Water conservation, Irrigation, Sorghum, Wheat, Root development, Cropping patterns, Soil moisture, Crop yield, Crop production, Agriculture, Texas.
Identifiers: Water application rate.

Because of a limited ground-water supply, irrigation water and rainfall must be used most efficiently in the Texas Panhandle where a study was made over 3 crop years to determine crop yields. Growing grain sorghum and winter wheat in alternate 80-in. field strips increased grain yields about 15% with adequate irrigation. Good yields obtained with reduced water levels indicated that alternating a winter and summer crop in narrow strips can result in efficient use of water under limited irrigation. Lateral plant rooting developed completely across adjacent strips during the nongrowing period of the adjacent crop, which increased the amount of stored soil water available for plant use. (USBR)
W72-13123

POTENTIAL FOR CONTROLLING QUALITY OF IRRIGATION RETURN FLOWS,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05G.
W72-13179

FLUCTUATIONS IN THE CO2 COMPENSATION POINT IN COTTON PLANTS UNDER THE EFFECT OF OSMOTIC TREATMENTS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
Anh Thu Nguyen Duc, and Da Silva Jorge Vieira.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). Vol 273, No 15, p 1291-1294, 1971, Illus.
Identifiers: *Plant physiology, *Carbon dioxide, Moisture stress, Compensation, *Cotton D, Fluctuations, Osmotic treatment, Oxygen, Plants, Respiration.

The equilibrium between CO2 emission and its absorption in cotton which is practically constant under favorable water conditions, varies in time for water deficiencies induced by osmotic treatments. Emission prevails over assimilation: the greater the water deficiency or the longer the time of treatment, the greater this prevalence. Under the effect of osmotic treatment, photorespiration decreases and even becomes abolished in spite of an increase in CO2 emission in an atmosphere without O2.--Copyright 1972, Biological Abstracts, Inc.
W72-13245

TIME-INTEGRATED THERMAL EFFECTS OF FOREST IRRIGATION,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 05D.
W72-13247

EROSION OF SOME BULGARIAN SOILS BY IRRIGATION (IRRIGATSIONNAYA EROZIYA PRI SAMOTECHNOM OROSHENII NEKOTORYKH POCHV BOLGARII),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
For primary bibliographic entry see Field 02J.
W72-13283

WATER INTAKE RATES ON A SILT LOAM SOIL WITH VARIOUS MANURE APPLICATIONS,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
O. E. Cross, and P. E. Fischbach.
Paper No 72-218 presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972. 13 p, 9 fig, 4 ref. OWRR B-012-NEB (1).

Descriptors: *Irrigation practices, *Infiltration rates, Irrigation efficiency, *Fertilization, *Farm wastes, *Silts, *Loam, Soil types.

The application of manure to cultivated and irrigated soils changes the intake rate of irrigation water when compared to the intake-rate of nonmanured soils. Findings of a two-year study of irrigation on manured soils are presented. The initial water intake rate increased as the quantity of manure application increased. The basic water intake rate increased as more time from date of manure application had elapsed. Manure application decreased the basic intake rate as compared to the basic intake rate of non-manured silt loam soil. Depth of plowing did not appreciably affect the basic intake rate. The intake rates are a necessary guideline for the irrigator.
W72-13295

WATER TABLE CONTROL AND SUBSURFACE IRRIGATION IN MINERAL AND HIGH ORGANIC COASTAL PLAIN SOILS,
North Carolina Water Resources Research Inst., Raleigh.
R. Skaggs, and G. J. Kriz.
Available from the National Technical Information Service as PB-211 616, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 67, May 1972, UNC-WRRI-72-67, 63 p, 22 fig, 3 tab, 7 ref. OWRR-A-033-NC (3).

Descriptors: *Irrigation design, *Subsurface irrigation, *Drainage systems, *Subsurface drainage, *Soil-water-plant relationships, Surface-groundwater relationships, *North Carolina, *Water table, *Coastal plains, *Organic soils, Loam, Sands, *Hydraulic conductivity.
Identifiers: *Mineral soils.

Field experiments were conducted at three sites in the Lower Coastal Plain of North Carolina to measure the water table response to subirrigation, drainage, rainfall infiltration, and evapotranspiration. The water table response to drain tube subirrigation and drainage was determined for three drain spacings on a Lumbee sandy loam soil. Results showed that water could be supplied to the root zone at a rate more than sufficient to satisfy

plant needs for the 7.5 and 15 m but not the 30 m drain spacings. Theoretical calculations showed that the suggested water table depth range of 60 to 90 cm could be maintained in this soil with a drain spacing of 19.2 m. An equation derived to determine the upward movement of the water table during subirrigation can be used to accurately predict the water table rise midway between the drain lines except for an ititial lag period. Four theoretical equations were used to calculate drain spacings using water table drawdown rates measured in the field experiments. When the hydraulic conductivity is determined from soil cores or other independent measurements, the order of preference of the four equations is Bouwer and van Schilfgaarde, van Schilfgaarde, Glover, and Hammad. If an effective hydraulic conductivity is determined from water table drawdown measurements, the Hammad equation gives the most accurate prediction of the drain spacing. Much greater accuracy can be obtained in all of the above equations by evaluating the drainable porosity based on the initial and final water table depths rather than using a constant value.
W72-13304

STUDY ON THE VARIETIES OF WINTER AND SPRING WHEAT,
Volgorad Agricultural Inst. (USSR).
P. A. Yakhtenfel'D.
S-Kh Biol. Vol 6, No 4, p 483-489. 1971. English summary.
Identifiers: *Crop production, *Irrigation effects, Plant diseases, Fungi, Resistance, Rust, Spring, Triticum turgidum M, Varieties, Wheat-M, Winter.

Cultivars (21) of winter and spring wheat were tried under irrigation. Watering almost doubled the yield. However, under such conditions, properties as resistance to lodging and fungal diseases become more important. In the years of good winter 'Mironovskaya Yubileinaya 50' and 'Besostaya 1' winter wheat produce the best results under irrigation with regard to yield and the quality of grain. 'Mironovskaya 808' proves susceptible to lodging and rust under such conditions. It is difficult to select varieties of soft spring wheat for irrigated plantings when they have been developed for regions of arid farming. Some variations of T. turgidum as well as 'Melanopus 26' and 'Kharkovskaya 46' hard wheats look promising for irrigated farming because they are resistant to brown leaf rust and lodging and produce large high-quality grain.--Copyright 1972, Biological Abstracts, Inc.
W72-13348

REGULARITIES OF WATER EXCHANGE IN CORN UNDER OPTIMAL GROWING CONDITIONS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Kukuruzy, Dnepropetrovsk (USSR).
M. Y. Tregubenko, G. L. Filippov, and N. V. Vishnevskii.
S-Kh Biol. Vol 6, No 4, p 490-495. 1971. Illus. English summary.
Identifiers: *Crop production, *Plant physiology, *Irrigation effects, Corn M, Irrigation, Minerals, Nutrition, Respiration, Transpiration.

The water availability and the mineral nutrition of corn affect water properties of leaves, respiration and transpiration. There is more useful water in irrigated plants, and their respiration and transpiration are more intensive. Changes in the water regime of irrigated plants depend not only on the level of metabolism but also on the water regime of the soil. The intensity of respiration and transpiration are directly affected by the activity of water in leaves.--Copyright 1972, Biological Abstracts, Inc.
W72-13362

RESPONSE OF 'TAICHUNG NATIVE 1' RICE TO WATER-MANAGEMENT PRACTICES AND NITROGEN FERTILIZATION IN DRY SEASON,
Irrigation Research Centre, Sambalpur (India).
D. Lenka.
Indian J Agric Sci. Vol 41, No 2, p 166-172. 1971.
Identifiers: *Crop production, *Water conservation, Water management (Applied), Dry, Fertilization, India, Nitrogen, Rice M, Taichung Native 1.

At Bhubaneswar, 'Taichung Native 1' responded linearly up to 160 kg N/ha in the dry season. Continuous saturation of the field is as good as continuous submergence and is also most efficient. It is possible to economize water use and to increase crop yield by suitable water-management practices and fertilization. Alternate wetting and drying and high levels of N fertilization are conducive to higher yields. Deep percolation losses account for 29% of total water required in the field.--Copyright 1972, Biological Abstracts, Inc.
W72-13363

OBSERVATIONS AND GENERAL CONSIDERATIONS ON RICE GROWING IN THAILAND,
Ministry of Agriculture, Bangkok (Thailand). Rice Dept.
Tisuke Takahashi, Chob Kanareugsa, Prachern Kanchanomai, and Pratieb Krasaesindhu.
Thai J Agric Sci. Vol 4, No 2, p 105-136. 1971.
Identifiers: *Crop production, *Rice M, Thailand, Time, Transplanting.

The different dates of transplanting showed a profound influence on the plant height, maturity period and yield. Aug. or Sept. transplanting, depending on the cultivar, gave higher yields than other transplanting times, and showed a reduction in the growing period, the height of the plant and the straw/grain ratio. Split application of N was always better than basal application, and there was no significant difference between the 2 and 3-application treatments. Transplanting time affects the yield significantly in 3 locations. At Bang Khen and Rangsit, Sept. transplanting proved to be the best time. But at Chai Nat, Aug, proved to be the best time for transplanting. This was only the exception out of 9 experiments to the conclusion that the growing duration of about 5 mo. in the monsoon season is optimum for the yield. The effect of spacing on the yield is significant, but the trend varies according to location. At Bang Khen and Rangsit 20 x 20 cm spacing is better, while in the rich soils of Chai Nat there was no definite trend in favor of a particular spacing. Cultivar difference is highly significant at Chai Nat where the yield is the highest; significant at Bang Khen where the yield is moderate, and not significant at Rangsit where the yield is lowest. 'Puang Nakh 16' also responds better to top dressing and produces bigger panicles than 'Leuang Pratew.' Yields of 12 varieties were greatly dependent on the sowing time. When sown from Jan. to May, the plants did not flower and yielded no grain. Earlier sowing yielded less, the yield became increasingly higher through June, July, Aug., Sept. and Oct. when the majority of varieties attained a peak, after which the yield fell. Three seedlings per hill proved to be the best. However, more seedlings may prove better if planting time is delayed or if the varieties used produce a fewer number of tillers. A demonstration experiment was conducted in which all of the best known cultural factors were combined. The yield obtained (6256 kg clean paddy/ha at 13% moisture) is remarkable for a rainy season crop.--Copyright 1972, Biological Abstracts, Inc.
W72-13364

COMPILATION TECHNIQUES FOR MEDIUM--SCALE CADASTRAL MAPS ON HILLY TERRAIN,
For primary bibliographic entry see Field 07C.
W72-13371

SOILS IN THE FLOODPLAIN OF THE AMUR RIVER WITHIN THE UDYL-KIZINSKAYA LOWLAND,
For primary bibliographic entry see Field 02G.
W72-13372

CONTROLLING PRACTICES FOR WATER REGIME OF SANDY SOILS,
A. A. Kolosova.
Tr Novozybkovsk S-Kh Opytn Stn Vses Nauchno-Issled Inst Udobr Agropochvoved. 3. p 340-349. 1969.
Identifiers: *Crop production, *Water conservation, Soil treatment, Mulching, Irrigation, Moisture content, Oats M, Soils.

The effect of water-retaining intercalations on the moisture content of sandy soils and on the yields of some crops is presented. Yields of oats were favorably affected by irrigation, various mulching films, and water-retaining intercalations; in the variant with a cellophane intercalation (at a depth of 50 cm) the grain yield was about twice that on the control plot on which the soil was loosened to a depth of 50 cm, and 2.5 times higher than after autumn plowing.--Copyright 1972, Biological Abstracts, Inc.
W72-13375

RESEARCH ON THE EFFECT OF SOIL AND WATER CONSERVATION BY STRAW MULCH ON THE SLOPE FIELDS, (IN KOREAN),
Institute of Agricultural Engineering Utilities, Suwon (Korea).
S. K. Han, W. D. Han, and Y. W. An.
Res Rep Off Rural Dev (Korea) (Agri-Engine-Seric). 13: p 1-80. 1970. Illus. English summary.
Identifiers: *Mulching, *Crop production, Soil conservation, Water conservation, Barley M, Crops, Runoff, Slopes, Soils, Soybean D, Straw, Sweet potato D, Temperature, Wheat M.

One third to one half of the annual rainfall occurs in June and July during the harvest of barley or wheat; thus, the land is bare for several weeks before and after planting soybean or sweat potato. To prevent run-off, soil erosion and evaporation, and to insure favorable soil moisture, temperature and crop yield, straw mulch was applied to land with 5 degree, 10 degree, and 15 degree slopes.--Copyright 1972, Biological Abstracts, Inc.
W72-13376

CERTAIN PROPERTIES OF SANDY AND SANDY LOAMY SOILS IN THE MESHCHERA LOWLAND ON BINARY DEPOSITS AND THEIR AGRICULTURAL VALUE,
N. F. Ganzhara, and V. A. Devyatykh.
Dokl Mosk S-Kh Akad Im K A Timiryazev. 154. p 101-104. 1969.
Identifiers: *Soil treatment, *Crop production, Agriculture, Compost, Crops, Deficiency, Deposits, Excess, Fertilizers, Meshchera, Minerals, Moisture, Soils, USSR, Podzols.

Sod podzolic sandy and sandy loamy soils of Meshchera on fluvioglacial sands underlain by morainic loams are subject to superficial (contact) gleying and erosion. Crops grown on these soils may suffer from an excess or deficiency of moisture, depending on the frequency and quantity of atmospheric precipitation. When cultivated, the soils require bilateral moisture regulation. The application of manure-soil composts, mineral fertilizers and liming is recommended.--Copyright 1972, Biological Abstracts, Inc.
W72-13377

PHYSIOLOGICAL RESPONSES OF SORGHUM AND MAIZE LEAVES TO DROUGHT: IV. RESISTANCE OF LEAF TISSUES TO DEHYDRA-

TION BY DETERMINING SUBLETHAL WATER DEFICIENCIES,
Consejo Superior de Investigaciones Cientificas, Madrid (Spain). Instituto de Edafologia y Biologia Vegetal.
M. F. Sanchez-Diaz, M. Morey, and F. Gonzalez-Bernaldez.
Ad Edafol Agrobiol. Vol 29, No 3/4, p 265-276. 1970. Illus. English summary.
Identifiers: *Plant physiology, *Drought resistance, Air, Deficiencies, Dehydration, Droughts, Elongation, Flow, Leaves, Maize M, Permeability, Photosynthesis, Porometers, Resistance, Soils, Sorghum M, Tissues, Transpiration, Hydrogen ion concentration.

No significant differences of water loss (measured by weighing the posts) between the 2 species were detected. A similar result was obtained for leaf elongation as a function of soil pF. In both experiments the soil was fully permeated by the roots and it seems that water movement through the soil was the controlling factor. Under field conditions, with much more extensive root development, differences between the 2 spp. may occur. The determination of an average pF for the whole root system is very difficult. For a pF = 3.15 the transpiration of the stressed plants was only 50% of the controls. Leaf elongation shows a similar response, becoming 50% of the control for a pF from 2.8 to 3.0. In experiments with air flow porometers and varying soil pF, significant differences between the 2 spp. were found. Maize leaf permeability begins to decrease for pF values lower than for sorghum (pF from 2.8 to 3.2 for maize and 3.6 for sorghum). On the other hand, a sudden increase in permeability of maize leaves occurs at the end of the drought period. These results are supported by the trend of the water losses from cut leaves as a function of leaf water deficits. Sorghum loses much more water than maize. Under comparable conditions, normal watered sorghum leaves transpire from 2-3 times more than maize leaves. The water loss regulation mechanisms begin to operate in maize for stress levels lower than in sorghum. It seems that the adjustment of the transpiration decrease mechanisms to water supply and transport capacity have an adaptative significance. Sorghum plants may 'risk' higher internal water deficits than maize, but have a more continuous photosynthesis. Sublethal water deficits and tissue resistance to desiccation seem to be very similar in both species, indicating that the differences between them are not of the 'protoplasmic' type. Morphological data seem to indicate that the different soil exploration of the 2 plants caused their different behavior under drought conditions. However, this factor is reflected in the differences in leaf response, which show a coupling to the water supply to which the species is adapted. These differential leaf responses are not the 'cause' of the increased drought resistance of sorghum.--Copyright 1972, Biological Abstracts, Inc.
W72-13380

TILLAGE OF SOIL FOR EROSION CONTROL AS A DROUGHT CONTROL MEASURE,
I. G. Zinchenko.
Tr Vses Nauchno-Issled Inst Zernovogo Khoz. 3, p 67-71. 1970.
Identifiers: Agriculture, *Water conservation, *Cultivation, Accumulation, Erosion control, Droughts, Erosion, Moisture, Soils, Spring, Wheat M.

Primary cultivation of fallow and underwinter fallow with flat-cutting implements (deep digger and subsurface tiller) protects the soil against wind erosion and facilitates spring moisture accumulation in soil, making for better yields of spring wheat on the southern calcareous chernozems in northern Kazakhstan.--Copyright 1972, Biological Abstracts, Inc.
W72-13382

INFILTRATION PROPERTIES OF SOILS ON THE NORTHERN SLOPE OF TRANSILI ALA--TAU AND THE EFFECT OF MAN'S ECONOMIC ACTIVITIES,
For primary bibliographic entry see Field 02G.
W72-13383

SOILS OF THE GLENAVY-WILLOWBRIDGE DISTRICT, SOUTH CANTERBURY, NEW ZEALAND, AND THEIR SUITABILITY FOR IRRIGATION,
Department of Scientific and Industrial Research, Christchurch (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 02G.
W72-13386

EFFECT OF SOIL TYPE AND IRRIGATION METHOD ON LATERAL MOVEMENT OF CYCLOATE,
Oregon State Univ., Corvallis. Dept. of Farm Crops.
For primary bibliographic entry see Field 05B.
W72-13388

NUTRITION AND BLOSSOM-END ROT OF TOMATOES AS INFLUENCED BY SOIL WATER REGIME,
Manitoba Univ., Winnipeg. Dept. of Soil Science; and Manitoba Univ., Winnipeg. Dept. of Plant Science.
C. F. Shaykewich, M. Yamaguchi, and J. D. Campbell.
Can J Plant Sci. Vol 51, No 6, p 505-511. 1971.
Identifiers: *Soil-water-plant relationships, *Soil moisture, Lycopersicon esculentum D, Nutrition, Rot, Soils, *Tomatoes D, *Moisture stress.

Two cultivars of tomatoes (Lycopersicon esculentum), 'Moreton hybrid' and 'Cardinal hybrid', were grown under greenhouse conditions on Riverdale clay and Oakville clay loam soils. The 3 water regimes used were field capacity, field capacity to 50% available water depletion, and 1/2 of the soil varying between field capacity and wilting percentage with the other half maintained at the wilting percentage. Increased soil water stress increased N and decreased P concentration in plant tissue. Concentrations of K, Na, Ca, and Mg were not significantly affected. The change in nutrient concentration increased with severity of water stress. Incidence of blossom-end rot increased with increasing soil water stress.--Copyright 1972, Biological Abstracts, Inc.
W72-13394

INTERACTIONS OF LIGHT, TEMPERATURE AND MOISTURE ON TERBUTRYN TOXICITY,
Missouri Univ., Columbia. Dept. of Plant Pathology.
For primary bibliographic entry see Field 05C.
W72-13395

INFECTION OF WHEAT SEEDLINGS BY SEPTORIA NODORUM IN RELATION TO ENVIRONMENTAL FACTORS,
Manchester Univ. (England). Dept. of Cryptogamic Botany.
S. J. I. Holmes, and J. Colhoun.
Trans Br Mycol Soc, Vol 57, No 3, p 493-500, 1971, Illus.
Identifiers: *Spores, *Environmental, Humidity, Infection, Moisture, Production, Seedlings, Septoria avenae, Septoria nodorum, Septoria secalis, Septoria tritici, Soils, Temperature, Wheat M.

A technique for the production of large quantities of spores of Septoria nodorum is described, this technique being also suitable for inducing copious sporulation of S. tritici, S. avenae and S. secalis. In glasshouse experiments very favorable conditions for infection of wheat coleoptiles by S. nodorum are provided in dry soil at a temperature of 12C. Wetter soils and temperatures of 8 or 17C permit the occurrence of less infection. Pycnidia were frequently produced on diseased coleoptiles in the glasshouse when high air humidities were provided after infection had occurred. Cultivars probably differ in their reaction to S. nodorum in the seedling stage. 'Cappelle-Desprez' was very susceptible.--Copyright 1972, Biological Abstracts, Inc.
W72-13399

CERCOSPORA LEAF SPOT EPIDEMICS ON SUGARBEETS IN THE TEXAS-NEW MEXICO HIGH PLAINS,
Texas A and M Univ., College Station. Dept. of Plant Sciences.
E. P. Van Arsdel, T. W. Jares, and Robert F. Ginn.
Plant Dis Rep, Vol 55, No 12, p 1073-1076, 1971, Illus.
Identifiers: *Fungi, *Sugar beets, *Crop production, Beta vulgaris D, *Cercospora beticola, Diurnal, Epidemics, Humidity, Moisture, New Mexico, Temperature, *Texas.

A major epidemic of Cercospora beticola on Texas-New Mexico High Plains sugarbeets (Beta vulgaris) was concurrent with a reduction in sugar content from 13 to 8% where 12% was the minimum marketable content in 1969. During 1970 Cercospora infections could be detected previsually by false color IR photography; however, this was too late to inaugurate a spray program to protect the crop with the protective fungicides currently in use. The fungus was present in sufficient quantities to start an epidemic whenever the weather was favorable. Although irrigation water could augment local dew and high humidity, the development of an epidemic was dependent upon rainfall for sufficient moisture. In the High Plains the reduction in diurnal temperature range which accompanied cloudy, rainy weather was also necessary to produce temperatures favorable for the development of an epidemic. Sugarbeet production started in 1964, and epidemics occurred in 1966 and 1969. These 2 yr were the only ones, of the last 10, which had 10 or more rainy days in Aug. and Sept. at most stations. The rainfall varied widely among 8 local weather stations, but the temperature parameters were more consistent. The reduction in the diurnal temperature range was roughly proportional to the amount of available moisture; hence, the weather favorable to Cercospora epidemics was best predicted by correlation with the least diurnal temperature range. The 1969 epidemic year had the warmest night temperatures in both Aug. and Sept. of any of the last 10 yr.--Copyright 1972, Biological Abstracts, Inc.
W72-13400

HYGIENIC EVALUATION OF THE APPLICATION CONDITIONS OF HERBICIDES IN RICE GROWING,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 05B.
W72-13408

DRAINAGE AND LEACHING OF SALINIZED SOIL ON THE GARIEP IRRIGATION SETTLEMENT,
A. Streutker.
Agrochemophysica. Vol 2, No 2, p 23-31. 1970. Illus. English summary.
Identifiers: Africa, *Cotton D, *Drainage, Irrigation, *Leaching, Pipes, Soils, *Saline soils, Tiles, Drains.

Cotton plants on the Gariep irrigation settlement were seriously affected by a high concentration of salts in the soil, the result of capillary movement from a water table within 150 cm from the surface. Underground drains were installed near the foot of the terrace wall, where these saline spots occurred. These drains were made of clay tiles, per-

forated pitch fiber pipes and perforated polyvinylchloride pipes wrapped in a filter of fiberglass. An area of 7 ha was planted to cotton and leached with irrigation water. After 12 irrigations, totalling 180 cm of water, the soluble salts were leached from the soil profile to a depth of 120 cm; the subsurface drains lowered the water table, controlled it at a depth of 150 cm or more below the surface, and were not silted. The creep strain of the drain pipes at a depth of 150-180 cm below the surface was 0%, 1% and 7% for the clay tile, the PVC-pipe and the pitch fiber pipe respectively; all these pipes can thus be recommended for drainage purposes. The fiberglass silted up seriously, but still performed satisfactorily in conducting the groundwater into the drain. For 3 seasons a uniform stand of cotton plants was obtained. To prevent a shallow water table and salinization of the soil, a large difference in height between adjacent terraces should be avoided.--Copyright 1972, Biological Abstracts, Inc.
W72-13422

THE INFLUENCE OF SOIL TEMPERATURE ON THE CHEMICAL KINETICS OF FLOODED SOILS AND THE GROWTH OF RICE,
International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 02G.
W72-13430

NON-PREPARED SOWING CULTURE OF ITALIAN RYEGRASS ON THE SEMI-ILL-DRAINED PADDY FIELD IN A SNOWY DISTRICT,
Ministry of Agriculture and Forestry, Takada (Japan). Hokuriku Agricultural Experiment Station.
T. Takeuchi, and T. Hashimoto.
Bull Hokuriku Agric Exp Sta. 11, p 83-123. 1970. English summary.
Identifiers: *Sowing culture, Drainage, *Fertilization, Germination, Grass M, Japan, Snow, Crop yield, *Ryegrass.

In the Hokuriku districts the production of fodder by cultivating the second crop on the paddy field is very important. Before planting rice, slaked lime was added to the paddy field to neutralize the soil acidity for the second crop. This resulted in increased yields of Italian ryegrass. The use of sowing germinant seed brings about high germination rates, good growth and high yield, due to increased height of grass, and increased numbers of main stems. The yield was increased for Italian ryegrass by fertilizing with excess N. For Italian ryegrass the N fertilizer is mainly added at the sowing time. If it is fertilized before the middle of Sept., comparatively heavy fertilization is possible, but if later, fertilization may be fruitless and may accelerate snow damage. If the sowing is finished by the beginning of Sept., harvesting within the same year may be possible and the plants may survive the winter even in a very snowy year. Sowing in Oct. results in snow damage and abundant weeds. Fertilization should be made before the sowing. When Italian ryegrass is mowed, much of the total available carbohydrate (TAC) is consumed for 5-10 days for regrowth. In Nov., it can restore within 2-3 wk but in Dec. the restoration requires longer. In some cases, before being completely restored, it is covered by continuous snow and markedly damaged. Mowing in fall should be ended 1 1/2 mo. before the 1st day of continuous snow cover. TAC content in stubble was higher than in leaves and the N content of leaves was higher than in stubble. The relation between TAC and total N in stubble showed a highly negative correlation, showing much TAC and less total N in the case of little snow damage, and less TAC and much total N in the case of great snow damage. TAC and dry matter ratio in stubbles showed a highly positive correlation.--Copyright 1972, Biological Abstracts, Inc.
W72-13436

ELECTRONIC MEASURING DEVICES IN AGROPHYSICAL INVESTIGATIONS (IN RUSSIAN).
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).

SB. TR. Po Agron. F12.25, 220 p. Leningrad, 1970.
Identifiers: *Electronic equipment, *Measurement, *Plant growth, *Agriculture, Instrumentation.

Results are summarized of investigations carried out by the laboratory for methods and devices for obtaining information in plant growing and agriculture, based on data relating to development of blocks and assemblies of electron measuring devices, theory of instruments and measuring systems for agrophysical investigations and system for regulation of conditions and environments.--Copyright 1972, Biological Abstracts, Inc.
W72-13486

AEROBIC TREATMENT OF FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-13517

AEROBIC TREATABILITY OF FEEDLOT RUNOFF,
Nebraska Univ, Lincoln.
For primary bibliographic entry see Field 05D.
W72-13518

AEROBIC TREATMENT OF FEEDLOT RUNOFF.
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 05D.
W72-13519

THE IMPACT OF PUBLIC WORKS SCHEMES ON FARMING: A CASE STUDY RELATING TO A RESERVOIR AND POWER STATION IN NORTH WALES,
University Coll. of Wales, Aberystwyth.
W. D. Jones.
Journal of Agricultural Economics, Vol 23, No 1, p 1-13, 1972.

Descriptors: *Reservoirs, *Nuclear powerplants, *Construction, *Economic impact, Social impact, Agriculture, Farms, Employment, Income.
Identifiers: *North Wales (Great Britain).

The economic effects on farming of building a reservoir and an atomic power station in two rural areas in North Wales is studied. The study spans a ten-year period beginning with the commencement of construction work on the Atomic Power Station in 1958 and ending with completion of the Station and the reservoir in 1968. By the end of this period, the farmers who remained in the area were becoming accustomed to their new farming circumstances and environment. The economic impact on farming was found to depend on many factors, the most important of which are (1) the nature of the construction work and of the building, industry, or service resulting from it; (2) the area and quality of the land acquired by the public agency; (3) the general structure of agriculture in the vicinity, including the systems of production employed; (4) the thriftiness of the farmers; and (5) the specific problems associated with farming in the affected areas. An important conclusion arising from this study is that the methods of assessing the value of land acquired compulsorily and the amount of compensation payable for disturbance need to be more closely related to economic and social realities. (Settle-Wisconsin)
W72-13560

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A WIDE-AREA INVESTIGATION OF WATER UTILIZATION--PRIMARY REPORT.
Ministry of Construction, Tokyo (Japan). River Bureau.
For primary bibliographic entry see Field 06D.
W72-13054

FLOOD DAMAGE PREVENTION POLICIES,
Chicago Univ., Ill. Dept. of Geography.
G. White.
In: Natural Resources Forum, United Nations, Dept. of Economic and Social Affairs, Vol I, p 39-45, 1971. 1 tab, 19 ref.

Descriptors: *Floods, *Flood plains, *Flood damage, Flood protection, *Flood control, Flood plain insurance, Forecasting, Cost-benefit analysis.

In using areas subject to overbank flooding, man may adjust to the hazard of flood loss in any of three ways. He may (1) change the flood, (2) distribute flood losses, or (3) arrange his use so as to change the losses. In the past, the most common adjustments sponsored by governments were concerned with altering the stream channel. However, a review of recent programs and legislation in a number of countries indicates that several new trends for dealing with flood losses may be emerging. First, more precise and comprehensive systems for forecasting floods are being installed. For the forecasting systems to be of maximum value, they must be linked with effective warning systems. Second, flood plains are being delimited so that potential users may be aware of the risks of locating at any particular location in the flood plain. Third, flood control projects such as dams are being integrated with other measures for river basin development. Fourth, advancements are being made in the use of cost-benefit and cost effectiveness studies. Fifth, there is an increasing reliance on a policy mix for distributing losses. The application of these new approaches may be particularly appropriate in developing countries. (Settle-Wisconsin)
W72-13074

OPTIMIZATION MODEL FOR CHURCHILL RIVER DIVERSION,
Metcalf and Eddy, Inc., Boston, Mass.
Abu M. Z. Alam.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY8, Paper 9089, p 1351-1366, August, 1972. 4 fig, 9 ref, 2 append.

Descriptors: *Diversion, *River systems, *Reservoirs, *River flow, Optimization, Linear programming, Algorithms, Mathematical models, Operations research, Constraints, Digital computers, Hydrology, Elevation, Low flow, Storage, Volume, Gravity, Costs, Canada.
Identifiers: Linear algebraic equations, Nonlinear algebraic equations, Mathematical programming, Separable programming technique, Capacity, Operating storage volume.

A mathematical model is developed to ascertain optimal operating costs and project configurations for diverting flow at various rates from the Churchill River basin into the Nelson River basin in Canada, under various physical, hydrologic, and economic constraints. It is a storage and diversions scheme for augmenting dry season flows; the

minimum and maximum operating levels of the reservoirs determine the firm diversion capability and the operating storage volume. Costs of development and resource losses are also dependent directly on these levels. In the optimization problem these are, therefore, considered decision variables. All nonlinear functions are transformed into piece-wise linear functions preserving all essential nonlinear features. The stochastic nature of the inflow is approximated by a deterministic analysis. The Separable Programming algorithm of MPS/360 is used to perform the actual optimization. Presented is the determination of costs of optimum developments of storages and diversion flows from three interconnecting reservoirs, with consideration of all interests affected by the development of the reservoirs. Each solution indicates the combination of diversion routes and storage ranges in the three reservoirs for a firm capability and storage as required by the total Manitoba Hydro system operation. (Bell-Cornell)
W72-13134

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
J. A. Cole.
Paper, presented AIHS--IASH, International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July 26-31, 1971. 14 p, 5 fig, 1 tab, 6 ref, append.

Descriptors: *Dynamic programming, *Flood control, *Reservoir operation, *Multi-purpose reservoirs, Optimization, Costs, Mathematical models, Water deficiencies, Water supply, Storm runoff, Equations, Downstream, Low flow, Storage, Water demand, Stormwater, Spillways, Pipelines, Seasonal, Cities, Inflow, Forecasting.
Identifiers: Cost minimization.

Starting from a long-term objective of minimizing the combined costs of water-supply deficiencies and of downstream flood damage, the monthly release rules of a reservoir are found by dynamic programming. Examples are presented of how the rules may depend on prevailing contents and the previous monthly inflow. Methods of taking prior inflow into account, without having any significant increase in the problem's dimensions, are tested. Computational efficiency is enhanced by limiting the number of decision states. Given the seasonal values of each contents state, resulting from the dynamic programming calculation, it is then shown how short-term regulation of the reservoir contents may be decided, using a quantitative forecast of storm runoff. (Bell-Cornell)
W72-13139

THE HYDROLOGICAL ROLE OF FORESTS OF THE LITHUANIAN SSR,
G. Pauliukevicius.
Geogr Ezheg Geogr O-Va Lit SSR. 10. 83-90. 1969.
Identifiers: *Forest management, *Water conservation, Cover, Evaporation, Forests, Hydrology, Larch G, Lithuanian SSR, Moisture, Plants, Precipitation, Soils, Spruce G.

The relation between the forest cover percentage and the amount of precipitation is shown. Pure spruce forests retained 40% of the annual rate of precipitation and reduced the height of flood waters in the river basins. The interrelationship is given between the moisture deposits in the soil, the total evaporation, the amount of precipitation and the degree of anthropogenic influence. Much moisture is expended by larch stands. In the southeastern part of Lithuania a linear relationship exists between the river discharge and the forest-cover percentage of the basins. The role of forests in water conservation and the values of the optimum forest-cover percentage are given.--Copyright 1972, Biological Abstracts, Inc.
W72-13158

GENERAL PLAN 2020, LAND USE GUIDE FOR WATER, WASTE WATER AND DRAINAGE ENGINEERING STUDIES, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.
For primary bibliographic entry see Field 06D.
W72-13160

STORM DRAINAGE, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10378, $3.00 in paper copy, $0.95 in microfiche. Humboldt County Planning Commission, Eureka, California, April 1971. 125 p, 22 fig, 21 tab. LPO-P/360-CAS-1.

Descriptors: *Drainage programs, *Drainage systems, *Surface drainage, *Urban drainage, *Planning, Runoff, Rainfall-runoff relationships, Storm runoff, Runoff forecasting, Runoff coefficient, Rational formula, Drainage engineering, Long-term planning, Sewerage, Sewers, Drains, California.
Identifiers: *Humboldt County (California).

Storm drainage was studied for the western midportion of Humboldt County, extending 34 miles along the Pacific Coast and about 15 miles inland. The primary objective is the development of a long-range plan for storm drainage to assure proper development and orderly growth of the Study Area. A second objective is that of correcting any deficiencies that exist in the present system so that these facilities may be integrated into the long-range plan; and the third objective is to formulate a sound financing program wherein sufficient funds will be available when the proposed facilities are required. A complete system of storm drainage facilities was developed for all areas for which development now exists, or is anticipated, within the Study Area. In addition to these proposed improvements, additional improvements could be made to Salmon Creek, Elk River, Freshwater-Ryan Creeks, Jacoby Creek, and Little River to confine the runoff and limit flooding. Two methods for computing peak discharge from a given watershed were used. For the smaller watersheds with tributary areas less than five square miles, the conventional method was followed using the Rational Formula. For the larger watersheds, the Soil Conservation Service method was used for computing flood hydrographs. Where stream flow records were available, flood magnitude-frequency relationships were examined and compared with computer flood hydrographs. General recommendations are presented for ameliorating and preventing drainage problems. Specific recommendations are given for drainage improvements in all parts of the study area. Financial and administrative considerations are included. (See also W72-13160) (Poertner)
W72-13162

FLOW UNDER A WEIR ON SOIL UNDERLAIN BY SLOPING IMPERVIOUS LAYER,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
For primary bibliographic entry see Field 02G.
W72-13199

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI (NATCHEZ AREA) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 08A.
W72-13217

CALIFORNIA WATER PROJECT,
California State Dept. of Water Resources, Sacramento.
W. R. Gianelli, and R. B. Jansen.
Civil Engineering, ASCE, Vol. 42, No. 6, p 78-84, June 1972, 2 fig., 2 tab.

Descriptors: *Water supply, Resources development, *Water conveyance, Recreational facilities, *Design, *Distribution systems, *California, *Utilities, *Water transfer.

The 2.3 billion dollar California Water Project, the largest public works project ever undertaken in one state, carries surplus water from Northern California to water-short Central and Southern California. Its major elements include 22 dams, 6 powerplants, 23 pumping facilities and nearly 700 mi (1126 km) of conveyance systems. Earthquake vulnerability and subsistence on arid slopes posed challenging construction problems. The entire network is coordinated by a control system which monitors water level and flow data, and converts information into a coded format for computer use. Extensive recreational facilities are an environmental by-product of this project. (Bean-AWWARF)
W72-13259

UNCONFINED AQUIFER AND SLOW DRAINAGE,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W72-13269

SOIL-RECLAMATION STUDIES IN THE POLISH PEOPLE'S REPUBLIC (POCHVENNO--MELIORATIVNYYE ISSLEDOVANIYA V POL'SKOY NARODNOY RESPUBLIKE),
J. Ostrowski.
Pochvovedeniye, No 12, p 116-126, December 1971. 2 tab, 20 ref.

Descriptors: *Land management, *Land reclamation, *Drainage, *Soil classification, Soil groups, Soil types, Soil investigations, Soil surveys, Mapping, Soil profiles, Soil properties, Soil texture.
Identifiers: *Poland, *Soil maps, Soil productivity ratings, Soil-use capability, Drainage requirements.

Improvement of the water and air regime of soils by drainage is a basic soil-management practice in the Polish People's Republic. Subsurface drainage by use of tile drains has been practiced extensively in the Republic since the 19th century. According to 1970 figures released by the Ministry of Agriculture, drainage improvement currently involves 4.3 million ha of plowland and 2.8 million ha of meadow land, which represents 62% and 67%, respectively, of the total area of these lands in need of drainage. Procedures and techniques for soil-reclamation projects in the Republic are described together with a method for determining drainage requirements of plowed soils, based on soil morphological, chemical, and physical characteristics, including horizon arrangement, texture, structure, consistency, salinity, and soil moisture-holding capacity. (Josefson-USGS)
W72-13282

CONTROLLING WATER INFILTRATION IN BIMODAL POROUS SOILS: AIR-EARTH INTERFACE CONCEPT,
Agricultural Research Service, Reno, Nev.
For primary bibliographic entry see Field 02G.
W72-13289

CONTROL OF WATER MILFOIL IN WISCONSIN,
Wisconsin Univ. Center, Marinette.
For primary bibliographic entry see Field 05C.
W72-13291

A PILOT PROGRAM TO DETERMINE THE EFFECT OF SELECTED NUTRIENTS (DISSOLVED ORGANICS, PHOSPHORUS, AND NITROGEN) ON NUISANCE ALGAL GROWTH IN AMERICAN FALLS RESERVOIR,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-13300

SIMULATION MODEL FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
G. H. Toebes, and T. P. Chang.
Available from the National Technical Information Service as PB-211 613, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center Technical Report No. 27, July 1972. 100 p, 31 fig, 13 tab, 91 ref, 3 append. OWRR-A-012-IND (3) and A-016-IND (1).

Descriptors: *Model studies, *Reservoir operation, *Water storage, *Flood control, *Reservoir releases, Hydrologic models, *Simulation analysis, Reservoirs, Reservoir management, *Computer models, *Indiana.
Identifiers: *Wabash River Basin (Ind).

The construction of a digital regional reservoir-river simulation model is described. Simulation as a systems analysis tool is discussed in an introductory way. A comparative discussion of river routing models is given. The best selection of local routing coefficients is discussed when based only on daily flow data. The problems posed by not using precipitation data are stated. The model simulates the authorized surface water management plans and existing reservoir operating policies for the 8,000 square mile Wabash River Basin upstream of Williamsport, Indiana. It is used in testing systems operating policies for the upper Wabash Basin.
W72-13301

THE INTERGRATION OF MULTIPLE OBJECTIVES IN URBANIZING WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 06B.
W72-13303

WATER TABLE CONTROL AND SUBSURFACE IRRIGATION IN MINERAL AND HIGH ORGANIC COASTAL PLAIN SOILS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 03F.
W72-13304

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM (HISARS) REFERENCE MANUAL,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 07C.
W72-13308

STREAMFLOW REGULATION BY ARTIFICIAL RECHARGE FED FROM UPSTREAM SURFACE STORAGE: DERIVATION OF CONTROL RULES,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 06A.
W72-13356

A STORAGE MODEL IN WHICH THE NET GROWTH-RATE IS A MARKOV CHAIN,
Michigan State Univ., East Lansing. Dept. of Statistics, and Probability.
For primary bibliographic entry see Field 06A.
W72-13358

A LINEAR PROGRAMMING FORMULATION OF A WATER SUPPLY PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
For primary bibliographic entry see Field 06A.
W72-13359

COMPUTER TECHNIQUES FOR WATER-DISTRIBUTION ANALYSIS,
Becher-Hoppe Engineers, Inc., Schofield, Wis.
For primary bibliographic entry see Field 06A.
W72-13361

CONTRIBUTION TO THE BOTANY OF THE TARAI FORESTS OF THE BAHRAICH DISTRICT OF UTTAR PRADESH,
Botanical Survey of India, Allahabad. Regional Circle.
G. Panigrahi, A. N. Singh, and O. P. Misra.
Bull Bot Surv India. Vol 11, No 1/2, p 89-114. 1969.
Identifiers: Aegle D, Botany, *Forests, Grass M, *India, Savanna, Species, Tarai forests, Terminalia D, Uttar Pradesh.

Three collecting types yielded 530 spp. of angiosperms and 14 spp. of pteridophytes. An outline is presented of the 3 classes of forest types sal, miscellaneous and grass and an analysis of the floristic composition in the Katarniaghat-Dharmanpur-Motipur-Doba-Chakia-Chardha and Bhinga forests which are isolated blocks separated by 8-16 km by intervening tracts of cultivation and grazing grounds, except the forests of Dhramanpur and Motipur, which adjoin. The sal forests are divided into moist (Gangetic) high level alluvial, dry (Gangetic) alluvial, moist (Gangetic) low level alluvial, dry (Gangetic) alluvial subtypes; the miscellaneous forests are subdivided into North-Indian Moist Terminalia, cane brakes, tropical valley freshwater swamp, Khair-babul, Khair-sissoo, North dry-mixed deciduous, Aegle and Ganetic saline scrub; the Grasslands belonging to the lower alluvial moist savanna type and extending over about 3700 acres, represent the largest of the forest sub-types. The richness of the grass in the savannah is not due to the large number of different species in the area, but due to the distribution of some species over more stable riverain flats, which are subject to occasional floods and are locally known as 'phantas.'--Copyright 1972, Biological Abstracts, Inc.
W72-13365

THE DISTRIBUTION OF FOREST AND BOG VEGETATION ACCORDING TO LANDSCAPE--GEOMORPHOLOGICAL COMPLEXES AND THE RELIEF ON THE TAVDA-KONDA INTERFLUVE,
V. I. Makovskii, and Z. I. Sinel'Shchikova.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 67, p 101-116. 1970.
Identifiers: *Geomorphology, *Vegetation, Bilberry D, Birch D, Bogs, Distribution, Forests, Grass M, Interfluve, Landscape, Linden D, Moss, Pine G, Sedges M, Spruce G, Tavda-Konda, USSR.

Four principal geomorphological complexes were distinguished: the present-day valley of the Tavda River (floodplain and the low terraces above the floodplain); the ancient high terraces above the floodplain of the Tavda and Pra-Tavda rivers; the plains of the Tavda-Kuma and Kuma-Konda divides; and the high terraces of the Konda River. Inherent in each of these complexes are definite forest formations and associations. In the Tavda valley about 77% of the territory is occupied by pine forests (chiefly bilberry and moss-linden types), about 10% are birch forests (grass-mixed herbage, smallreed-sedge types), and about 11% are peat bogs (predominantly sedge types originating from lakes). On the terraces above the floodplain the forests are represented chiefly by moss-linden pine forests (60% of all the forested territory), but dark coniferous spruce forests are also found (10-12%); most of the territory is covered by unforested lowland bogs. Dark coniferous forests predominate on the divides (on the crests and drained slopes); on the entire central part of the plain of the divide there are peat banks and bog pools. The ise of surveyors' transits is recommended for newly reclaimed areas which are of difficult access.--Copyright 1972, Biological Abstracts, Inc.
W72-13387

CHEMICAL CONTROL OF CATTAIL, TYPHA LATIFOLIA,
Alberta Univ., Edmonton. Dept. of Plant Science.
W. G. Corns, and R. K. Gupta.
Can J Plant Sci. Vol 51, No 6, p 491-497. 1971.
Identifiers: *Weed control, Chemcontrol, Amitrole, Atlox, *Cattail M, Dalipon, Diesel oil, *Herbicides, Surfactants, Tandex, Typha latifolia M.

Foliar sprays of 22.4 kg/ha Tandex in 3368 l/ha of aqueous carrier containing 1% Atlox 210 surfactant, applied at, or soon after the flowering stage of cattail (Typha latifolia L.), kept plots free of all growth for a 3 yr period. Comparable soil treatments with pelleted material were as effective only on areas that had no surface water. Foliar sprays with 16.8 kg/ha amitrole or 22.4 kg/ha dalapon were excellent for 2 yr control of cattail but allowed invasion of other weeds. Single annual foliar applications of 6.7 kg/ha 2,4-D ester with added surfactant and 112.3 liters/ha diesel oil, in 3368 l/ha total volume, were effective for cattail control. There was no appreciable advantage from higher dosages. Results from amitrole, dalapon, paraquat and Tandex, used alone, were at least as good as they were from certain mixtures of each of these herbicides with 2,4-D formulated to give the same total respective dosage. Mowing 7 times between July, 1968, and Aug., 1969, of plots not in water, reduced their cattail population by 90%. There was no apparent effect on biological activity of sewage lagoons from repeated applications of 2,4-D ester to bordering cattail, and there were no detectable residues of dalapon or amitrole in the water after treatment with these herbicides. Other chemicals were not involved in such determinations at separate lagoons.--Copyright 1972, Biological Abstracts, Inc.
W72-13431

IMPROVING PRECIPITATION-USE EFFICIENCY ON RANGELAND BY SURFACE MODIFICATION,
Agricultural Research Service, Sidney, Mont. Northern Plains Soil and Water Research Center.
J. R. Wight, and F. H. Siddoway.
Journal of Soil and Water Conservation, Vol 27, No 4, p 170-174, July-August 1972. 4 fig, 1 tab, 21 ref.

Descriptors: *Water conservation, *Consumptive use, *Grasslands, *Soil surfaces, *Range management, Contour furrows, Infiltration, Evapotranspiration.
Identifiers: *Precipitation-use efficiency, *Soil surface modification, Pitting (Soil), Scalping (Soil), Rotary subsoiling.

Five surface modification treatments-contour furrowing, pitting, scalping, miniature fallowing, and rotary subsoiling-were evaluated for their effect on precipitation-use efficiency (PUE) on rangelands in the Northern Plains. Contour furrowing, scalping, pitting, and miniature fallowing (fallow strips were allowed to revegetate) increased PUE. Improved PUE resulted from changes in soil water, species composition, and soil fertility which accompanied the surface-modification treatments. Soil-water benefits resulted primarily from increased retention of runoff and snow. On sites with low infiltration capacities, surface modification increased PUE more than 100 per-

cent. On sites with high infiltration capacities, PUE increased about 20 percent, mainly because of changes in species composition and increases in nutrient availability. (Knapp-USGS)
W72-13455

SOME PROPERTIES OF LINK MAGNITUDE FOR CHANNEL NETWORKS AND NETWORK PATTERNS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02E.
W72-13458

NEW CONCEPT IN HYDROGRAPH ANALYSIS,
Nebraska Univ., Omaha. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13475

SIMULATION MODEL FOR THE ECONOMIC EVALUATION OF PUMPED-STORAGE,
Electricite de France. Paris.
P. R. Gerard.
In: Pumped Storage Development and Its Environmental Effects, Proceedings of the International Conference, September 19-24, 1971, University of Wisconsin-Milwaukee, p 383-387. 5 fig.

Descriptors: *Pumped storage, *Electric power production, *Simulation analysis, Electricity, Demand, Supply, Management, Mathematical models.
Identifiers: *Electricite de France. *Probabilistic model.

To estimate the economic value of using pumped-storage, a simulation model must assess the impact on all the components of the system whose operation may be modified by the use of pumped-storage. These components include reservoir hydroplants, gas turbines, and old steam plants. Also, demand and supply variables should be treated as stochastic variables which have a known probability distribution. Simulation models can be used to test what happens (1) hour after hour in certain restrictive circumstances, or (2) month after month under less restrictive circumstances. Simulation-by-the-hour can be used to analyze the flexibility provided by a given plant. Simulation-by-the-month is necessary to plan how many plants should be scheduled, when they should be inserted into the system, and in what proportion pumped-storage and gas turbines should be used. The model presently used by the Electricite de France is a rather ambitious simulation-by-the-month model. (See also W72-13567 -- 13568) (Settle-Wisconsin)
W72-13566

ECONOMICS OF PUMPED STORAGE IN NEW ENGLAND,
Alexander Kusko, Inc., Needham Heights, Mass.; and Massachusetts Ins. of Tech., Cambridge, Mass.
A. Kusko.
In: Pumped Storage Development and Its Environmental Effects, Proceedings of the International Conference, September 19-24, 1971, University of Wisconsin-Milwaukee, Milwaukee, p 414-417. 6 tab, 4 ref.

Descriptors: *Pumped storage, *Electric power production, *Energy, *Costs, Nuclear energy, Nuclear powerplants, Turbines, Optimization, *New England.
Identifiers: *Cost minimization.

Cost studies for pumped storage development in New England have shown a trend from first favoring pumped storage to recently favoring alternate forms of generation as more economical. An article in 1969 by S. R. Knapp suggested that the combination of nuclear base-load capacity with pumped storage would provide energy at a lower cost than either a nuclear-gas turbine combination or a nuclear-steam peaking combination. He estimated that the pumped storage combination would be 4.4% cheaper than the gas turbine combination by 1973 and 14.8% cheaper by 1977. In September, 1970, a report by H. Zinder and Associates, Inc. indicated that an energy system consisting of 12% pumped storage offered practically no cost advantages over systems consisting of 9% and 3% pumped storage, respectively. In February, 1971, Kusko reported that a pumped storage system would be a higher cost energy source than a gas turbine system. Finally, in May, 1971, the Generation Task Force for the New England Planning Committee concluded that pumped storage development in New England was not economical for either fossil-plant base load expansion or a mixture of fossil and nuclear-plant base load expansion. (See also W72-13566) (Settle-Wisconsin)
W72-13567

ECONOMIC ANALYSIS OF SWISS PUMPED STORAGE SCHEMES FOR VARIOUS PARAMETERS OF OPERATION AND ENERGY COSTS,
Maggia, Locarno (Switzerland).
H. Fankhauser, and G. Trucco.
In: Pumped Storage Development and Its Environmental Effects, Proceedings of the International Conference, September 19-24, University of Wisconsin-Milwaukee, Milwaukee, p 367-371. 7 fig, 2 tab.

Descriptors: *Pumped storage, *Electric power production, *Costs, Energy, Operations, Mathematical models.
Identifiers: *Swiss Alps, *Valuation model.

In order to analyze a pumped storage scheme designed for the Swiss Alps, two valuation models were developed. The models represent a nuclear and a thermic plant with an installed capacity of 300 MW. The application of these models allows (1) the determination of production capacity under the fixed operating conditions defined by the model, (2) the determination of average season production costs of pumped storage production, and (3) the estimation of those economic factors necessary for the comparison of different pumped storage projects. The factors include the utility value of energy, construction costs, yearly cost rates, and the costs of pumping energy. The influence of reservoir capacity on (1) the freedom of operation and (2) the reserve capacity of pumped storage in the power network is also considered. The effects of a weekly pumping cycle, a weekend pumping cycle, and long-time storage on reservoir capacity is assessed. (See also W72-13566) (Settle-Wisconsin)
W72-13568

DYNAMICS OF ION TRANSPORT DURING MOISTURE FLOW FROM A DOUGLAS-FIR FOREST FLOOR,
Washington Univ., Seattle.
J. G. McColl.
Soil Science Society of America Proceedings, Vol 36, No 4, p 668-674, July-August 1972. 4 fig, 3 tab, 32 ref. NSF Grant GB-8125.

Descriptors: *Ion transport, *Leaching, *Forest soils, *Lysimeters, Monitoring, Forests, Forest management, Douglas fir trees, Temperature, Soil water movement, Clear-cutting.
Identifiers: *Automated field-monitoring system.

Ion transport was studied during periods of moisture flow from the forest floor using automated equipment in a second-growth Douglas-fir forest in western Washington. The transport process was related to the temperature in the forest floor, the duration of time before flow, and the amount of moisture flow. The relationship of seasonal climatic changes to the ion transport process, and the changes in solution concentration during wetting cycles are described. The study provides a base for predicting possible effects of manipulating natural forest ecosystems. A warning is given of possible effects of some common forest-management practices. (Knapp-USGS))
W72-13570

A HYDROGEOLOGICAL ZONING OF THE AFRICAN CONTINENT (GIDROGEOLOGICHESKOYE RAYONIROVANIYE AFRIKANSKOGO MATERIKA),
For primary bibliographic entry see Field 02F.
W72-13592

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (THE TRINITY RIVER BASIN, TEXAS),
Texas Univ., Austin. Center for Research in Water Resources.
E. F. Gloyna, A. J. D'Arezzo, and D. T. O'Laoghaire.
Available from the National Technical Information Service as PB-211 964, $3.00 in paper copy, $0.95 in microfiche. Center for Research in Water Resources, Technical Report CRWR-79, January 1972. 78 p, 78 ref. OWRR B-079-TEX (1).

Descriptors: *River basin development, Water resources development, *Data collection, *Monitoring, *Instrumentation, *Texas, Computer programs, Remote sensing, *Management.
Identifiers: *Trinity River, *Dallas-Fort Worth area, Industrial growth, River basin management, Algorithm, Fortran IV.

The conceptual requirements of future data acquisition and monitoring instrumentation systems for the efficient operation and management of a highly developed river basin system, such as envisaged for the Trinity River Canalization project were investigated. A practical inventory analysis was made of the entire river system, considering all major features, facilities and points of stress. The complexity of the entire system was evaluated and the feasibility of using a real-time data acquisition system of the Trinity River and its tributaries based on a closed-loop, feedback management systems approach was considered. A more detailed practical inventory analysis was made of the Dallas-Fort Worth area, a large urbanized region. Stationary continuous monitoring, mobile continuous monitoring and a regular grab sampling program were proposed. The problem of managing the waters of a river basin that are under increasing environmental stress because of rapid in-basin industrial growth was discussed. An algorithm, coded into Fortran IV, was suggested as a preliminary input to solving this problem that combines combinatorial analysis with a network plan routine. (Galwardi-Texas)
W72-13609

4B. Groundwater Management

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-13051

IMPACT OF THE DECLINING WATER SUPPLY ON THE ECONOMY OF CURRY AND ROOSEVELT COUNTIES,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
F. H. Osterhoudt.

New Mexico Agricultural Experiment Station Research Report No 222, January, 1972. 80 p, 6 fig, 30 tab, 52 ref, 1 append.

Descriptors: *Irrigation, *Groundwater, *Groundwater recharge, Water table, Economic impact, Forecasting, New Mexico.
Identifiers: Curry County (New Mexico), Roosevelt County (New Mexico).

Curry and Roosevelt, adjacent counties in eastern New Mexico, are rapidly depleting their irrigation water supply. Since there are no regularly flowing streams in either county, the irrigation water is supplied by wells drilled in permeable, water-bearing sands and gravel. Unfortunately, these groundwater sources have little or no recharge. In order to analyze the impact of this declining water supply on the economics of the two counties, a linear programming simulation model is developed. The model is used (1) to compare, under four alternative land-use assumptions, the regional and county situations for the 1967-1969 base period with those projected for the year when irrigation ceases completely, (2) to trace the economic effects of the decline of irrigation water by 10-year intervals over the period from the base year to 2020, and (3) to develop projections in which all government programs are removed from the calculations. The model suggests that by 2020 little or no irrigation will remain. Irrigated agriculture will be replaced by less intensive agricultural uses. Farm employment and farm purchases will decline, smaller amounts of agricultural products will be handled, and land tax income to local governments will diminish. Numerous tables are included. (Settle-Wisconsin)
W72-13078

THE ECONOMICS OF GEOTHERMAL POWER,
For primary bibliographic entry see Field 06C.
W72-13092

GEOPHYSICS AND GROUND WATER, PART 2, APPLIED USE OF GEOPHYSICS.
For primary bibliographic entry see Field 08A.
W72-13146

WATER SYSTEM AND TREATMENT HANDBOOK.
For primary bibliographic entry see Field 08B.
W72-13147

THE AUTHORITATIVE PRIMER - GROUND WATER POLLUTION.
For primary bibliographic entry see Field 05B.
W72-13152

WATER SUPPLY, TREATMENT AND DISTRIBUTION, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.
For primary bibliographic entry see Field 06D.
W72-13161

FACTORS PERTINENT TO WATER QUALITY IN THE ALBUQUERQUE METROPOLITAN AREA,
Albuquerque Urban Observatory, N. Mex.
For primary bibliographic entry see Field 06D.
W72-13168

ELECTROMAGNETIC METHODS FOR MAPPING AND EVALUATING AQUIFERS,
California Univ., Berkeley. Water Resources Center.
For primary bibliographic entry see Field 02F.
W72-13182

A NEW TECHNIQUE FOR TIME-VARIANT GROUND WATER FLOW ANALYSIS,
For primary bibliographic entry see Field 02F.
W72-13263

DEVELOPMENT OF GROUND WATER IN THE HOUSTON DISTRICT, TEXAS, 1966-69,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 03D.
W72-13264

ON THE HYDROGEOLOGY OF THE COASTAL REGION OF SOUTHEASTERN FINLAND,
Geological Survey of Finland, Otaniemi.
P. Lahermo.
Geological Survey of Finland Bulletin 252, 1971. 44 p, 31 fig, 2 tab, 48 ref.

Descriptors: *Hydrogeology, *Groundwater, *Groundwater basins, *Groundwater barriers, *Groundwater movement, Infiltration, Percolation, Fracture permeability, Structural geology, Geologic formations, Bedrock, Inorganic compounds, Metals, Water types, Water properties, Water quality, Water pollution, Water yield, Wells, Pumping.
Identifiers: *Finland, *Eskers, *Rapakivi.

With respect to structure and origin, the Quaternary deposits in southeastern Finland are similar to those elsewhere along the Finnish coast. Glaciofluvial groundwater sources include eskers, separated from each other by clay beds, and smaller groundwater basins, separated from each other by rocky thresholds. The amount of groundwater obtainable from any point in an esker is generally between 200 and 500 cu m/day and only in rare instances does it exceed 1,000 cu m/day. Wells drilled into nearly cubically fractured rapakivi granite yield an average of 50 cu m of groundwater a day. The amounts of water drawn from bedrock consisting of rapakivi clearly exceed the yield of other species of bedrock in Finland. Deepening of a drilled well frequently increases the amount of groundwater, although there is no significant correlation between depth and yield. The content of iron-rich, humus-bearing groundwater in eskers at the beginning of pumping is high but diminishes as the groundwater table drops. Chloride concentrations in groundwater drawn from borings close to the coast and from exceptionally deep borings far from the coast are high but decrease during constant use. The amount of dissolved matter in groundwater is inversely proportional to the rate of percolation, which, in turn, depends on the structure of the geological formation. During the weathering process, sodium is released more readily than potassium, and alkaline earths are released in relatively larger amounts than alkalis. The fluoride content of groundwater of the rapakivi granite area is 10 times higher than that of groundwater of the country as a whole. The pollution caused by agricultural activity is reflected in groundwater through an increase in its nitrogen compounds, chlorides, sodium, and potassium. (Josefson-USGS)
W72-13265

GROUND WATER IN SANTA BARBARA AND SOUTHERN SAN LUIS OBISPO COUNTIES CALIFORNIA, SPRING 1969 TO SPRING 1970,
Geological Survey, Menlo Park, Calif.
J. W. Warner.
Geological Survey Open-file Report, May 8, 1972. 27 p, 10 fig, 3 tab, 4 ref.

Descriptors: *Groundwater resources, *Withdrawal, *Aquifer characteristics, *Water quality, *California, Hydrologic data, Data collections, Pumping, Water yield, Water utilization, Water demand, Chemical analysis, Water level fluctuations, Groundwater recharge.
Identifiers: *Santa Barbara County (Calif), *San Luis Obispo County (Calif).

In Santa Barbara and southern San Luis Obispo Counties, California, precipitation for the 1970 water year (Oct. 1, 1969 to Sept. 30, 1970) was considerably lower than the long-term average. Precipitation at Santa Barbara was 11.83 inches, 66% of the 103-year average; precipitation at Santa Maria was 8.26 inches, 60% of the 85-year average. Groundwater pumpage increased slightly from that of 1968 in most areas. Pumpage decreased slightly in areas of the Santa Ynez unit except for the upland area of the Lompoc subunit and the Santa Ynez subunit. The greatest increase in pumpage occurred in the Cuyama Valley subunit, where 55,300 acre-feet was pumped in 1968 compared to 76,900 acre-feet for 1969--an increase of 21,600 acre-feet. Water levels remained about the same between spring 1969 and spring 1970. Groundwater in storage decreased in areas of the Santa Ynez unit and increased in all other major groundwater basins. The largest groundwater storage increase, about 133,000 acre-feet, occurred in the Santa Maria and Sisquoc subunits. There was no significant change in groundwater quality from the previous year. (Woodard-USGS)
W72-13266

MAJOR AQUIFERS IN CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak.
For primary bibliographic entry see Field 02F.
W72-13272

DATA FROM CONTROLLED DRILLING PROGRAM IN DU PAGE, KANE, AND KENDALL COUNTIES, ILLINOIS.
Illinois State Geological Survey, Urbana.

Illinois State Geological Survey Environmental Geology Notes, No 53, P. C. Reed, compiler, July 1972. 42 p, 1 fig, 1 tab.

Descriptors: *Groundwater resources, *Drill holes, *Test wells, *Well data, *Illinois, Drilling, Geology, Logging (Recording), Data collections, Sieve analysis, Soil properties, Aquifer characteristics, Pumping, Hydrogeology.
Identifiers: *DuPage County (Ill), *Kane County (Ill), *Kendall County (Ill).

To facilitate the search for new shallow sources of groundwater for the rapidly expanding metropolitan areas of northeastern and north-central Illinois, the Illinois State Geological Survey and the State Water Survey made drill hole tests in three counties. Fourteen holes were drilled at 8 sites in Du Page County, 3 sites in Kane County, and 2 in Kendall County. Data from field and laboratory analyses of sample materials collected from the holes are presented. Only shallow groundwater sources--the glacial deposits and the underlying limestone bedrock--were evaluated, because they are believed to be capable of yielding more groundwater than they are yielding at present. The deep sources of water, the artesian sandstones, are already being overpumped in the Chicago region. Pumping tests were conducted at two sites, one in Du Page County and one in Kane County. (Woodard-USGS)
W72-13275

UNSTEADY RADIAL FLOW IN AN UNCONFINED AQUIFER,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W72-13466

TEST-OBSERVATION WELL NEAR ODESSA, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
K. L. Walters, D. R. Cline, and J. E. Luzier.
Geological Survey Open-file Report, 1972. 25 p, 6 fig, 2 ref.

Descriptors: *Groundwater resources, *Test wells, *Observation wells, *Aquifer characteristics, *Washington, Water resources development, Pumping, Water yield, Drawdown, Groundwater movement, Hydrogeology, Well data, Water level fluctuations, Hydrologic data, Data collections.
Identifiers: *Odessa (Wash.).

A test-observation well drilled near Odessa, Wash., provides information on the area's aquifer characteristics which is not otherwise available from existing deep irrigation wells. The information is of value to the State of Washington Department of Ecology in its management decisions in this area where heavy groundwater withdrawals have resulted in increasing annual water-level declines. The 10-inch well is 750 ft deep and penetrates six aquifer zones (A through F) in basalt. The upper 60 ft of the well is cased, while the remainder of the hole is open in the basalt. The well was test pumped during drilling and showed specific capacities of 0.65 gallon per minute per foot of drawdown when at the 258-ft depth and open to aquifers A and B, 0.62 gpm/ft of drawdown when at the 540-ft depth and open to aquifers A through D, and 22 gpm/ft of drawdown when at the full 750-ft depth and open to all six aquifers. Borehole geophysical logging provided information on natural gamma radiation, water temperature and resistivity, downhole movement of the water, and borehole diameter. (Woodard-USGS)
W72-13571

4C. Effects on Water of Man's Non-Water Activities

SEDIMENTATION AND CONTAMINANT CRITERIA FOR WATERSHED PLANNING AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
H. W. Shen.
Available from the National Technical Information Service as PB-211 665, $3.00 in paper copy $0.95 in microfiche. Completion Report Series No 31, Colorado Environmental Resources Center, Fort Collins, June 1972, 175 p, 44 fig, 9 tab, 9 ref, 2 append. OWRR-B-014-COLO (6).

Descriptors: *Watershed management, *Forest management, *Sediment yield, Erosion control, Surface runoff, *Vegetation effects, *Planning, River basins, Clear cutting, *Model studies, Sediments, Agricultural watersheds.

A model to estimate the resistance of flow due to various combination of tall vegetation (such as trees) on the order of flow depths is given. An empirical curve by regression to estimate the flow resistance with large rigid roughness (short vegetation such as grasses) in the order of normal boundary roughness is developed. The possibility of applying this curve to flexible roughness has also been explored. An analytical method to investigate the effect of vibrating flexible roughness elements in flow rate is also presented. The relative effect of various combinations of tall vegetation on the reduction of sediment yields based on the reduction of flow rates is studied. This should be rather useful in determining the relative effect on sediment yields by clear cutting and other selective cutting of forest lumber. The effect of rainfall on these sheet flows is investigated and a simplified method to estimate the rainfall effect on flow resistance is also developed. The dispersion of contaminated bed particles for different time and space can be found from graphical solutions as illustrated. An empirical curve to estimate the sediment bed material load for various flow conditions is found.
W72-13353

4D. Watershed Protection

SEDIMENTATION AND CONTAMINANT CRITERIA FOR WATERSHED PLANNING AND MANAGEMENT,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 04C.
W72-13353

RESEARCH ON THE EFFECT OF SOIL AND WATER CONSERVATION BY STRAW MULCH ON THE SLOPE FIELDS, (IN KOREAN),
Institute of Agricultural Engineering Utilities, Suwon (Korea).
For primary bibliographic entry see Field 03F.
W72-13376

WIND EROSION IN UZBEKISTAN AND SOME METHODS FOR ITS PREVENTION,
For primary bibliographic entry see Field 02G.
W72-13378

TILLAGE OF SOIL FOR EROSION CONTROL AS A DROUGHT CONTROL MEASURE,
For primary bibliographic entry see Field 03F.
W72-13382

CONTROL OF SEDIMENT IN CANALS.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, Paper 9177, p 1647-1689, September 1972. 20 fig, 1 tab, 37 ref.

Descriptors: *Sediment control, *Bed load, *Canals design, Hydraulic models, Model studies, Reviews, Diversion, Settling basins, Dredging, Scour, Sediment transport, Desilting.
Identifiers: *Sediment ejectors.

Removal of sediment from stream diversions into canals is a major design problem. The design must be based on the most economic arrangement to remove that part of the sediment which cannot be transported through the lateral system onto the land without damage. Design of diverstion structures by analytical methods is not yet practical. Such designs are most reliable when based on model studies. Canal diversions from a stream are usually located on the outside of a curve to take advantage of the principle of spiral flow. Structures that reduce the amount of bedload entering canals are classified generally as diverters or ejectors. Several examples of these structures are described and reviewed. Removal of accumulated sediment from most of these structures is accomplished by sluicing. Excessive amount of suspended sediment is removed from canals by settling basins. Sediment deposited in settling basins is removed by sluicing, dredging, or mechanical means. Content is draft for a section in Chapter V of the proposed ASCE Manual on Sedimentation Engineering. (Knapp-USGS)
W72-13576

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

DEGRADATION OF UREA IN CONCENTRATED AQUEOUS SOLUTION,
Connecticut Unit., Storrs. School of Pharmacy.
For primary bibliographic entry see Field 05B.
W72-13048

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley; California Univ., Irvine; California Univ., Davis; California Univ., Los Angeles; California Univ., Riverside; and California Univ., Santa Barbara.
For primary bibliographic entry see Field 07B.
W72-13052

AN ANNOTATED BIBLIOGRAPHY OF REMOTE SENSING OF AIR AND WATER POLLUTION,
Iowa Univ., Iowa City.
P. D. Brooks, and G. W. Thomson.
Available from NTIS, Springfield, Va 22151 as AD-737 588, Price: $3.00 paper copy; $0.95 microfiche. Army Corps of Engineers Topographic Command TOPOCOM Special Bibliography, September 1971. 21 p, 66 ref.

Descriptors: *Bibliographies, *Publications, *Remote sensing, *Water pollution sources, *Air pollution, Reviews, Documentation, Technical writing.
Identifiers: Annotated bibliography.

This annotated bibliography contains a list of literature published between 1965-70 on the subject of remote sensing of air and water pollution. The periodicals examined for articles include Applied Science and Technology, Reader's Guide to Periodical Literature, Air Pollution Control Association Abstracts, Journal of the Air Pollution Control Association, Journal of the Water Pollution Control Federation, Atmospheric Environment, Photogrammetric Engineering, Photogrammetria, Papers from the 1969 and 1970 Annual Meetings of the American Society of Photogrammetry, Journal of Applied Meteorology, Journal of Atmospheric and Terrestrial Physics, Bulletin of the American Meteorological Society, Symposiums of Remote Sensing of the Environment, and the International Journal of Air and Water Pollution. Articles from periodicals such as Science, Nature, Electronics Technology, Power, Review of Scientific Instruments, etc. were either listed in Applied Science and Technology or Reader's Guide to Periodical Literature or were listed as references in articles obtained previously. No attempt was made to completely search these periodicals for articles. (Woodard-USGS)
W72-13055

IRON AND MANGANESE PROFILES IN A COASTAL POND WITH AN ANOXIC ZONE,
Woods Hole Oceanographic Institution, Mass.
R. A. Horne, and C. H. Woernle.
Chemical Geology, Vol 9, No 4, p 299-304, June 1972. 3 fig, 1 tab, 9 ref.

Descriptors: *Water chemistry, *Ponds, *Anaerobic conditions, *Iron, *Manganese, Hydrogen sulfide, Oxidation-reduction potential, Stratification, Mixing.

The concentration of iron and manganese in the waters of a coastal pond with an anoxic zone (Oyster Pond, Falmouth, Mass.) were determined as a function of depth by atomic absorption spectrophotometry. The iron and manganese profiles exhibit marked maxima at a depth corresponding to the surface of the anoxic bottom layer. In mid-August the pond was apparently mixed and the maxima were disrupted. (Knapp-USGS)
W72-13057

ORGANIC MATTER IN RED SEA SEDIMENTS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 02J.
W72-13058

PESTICIDE RESIDUE ANALYSIS IN THE PRESENCE OF POLYCHLOROBIPHENYLS (PCB'S),
Ontario Research Foundation, Toronto.
L. M. Reynolds.
Pesticide Reviews, Vol 34, p 27-57, 1971. 7 fig, 2 tab, 62 ref.

Descriptors: *Aroclors, *Polychlorinated biphenyls, *Pollutant identification, *Analytical techniques, *Gas chromatography, *Chemical analysis, *Path of pollutants, Organic compounds, Chlorinated hydrocarbon pesticides, DDT, Chemistry, Analysis, Chromatography, Organophosphorous pesticides, Adsorption, Toxicity, Water pollution sources, Water pollution effects, Water pollution, Ecology, Canada.
Identifiers: *Florisil, Electron capture, Sublethal effects, Residues, Pollutant residues, Polychlorinated biphenyl residues.

Since 1966, polychlorinated biphenyls (PCB's) have been detected in fish and wildlife. Due to their similarities in structure and properties to the organochlorine pesticides, the PCB's tend to interfere with accurate gas-liquid chromatography - electron capture determination of organochlorine and many organophosphorous pesticides. A method for recognizing the presence of PCB's in samples, separating them from pesticides, and accurately determining the pesticide levels is described. A simultaneous estimate of total PCB content is afforded. Further research on toxicity and sublethal effects of PCB mixtures and their individual components is required. If particular components are more toxic than others, refinement of the PCB quantitative methods will be necessary. Also discussed are uses and properties of PCB's, ecosystem kinetics and toxicity of PCB's, and residues of PCB's found in Canadian wildlife. (LeGore-Washington)
W72-13097

FIELD TESTING FOR WATER QUALITY CONTROL AT KRAFT PULP MILLS,
British Columbia Research Council Vancouver.
For primary bibliographic entry see Field 05C.
W72-13102

IDENTIFICATION AND ESTIMATION OF THE MAJOR COMPONENTS OF A COMMERCIAL POLYCHLORINATED BIPHENYL MIXTURE, AROCLOR 1221,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. E. Willis, and R. F. Addison.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 592-595, 1972. 1 fig, 2 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Analysis, *Pollutant identification, Chemical analysis, Chlorinated hydrocarbon pesticides, Organic compounds.
Identifiers: *Composition, Component analysis, Biphenyl, Dichlorobiphenyl.

The major components of Aroclor 1221, a polychlorinated biphenyl mixture, have been tentatively identified as the following (weight % composition of each component is given in parentheses): biphenyl (12.7), 2-chlorobiphenyl (28.4), 4-chlorobiphenyl (18.7), 2,2'-dichlorobiphenyl (9.2), 2,4-dichlorobiphenyl (3.5), 2,4'-dichlorobiphenyl (13.6), and 4,4'-dichlorobiphenyl (6.2). (LeGore-Washington)
W72-13104

EFFLUENT CHARACTERISTICS OF BLEACHED KRAFT PULP MILLS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05C.
W72-13108

SAMPLING OF FISH MUSCLE FOR M.S. 222 AND QUINALDINE RESIDUES,
Bureau of Sport Fisheries and Wildlife Warm Springs, Ga. Southeastern Fish Control Lab.
C. W. Luhning, and P. D. Harman.
Journal of the Fisheries Research Board of Canada, Vol 28, No 1, p 113-115, 1971. 1 fig, 1 tab, 4 ref.

Descriptors: Public health, Absorption, Analytical techniques, Methodology, Pollutant identification, Water pollution effects, *Sulfonates.
Identifiers: *MS-222, *Tricaine methanesulfonate, *Quinaldine, *2-methylquinoline, *Fish fillets, Pollutant residues, Seafood, *Anesthetics.

Large variations in concentrations of M.S. 222 (tricaine methanesulfonate) and quinaldine (2-methylquinoline) residues occurred in various areas of fish fillets. Residue analysis of replicate samples from homogenized fillets yielded more representative results than samples cut from various areas of fillets. (LeGore-Washington)
W72-13111

RESIDUES OF ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN SOME COMMERCIALLY PRODUCED CANADIAN MARINE OILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05B.
W72-13114

ATTACHED ALGAE ON ARTIFICIAL AND NATURAL SUBSTRATES IN LAKE WINNIPEG, MANITOBA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. Evans, and J. G. Stockner.
Journal of Fisheries Research Board of Canada, Vol 29, No 1, p 31-44, January 1972. 7 fig, 4 tab, 21 ref.

Descriptors: *Biomass, *Aquatic algae, *Aquatic productivity, Light, Turbidity, Nutrients, Heterogeneity, Chlorophyta, Chrysophyta, Bioindicators, Physicochemical properties, Microscopy, Limnology, Water quality, Ecology, Aquatic habitats, Cladophora, Limiting factors, Ecological distribution.
Identifiers: *Lake Winnipeg, *Substrates, Achnanthes minutissima, Achnanthes cf. birgiani, Amphipleura pellucida, Amphora ovalis, Amphora ovalis v. pediculus, Cocconeis pediculus, Cocconeis placentula, Cyclotella cf. socialis, Cyclotella stelligera, Cymbella spp, Diatoma ssp.

The composition and distribution of attached algae on artificial (navigational buoys) and natural substrates in Lake Winnipeg in 1969-70, was studied, in the fall after about 145 days' growth, with special emphasis on the diatoms, the major component of the attached algal flora. Attached algae from known areas of the surface of representative substrates were weighed (dry-weight) and counted. Total diatom volumes (cu mm/sq cm) were calculated using an equation for the geometrical shape that closely resembled individual species, and by applying suitable corrections to each calculation. The percent by volume of other algal groups was estimated by microscopy. On both natural and artificial substrates a distinct zonation pattern related to water transparency or available light was prevalent. Preliminary results indicated that light was the most important physical factor affecting growth and specific composition of attached algae on substrates. Biomass values (dry weight) ranged from 1.7 to 29.1 mg/sq cm, with the greatest values consistently occurring between a 10 and 25 cm depth on buoys in the south basin. Diatom density and diatom volume were estimated from buoy samples and varied respectively, within the range 200,000-6,650,000 diatoms/sq cm and 0.32-10.00 cu mm/sq cm. It appears that nutrients may limit growth of attached algae in the north basin, whereas in the south basin, light is the major limiting factor. The specific composition of the algal assemblages on particular buoys was more related to the physical-chemical features of a major river plume in close proximity to the buoy than to a homogeneous Lake Winnipeg water mass. This factor, together with greater turbidity in the shallower south basin, is largely responsible for the observed heterogeneity among the attached algal assemblages in Lake Winnipeg. (Byrd-Battelle)
W72-13142

DIATOMS OF THE AUVERNIER NEOLITHIC STATION (LAKE NEUCHATEL), (LES DIATOMEES DE LA STATION NEOLITHIQUE D' AUVERNIER (LAC DE NEUCHATEL)),
Neuchatel Univ. (Switzerland). Institut de Zoologie.
For primary bibliographic entry see Field 02H.
W72-13143

A REVIEW OF AUTECOLOGICAL AND SAPROBIOLOGICAL DATA ON FRESHWATER CILIATES, (EINE ZUSAMMENSTELLUNG VON AUTOKOLOGISCHEN UND SAPROBIOLOGISCHEN BEFUNDEN AN SUSSWASSERCILIATEN),
Bonn Univ. (West Germany). Zoological Inst.
For primary bibliographic entry see Field 05C.
W72-13144

BACTERIA CAUSE MANY PROBLEMS.
For primary bibliographic entry see Field 05F.
W72-13156

A STATISTICAL ANALYSIS OF THE MERCURY CONTENT OF FRESH WATER FISH IN NEW YORK STATE,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05C.
W72-13163

A SMALL BIOASSAY LABORATORY DESIGNED FOR EXPERIMENTAL THERMAL EFFECTS EVALUATION,
Washington Univ., Seattle. Coll. of Fisheries.
Q. J. Stober.
University of Washington, College of Fisheries, Fisheries Research Institute, Circular No 72-1, 1972. 12 p, 4 fig.

Descriptors: *Bioassay, *On-site laboratories, *Evaluation, *Thermal pollution, *Laboratories, *Research facilities, Thermal powerplants, Water pollution sources, Water pollution effects, Heated water, Temperature control, Saline water systems, Laboratory equipment.
Identifiers: Thermal effects, Puget Sound (Wash).

Design details with drawings are presented for a small bioassay laboratory useful for specific site evaluation of large industrial developments. This laboratory has been operated at a proposed 1000 Mw nuclear power site in Northern Puget Sound (Kiket Island), Washington, since April, 1970. The laboratory is described, as well as the individual systems, including salt-water supply, heating, temperature control, compressed air supply, and emergency power supply. Experimental equipment and laboratory maintenance are discussed. The laboratory building houses insulated wet and dry laboratories, a mechanical equipment room, and a boat storage experimental area. (Svensson-Washington)
W72-13177

A RELIABLE ROUTINE TEST FOR ESCHERICHIA COLI FAECALIS FROM

WATER BY THE DETERMINATION OF GLUTAMIC ACID DECARBOXYLASE ACTIVITY THROUGH WEDGE STRIP CHROMATOGRAPHY,
Leipzig Univ. (East Germany). Hygiene-Institut.
G. Vogler.
Z Gesamte Hyg Grenzgeb. Vol 17, No 8, p 585-588. 1971. Illus.
Identifiers: *Water analysis, *E coli, Analytical techniques, Chromatography, Decarboxylase, Glutamic acid, *Pollutant identification.

Various bacteriological techniques for identifying and quantitating intestinal E. coli organisms in water, based on the IMVC test (Indole-Methyl red-Voges-Proskauer-Citrate) are reviewed but characterized as insufficiently selective. The advantages of the glutamic acid decarboxylase activity (GDA) test is that it is selective, saves working time and materials and gives the desired information 2 days sooner than older methods. Only fecal E. coli contain the enzyme that decarboxylate glutamic acid to gamma-aminobutyric acid; the latter is identified and estimated chromatographically.--Copyright 1972, Biological Abstracts, Inc.
W72-13211

NONIONIC DETERGENT DEGRADATION: III. INITIAL MECHANISM OF THE DEGRADATION,
Laboratory of the Government Chemist, London (England).
For primary bibliographic entry see Field 05B.
W72-13246

RAPID ASSESSMENT OF WATER QUALITY BY FLUORESCENT ANTIBODY IDENTIFICATION OF FECAL STREPTOCOCCI,
Massachusetts Univ., Amherst.
M. T. Pavlova, E. Beauvais, F. T. Brezenski, and W. Litsky.
Preprint, presented at 6th International Water Pollution Research Conference, Session 3, Hall A, Paper No 5, June 20, 1972. 8 p, 6 fig, 3 tab, 5 ref.

Descriptors: *Pollutant identification, Water quality, *Sewage, *Analytical techniques, *Streptococci, Fluorescence, Laboratory tests, Test procedure, Monitoring.
Identifiers: *Fecal streptococcus, *Fluorescent antibody reaction, Staining method.

Laboratory studies indicated that all species of group D streptococci (fecal streptococci) yielded positive fluorescent antibody reactions with laboratory prepared labeled antibodies. The specificity of these reactions was also demonstrated in that no cross-reactions with non-group D streptococci occurred after trypsimization of the smears prior to staining. Materials and test methods utilized were outlined. Fecal streptococci densities varied between 2.7 x 10 (1) to 1.4 x 10 (3) per 100 ml sample from the Connecticut and Mill rivers respectively, while in sewage these organisms were in the order of 2.4 x 10 (6). The fecal streptococci distribution from 15 river samples and 7 sewage samples were presented in tabular form. Using the outlined procedure, fecal streptococci can be indicated from water samples within 20 hours whereas if the routine biochemical and precipitation tests were employed, the identification procedure may take as long as 7-14 days. The ease with which the fluorescent antibody method can be employed for the rapid enumeration and identification of fecal streptococci from water and sewage suggested that the procedure may be automated for use in a continual monitoring system. (Galwardi-Texas)
W72-13248

A NEW APPROACH IN E. COLI IDENTIFICATION,
Technion - Israel Inst. of Tech., Haifa. Environmental Engineering Labs.
N. Buras, and Y. Kott.
Preprint, presented at 6th International Water Pollution Research Conference, Session 3, Paper No. 6, Hall A, June 20, 1972. 9 p, 1 fig, 2 tab, 17 ref.

Descriptors: *E. coli, *Analytical techniques, *Pollutant identification, *Bacteriophage, Coliforms, Laboratory tests, Efficiencies, Performance, Temperature.

A comparative study of conventional methods with a method using E. coliphages as E. coli identifiers was conducted. In order to ascertain the reliability of the test, 257 water samples from various sources with various degrees of pollution were tested. However, only 58 samples contained E. coli bacteria. Experimental procedures and analytical techniques utilized were outlined. The results showed that 93.5% of the E. coli present in the water samples were identified by the specific E. colibacteriophages available. Results were arranged in tabular form. It was suggested that this method be used in parallel with conventional methods so that sufficient data will be accumulated to confirm the accuracy of the test and its reliability. (Galwardi-Texas)
W72-13249

HIGH LEAD CONCENTRATIONS IN COLUMBUS SNOW,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
W. L. Hamilton, and J. E. Miller.
Ohio J Sci. Vol 71, No 5, p 313-316. 1971. Map.
Identifiers: Automobiles, *Columbus (Ohio), Potable water, *Lead, Snow, *Spectrophotometry, Water pollution sources, Pollutant identification.

Pb concentrations in snow collected on the ground within 100 feet of streets and roads in Jan., 1970, were determined by atomic absorption spectrophotometric analysis of dissolved and particulate fractions of impurities. Twenty-seven samples of snow were collected over a 20 square-mile, suburban, mainly residential part of Columbus, Ohio. Measured concentrations were between 0.05 and 1.09 ppm Pb, with an average of 0.41 ppm. In all but one sample the lead concentration exceeded the U.S. Public Health Service safe limit for drinking water of 0.05 ppm. The temporal and areal distributions of concentrations, together with a comparison with Fe concentrations measured in the same samples, indicated that automobile exhaust was the probable source of the Pb.--Copyright 1972, Biological Abstracts, Inc.
W72-13296

VARIATION IN DIATOM MORPHOLOGY AND WATER POLLUTION,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W72-13297

A PILOT PROGRAM TO DETERMINE THE EFFECT OF SELECTED NUTRIENTS (DISSOLVED ORGANICS, PHOSPHORUS, AND NITROGEN) ON NUISANCE ALGAL GROWTH IN AMERICAN FALLS RESERVOIR,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-13300

PLANT PHYSIOLOGY: ON THE DEUTERIUM CONTENT OF ORANGE JUICES,
Institut de Recherches Appliquees du Beissons, Montreuil (France).
For primary bibliographic entry see Field 02K.
W72-13334

A NEW MODEL OF THE KAJAK BOTTOM SAMPLER, AND OOTHER IMPROVEMENTS IN THE ZOOBENTHOS SAMPLING TECHNIQUE,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
For primary bibliographic entry see Field 07B.
W72-13338

TOTAL BACTERIAL NUMBER IN RYBINSK RESERVOIR,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. I. Romanenko.
Mikrobiologiya. Vol 40, No 4, p 707-713. 1971. Illus. Maps. English summary.
Identifiers: Abundance, *Bacteria, Number, *Rybinsk reservoir, Seasonal, USSR, Reservoirs.

The total bacterial number was calculated by a direct count on membrane filters during 16 yr (1954-1969) from May to Nov. with intervals of 15 days on 6 stations of the Rybinsk reservoir. The average bacterial number during all years was 1.43 plus or minus 0.18 x 1,000,000/ml of water. Distribution in water layers was uniform. Two statistically reliable maxima (in the spring and in the autumn) and 2 minima (in the summer and in the winter) were registered. The spring aand autumn maxima were induced by abiotic factors: freshets, floods and mixing with wind. The bacterial number was most stable in summer which is also during their most intensive growth.--Copyright 1972, Biological Abstracts, Inc.
W72-13342

ON THE CONTENT OF COBALT IN WATER MEDIUM (K OBSAHU KOBALTU VE VODNIM PROSTREDI),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05B.
W72-13345

CONTAMINATION OF MARINE LITTORAL AND SEA FOODS BY PESTICIDES, (CONTAMINATION DU LITTORAL MARITIME ET DES FRUITS DE MER PAR LES PESTICIDES),
Poitiers Univ. (France). Faculte de Medicine et de Pharmacie.
For primary bibliographic entry see Field 05C.
W72-13347

OFFENSIVE-ODOR SUBSTANCE IN THE EVIL--SMELLING FISH FROM THE SEA-POLLUTED BY PETROLEUM AND PETROCHEMICAL INDUSTRIAL WASTE: I. IDENTIFICATION OF OFFENSIVE-ODOR SUBSTANCE,
Okayama Univ. (Japan). Dept. of Public Hygiene.
Masana Ogata, and Yoshio Miyake.
Acta Med Okayama. Vol 24, No 4, p 471-481. 1970. Illus.
Identifiers: *Odor, Fish, Waste treatment, Water pollution sources, Identification, Industrial wastes, *Toluene, Water pollution effects, Oil, Oil wastes, Chemical wastes.

To reveal the source of offensive odor of fish from the sea facing petroleum and petrochemical industries, analyses were made on sea water, industrial wastes, offensive odor fish meat and eels kept in the sea or industrial waste for a certain period, by means of gas chromatography, IR, and UV absorption spectrophotometries and mass-spectrometry. Observations revealed toluene as possibly responsible for the bad smell of the fish. Finally, by analyzing the meat extract of the fish kept in the sea water containing toluene and by identifying the same smell as that of the offensive odor fish from the off-shore of the industries, it was confirmed that toluene imparts the offensive odor to fish. The activated sludge process effectively removed toluene from the industrial wastes.

The aliphatic carbohydrate as the possible source of the offensive odor of fish is discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13379

A RAPID METHOD EMPLOYING IMPREGNATED CHARCOAL AND ATOMIC ABSORPTION SPECTROPHOTOMETRY FOR THE DETERMINATION OF MERCURY,
National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
A. E. Moffitt, and R. E. Kupel, Jr.
Am Ind Hyg Assoc J. Vol 32, No 9, p 614-620. 1971. Illus.
Identifiers: *Analytical techniques, *Mercury, *Atomic adsorption, Spectrophotometry, Pollutant identification.

A quantitative procedure was developed for the determination of submicrogram quantities of Hg in atmospheric, biological, and aquatic samples. In the analysis of biological and water samples, organically bound Hg is oxidized with nitric acid, and all Hg present is reduced to the elemental state with stannous chloride. The liberated Hg is driven by an air current through impregnated charcoal for approximately 2 min. A glass tube packed with impregnated charcoal is used to take integrated atmospheric samples. All charcoal samples are analyzed directly for Hg with an atomic absorption sampling boat assembly. Measurement of the recorder peak height is used to determine the quantity of Hg present. The total analysis time is less than 5 min for aqueous samples, and the minimum detectable quantity of mercury is 0.02 microgram. After collection of Hg, the charcoal samples may be stored for later analysis.--Copyright 1972, Biological Abstracts, Inc.
W72-13389

THE DETERMINATION OF FLUORINE IN PLANTS WITH THE FLUORIDE ION SELECTIVE MEMBRANE ELECTRODE,
Ghent Rijksuniversiteit (Belgium). Dept. of Agricultural Science.
M. Verloo, and A. Cottenie.
Meded Fac Landbouwwet Rijksuniv Gent. Vol 35, No 1, p 291-299. 1970. Illus. English summary.
Identifiers: Electrodes, Fluorides, *Fluorine, Grasses M, Membranes, Plants, *Analytical techniques, Plant physiology.

Plant material is extracted with 15 N HN03, after which a buffer solution is added and the fluoride activity measured directly. The value of the method is illustrated by the results obtained in a study of fluorine contamination of grasses.--Copyright 1972, Biological Abstracts, Inc.
W72-13391

COLORIMETRIC DETERMINATION OF TOTAL PROTEIN AND NONPROTEIN NITROGEN IN PLANTS,
G. M. Lyaskovskii, S. N. Sergienko, and V. N. Sheredeka.
Tr Khar'Kov S-Kh Inst. Vol 78, No 115, p 49-57. 1969.
Identifiers: Analytical techniques, Amino acids, *Colorimetry, Nessler reagent, *Nitrogen, Nonprotein, *Plants, Physiology, Proteins.

A new modification of N determination with Nessler reagent is described. Digestion of the plant material (by H2S04 with H2O2 added) was followed by trial testing of 1 sample from the batch at different levels of dilution with water. Sodium silicate was added to the solutions, rapidly causing turbidity with the production of complex Ca and Mg compounds. Trichloroacetic acid is recommended for the separating out of proteins to permit the determination of nonprotein N, instead of Zn (OH)2 (which causes partial precipitation of amino acids). The treated solution is best viewed by means of an FEK-56 colorimeter. The N content should not be calculated from a calibration graph, but by the 'limited standards' method.--Copyright 1972, Biological Abstracts, Inc.
W72-13392

MEASUREMENT OF THE RADIOACTIVE CONTAMINATION OF SURFACE WATERS,
Controle Radioprotection, Brussels (Belgium).
For primary bibliographic entry see Field 05B.
W72-13434

BUMINES DATA PROMISE HELP IN IDENTIFYING PETROLEUM-SPILL SOURCES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
M. L. Whisman, and F. O. Cotton.
Oil and Gas Journal, Vol 69, No 52, p 111-113, December 27, 1971, 1 tab, 2 ref.

Descriptors: *Oil spills, *Water pollution sources, *Data processing, *Pollutant identification, Water pollution control, Trace elements.

To aid in the apprehension and prosecution of oil pollution violators it is helpful to identify the source of the petroleum. The U. S. Bureau of Mines maintains a data bank on crude oil properties. To augment this data bank, selected properties necessary for source identification were determined on 186 crude oils from important fields throughout the world. Tabulation of these properties is presented. Properties of unknown oil spill samples can be compared with these reference data. Availability of these data will permit the use of a computer program to establish the petroleum source. Additional data on the effects of weathering are still needed for positive isolation and identification of sources. (Ensign-PAI)
W72-13443

AN EVALUATION OF TWO NEUSTON SAMPLERS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
E. M. Levy, and A. Walton.
AOL Report No 9, 1971. 11 p, 12 fig, 3 ref.

Descriptors: Research equipment, *Sampling, *Structural design, *Water sampling, *Design standards, Water pollution sources, Oily water, *Oil pollution.
Identifiers: *Neuston samplers.

An investigation was conducted into the design of a towed sampling device for collection of floating oil and tar lumps to be constructed of light, relatively inexpensive materials. Two designs were tested and the 'other surface sampler' constructed by Sameoto and Jaroszynski was most satisfactory. It consisted of an open-ended aluminum frame with a standard plankton net and collection bucket. The side wings, bottom lip, and bridle, all adjustable, made the 26 pound sampler more adequately suited to oil pollution studies. (Ensign-PAI)
W72-13446

NATURAL VIRUS INACTIVATION PROCESSES IN SEAWATER,
Hadassah Medical School Jerusalem (Israel).
For primary bibliographic entry see Field 05B.
W72-13447

VARIATIONS OF SILVER IN THE SEA WATER AROUND MONACO,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05B.
W72-13449

RADIOMETRIC DETERMINATION OF TRACE AMOUNTS OF ANIONIC SURFACTANTS IN GROUND WATER AND POTABLE WATER,
Liverpool Polytechnic (England). Dept. of Chemistry.
C. G. Taylor, and J. Waters.
Analyst, Vol 97, No 1156, p 533-541, July 1972. 3 fig, 3 tab, 13 ref.

Descriptors: *Water analysis, *Surfactants, *Tagging, *Radiochemical analysis, Pollutant identification, Radioisotopes, Radioactivity techniques, Chemical analysis.
Identifiers: *Radiometric analysis, Anionic surfactants, Iron radioisotopes.

To analyze for anionic surfactants, the water sample is treated with an excess of ferroin solution labeled with iron-59. The solution is extracted with chloroform and the activity of a portion of the extract is measured. The anionic surfactant content of the sample is determined by the standard addition of sodium lauryl sulphate. The application of the method to river-water and tap-water samples gives results that agree with those obtained by using Abbott's methylene blue method. The method requires 30 minutes for each reading. The overall standard deviation for river-water samples has been calculated to be 4.3 percent at the level of 0.1 ppm of sodium lauryl sulphate. The limit of detection is 0.1 microgram of sodium lauryl sulphate (0.005 ppm in a 20-ml sample). Blanks are minimized by extracting at pH 4 with chloroform equilibrated with water by performing only one extraction, by centrifuging for a fixed period and by removing the extract for counting with a capillary device. Nothing interferes when present at the levels that are normally encoutered in river waters. Potential interferences by fluoride or iron are compensated for by the internal standard. (Knapp-USGS)
W72-13457

FIELD STUDY AND MATHEMATICAL MODEL OF THE SLACK-WATER BUILDUP OF A POLLUTANT IN A TIDAL RIVER,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-13494

MALTING EFFLUENTS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-13507

PAPER MILL FIBER AND CHIP TAGGING AND TRACING TECHNIQUE,
Washington State Univ., Pullman. Coll. of Engineering Research Div.; and Washington State Univ., Pullman. Radioisotopes and Radiations Lab.
R. M. Chatters, R. L. Peterson, and R. D. Rice.
Washington State University, Bulletin No. 312, November 1969. 40 p, 15 fig. AEC AT (45-1)-1951.

Descriptors: *Pulp wastes, *Analytical techniques, *Neutron activation analysis, Tracers, Radioactivity techniques, Radioisotopes, On-site tests, Path of pollutants, Pollutant identification.
Identifiers: Metallic salt.

A method was developed for the identification and tracing of one type of wood fiber in the presence of one or more other types of wood fibers. The technique involved treating a small sample of wood chips or fibers with a metallic salt, removal of excess additive, dispersion of the treated chips or pulp into the mill system at any desired point, and subsequent collection of fiber samples downstream in the process lines and effluent streams. Neutron activation analysis techniques were utilized to ascertain the amount, if any, of

treated fibers present in the collected samples. Representive inemill tests in which the technique was employed were presented. (Galwardi-Texas)
W72-13510

HIGH MERCURY AND ANTIMONY CONCENTRATIONS IN CRETACEOUS AND PALEOGENE SEDIMENTS IN THE SOUTHERN KIRGIZ SSR (O POVYSHENNYKH SODERZHANIYAKH RTUTI I SUR'MY V MELOVYKH I PALEOGENOVYKH OTLOZHENIYAKH YUZHNOY KIRGIZII),
Akademiya Nauk Kirgizskoi SSR, Frunze. Institut Geologii.
For primary bibliographic entry see Field 02J.
W72-13597

5B. Sources of Pollution

SANITARY LANDFILLS--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va. 22151, as PB-211 565, Price $3.00 paper copy; $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 72-214, July 1972. 166 p, 120 ref.

Descriptors: *Bibliographies, *Sanitary engineering, *Landfills, *Water pollution sources, *Abstracts, Information retrieval, Publications, Documentation, Waste disposal, Seepage, Groundwater, Infiltration, Leaching, Public health.
Identifiers: *Sanitary landfills, Landfill pollution effects.

Sanitary landfills is one in a series of bibliographies in water resources produced wholly from the information base comprising only Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 41,521 abstracts covering SWRA through May 15, 1972 (Volume 5, Number 10). A descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper has been indexed. It represents weighted terms that best describe the information content. A comprehensive index represents all of the descriptors and identifiers by which each paper has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending Accession Number order. An author index is included. (Woodard-USGS)
W72-13043

INTERACTION OF HERBICIDES AND SOIL MICROORGANISMS.
Boyce Thompson Inst. for Plant Research Inc., Yonkers, N.Y.
For primary bibliographic entry see Field 05C.
W72-13044

DETECTION OF ABANDONED UNDERGROUND COAL MINES BY GEOPHYSICAL METHODS.
HRB-Singer, Inc., State College, Pa. Environmental Sciences Branch.

Copy available from GPO Sup Doc EP2.10:14010 EHN 04/71, $1.00; microfiche from NTIS as PB-211 554, $0.95. Environmental Protection Agency Water Pollution Control Research Series, 04/71, April 1971. 95 p, 29 fig, 5 tab, 90 ref. EPA Program 14010 EHN 04/71.

Descriptors: *Water pollution sources, *Coal mine wastes, *Mine drainage, *Surveys, Analytical techniques, Water pollution control, Fractures (Geologic), Locating, Methodology, Remote sensing, Photogrammetry, Electrical resistance, Seismographs.
Identifiers: *Abandoned coal mines.

Acid drainage produced by abandoned coal mines continues to cause serious water pollution problems. Without knowing the exact location of the concealed openings and the extent of the mine, source abatement techniques are virtually impossible. Drilling is the only known method for accurately determining the location and extent of the mine voids, but this is extremely expensive. This project attacks the problem through field studies of the following geophysical methods: electrical resistivity, self-potential, infrared radiometry, total field and differential magnetometry, seismic refraction and reflection, very low frequency electromagnetic and induced polarization over well-documented, drift, coal mines. Airborne infrared radiometry proved to be an excellent tool for detecting and mapping acid mine/fresh water sources, acid mine/ fresh water drainage, and fracture traces under selected conditions. Resistivity and magnetics anomalies coincide with some drift mine entries. Induced polarization data show some correlations with mine workings. Other methods tested did not yield correlatable information. Conventional geophysical approaches to this problem do not appear adequate for the task. Unconventional approaches including high frequency seismic, shear wave seismic, and induced polarization methods may provide answers pending their further development. (Woodard-USGS)
W72-13045

DEGRADATION OF UREA IN CONCENTRATED AQUEOUS SOLUTION,
Connecticut Unit., Storrs. School of Pharmacy.
H. L. Welles, A. R. Giaquinto, and R. E. Lindstrom.
Journal of Pharmaceutical Sciences, Vol 60, No 8, p 1212-1216, August 1971. 3 fig, 4 tab, 18 ref. OWRR A-024-CONN (2).

Descriptors: *Water pollution sources, *Chemical reactions, *Urea, *Degradation (Decomposition), *Aqueous solutions, Laboratory tests, Hydrolysis, Temperature, Specific conductivity, Solubility.
Identifiers: Concentrated aqueous solutions.

The degradation of urea in concentrated solutions is a reversible reaction. Accordingly, the overall process will reach an equilibrium at a point in time that is dependent upon the temperature and urea concentration. The indications are that the amount of contaminant produced, presumably in the form of ammonium cyanate, is negligible for many current applications of concentrated urea solutions. Furthermore, unless the experiment demands, and unless the experiment is of relatively short duration, it is pointless to strive for ultrapure urea to be used in preparing concentrated solutions. The observations made show that at 25, 35, and 45 deg, it would take but 23, 2.5, and 1 hr., respectively, for a solution of ultrapure urea to reach the same specific conductance level as the solutions prepared from reagent grade unrecrystallized urea. (Woodard-USGS)
W72-13048

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley; California Univ., Irvine; California Univ., Davis; California Univ., Los Angeles; California Univ., Riverside; and California Univ., Santa Barbara.
For primary bibliographic entry see Field 07B.
W72-13052

AN ANNOTATED BIBLIOGRAPHY OF REMOTE SENSING OF AIR AND WATER POLLUTION,
Iowa Univ., Iowa City.
For primary bibliographic entry see Field 05A.
W72-13055

ROLE OF QUINONE GROUPS IN SOLUBILITY AND COMPLEXING OF METALS IN SEDIMENTS AND SOILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology Div.
M. A. Rashid.
Chemical Geology, Vol 9, No 4, p 241-247, June 1972. 1 fig, 2 tab, 28 ref.

Descriptors: *Humic acids, *Chelation, *Organic matter, *Soil chemistry, *Geochemistry, *Biochemistry, Water chemistry, Chemical precipitation, Oxidation, Reduction (Chemical), Trace elements.
Identifiers: *Quinones, *Complexes (Chemical).

Benzoquinone is present in natural humic acids along with other forms of quinone compounds. In laboratory tests it solubilized from 8.3 to 118.8 mg of Cu, Zn, Co, Mn, and Ni per gram of organic matter as compared with 54.0 to 250.0 mg by pure humic acid. From 1.5 to 8.5% of the total metal-solubilizing capacity of humic acid appeared to arise from the reaction of quinones. The infrared analyses suggest that the quinone groups are participating in organometal reactions. The intensity of quinone a absorption was reduced and shifted to lower frequency when benzoquinone reacted with metals. The metal-solubilizing properties of quinones, together with their unusual stability in the geological column, may play a significant role in the concentration of metals in the substrate. (Knapp-USGS)
W72-13059

LAKE WATER QUALITY PREDICTIONS,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05C.
W72-13060

EFFECTS OF TIDAL FLATS ON ESTUARINE WATER QUALITY,
Oregon State Univ., Corvallis.
D. A. Bella, A. E. Ramm, and P. E. Peterson.
Journal of Water Pollution Control Federation, Vol 44, No 4, p 541-556, April 1972. 7 fig, 4 tab, 67 ref.

Descriptors: *Tidal marshes, *Estuaries, *Water quality, Biochemistry, Water chemistry, Dissolved oxygen, *Sulfides, Iron, Sulfur bacteria, Aquatic bacteria, Ecology, *Path of pollutants, Sulfite liquors, Pulp wastes, Oxidation-reduction potential.
Identifiers: *Tidal flats.

After defining a conceptual model of a tidal flat system, the production, diffusion, and oxidation of free sulfides within this system are discussed along with the benthal oxygen uptake of tidal flat deposits. Data concerning the vertical distribution within sediments of total aerobic bacteria, sulfate reducing bacteria, total sulfides, redox potential, volatile solids, and particle size are presented. A simplified mathematical model describes the diffusion of dissolved oxygen and free sulfides and their chemical reaction within the aerobic zone of the deposit. Mathematical model and field results demonstrate that both dissolved oxygen and free sulfides may be present in significant quantities within the water above the deposits. (Knapp-USGS)
W72-13063

EXPLORATION OF MULTIPHASE FLUID FLOW IN A SALINE AQUIFER SYSTEM AFFECTED BY GEOTHERMAL HEATING,
Alabama Univ. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 02F.
W72-13064

EFFLUENT CHARACTERISTICS OF BLEACHED KRAFT PULP MILLS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05C.
W72-13108

RESIDUES OF ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN SOME COMMERCIALLY PRODUCED CANADIAN MARINE OILS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
R. F. Addison, M. E. Zinck, and R. G. Ackman.
Journal of the Fisheries Research Board of Canada, Vol 29, No 4, p 349-355, 1972. 1 fig, 3 tab, 26 ref.

Descriptors: *DDT, *Pesticide residues, *Polychlorinated biphenyls, *Dieldrin, *Oil, Water pollution effects, Chlorinated hydrocarbon pesticides, Aroclors, Herrings, Atlantic Ocean, Path of pollutants, Water pollution, Fish physiology, Antarctic, Public health.
Identifiers: *Whale oil, *Fish oil, *Herring oil, *Seal oil, Seals (Mammals), Seafood.

Herring oils produced in the late 1960s from Gulf of St. Lawrence fish generally contained 7-17 mg/l DDT complex, 0.1 mg/l dieldrin, and up to 11 mg/l PCB's. In spring, oils were richer in residues than in autumn. Seal oils contained up to 8 mg/l DDT complex, and about 4 mg/l PCB's, but no dieldrin. Residue levels showed no marked change from the mid-1950s to mid-1960s. North Atlantic whale oils contained up to 40 mg/l DDT complex, and (in a few samples only) about 7 mg/l PCB's; no dieldrin was found. Some Antarctic whale oils produced about 1950 contained 0.1 mg/l DDT complex and no detectable PCB's. (LeGore-Washington)
W72-13114

THE AUTHORITATIVE PRIMER - GROUND WATER POLLUTION.

Water Well Journal, Vol 24, No 7, July 1970, p 31-67.

Descriptors: *Groundwater, Groundwater movement, *Pollution abatement, *Pollutant identification, *Water wells, Standards, *Governmental interrelations, Injection wells, Legislation.
Identifiers: *Pollution controls, *Certification examinations, Laws, Governmental responsibilities, Availability of groundwater, *Sanitation.

This special issue of Water Well Journal is devoted to the topic of ground water pollution. It is a collection of ideas on the subject which have been published by the Journal for the decade 1960-1970 and is organized into separate articles discussing subdivisions of the topic. Listed separately are acknowledgements and references used in preparation of the issue. (See also W72-09127) (Campbell-NWWA)
W72-13152

ROCK SALT AS AN URBAN TRACER,
Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
W. S. Broecker, B. Schwartz, N. Sloan, and P. Anconda.
Available from the National Technical Information Service as CONF-710531-1, $3.00 in paper copy, $0.95 in microfishe. Paper presented at Street Salting-Urban Water Quality Workshop, State University Water Resources Center, College of Forestry, Syracuse, New York, May 6, 1971. 23 p, 10 fig, 2 tab, 1 ref. AEL AT (11-1)-3135.

Descriptors: *Water quality, *Highway effects, *Groundwater movement, *Tracers, *Groundwater pollution, *Groundwater recharge, Water conservation, Water supply, Municipal water, Time lag, On-site data collections, Sodium chloride, Water analysis, Water chemistry, Trace elements, Deicing, Street runoff, Roads, Snow removal, Highway icing, On-site investigations, Water measurement, Urban hydrology.

Measurements are reported of chloride ion content of surface waters in the suburban area northwest of New York City. The purpose was to determine whether the temporal and geographic distribution of the chloride ion resulting from applications of road deicing salts could be used to determine the time constant for ground water renewal. However, the sodium chloride contained in ground and surface waters of urban areas in the northeast and north central United States is not dominantly derived from this source. The study team hopes to make an estimate of the chloride retention time of the ground water system by refining estimates of the amount of road salt added during the past decade to the drainage basin of the Oradell reservoir and comparing this to the annual amount of chloride ion leaving this basin. Much of the surface drainage from Rockland County and Northern Bergen County passes through the Oradell Reservoir. Records and data on salt spreading operations in these areas were studied. The preliminary study clearly showed that chloride ion added to the ground waters of the New York area provides a valuable indicator of the retention time of soluble pollutants in the ground water system. This tracer can be used on a time scale of years (the exponential rise of salt usage), of months (the seasonal usage of salt) and of hours (the change in chloride produced by a single rain). Such information is necessary to any study of the flow of more hazardous pollutants through these systems. (Poertner)
W72-13164

TOXICITY OF COMBINED CHLORINE RESIDUALS TO FRESHWATER FISH,
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
For primary bibliographic entry see Field 05C.
W72-13174

MECHANISM OF DEGRADATION OF WOOD AND PULP PRODUCTS IN WATER SOLUTION,
Arizona Univ., Tucson. Dept. of Chemistry.
C. Steelink, and S. I. Clove.
Available from the National Technical Information Service as PB-211 645, $3.00 in paper copy, $0.95 in microfiche. Completion Report, August 3, 1972. 5 p, 1 ref. OWRR A-033-ARIZ (1).

Descriptors: *Lignin, *Pulp wastes, Fungi, Degradation (Decomposition).
Identifiers: *Fungal degradation, *Alkaline degradation, *Quinones, *Polyporus spp.

The degradation of wood and pulp products was carried out by two methods: microbiological and chemical. Each method was used to determine the nature of the degradation products and the types of experimental conditions which would favor optimum decomposition of the lignin macromolecule, the intractable part of the waste material. A number of wood-rotting fungi were cultivated on various phenolic substrates..The POLYPORUS species were shown to be most active in their ability to degrade these substances. Commercial lignin preparations were subsequently used as substrates. The low-molecular weight fractions were preferentially degraded by the POLYPORUS species. Another series of experiments focused on the formation of dark-colored substances in wood and pulp solutions. The identities of some of these chromophores was established, and the mechanism by which they are formed was elucidated. Alkaline processing of hardwood tissue results in effluents which contain quinones, some of which have antibacterial properties.
W72-13181

SOME ASPECTS OF ANALYZING TRANSVERSE DIFFUSION IN RIVERS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13202

NONIONIC DETERGENT DEGRADATION: III. INITIAL MECHANISM OF THE DEGRADATION,
Laboratory of the Government Chemist, London (England).
S. J. Patterson, C. C. Scott, and K. B. E. Tucker.
Journal of American Oil Chemists' Society, Vol 47, No 2, February 1970, p 37-41. 1 fig, 3 tab, 9 ref.

Descriptors: *Detergents, *Degradation (Decomposition), *Analytical techniques, *Chromatography, Oxidation, Hydrolysis, Hydrogen ion concentration, Water pollution sources, Pollutant identification.
Identifiers: *Thin layer chromatography, Alcohol ethoxylates, Alkyl phenol ethoxylates.

The initial mechanism of degradation of a number of commercially available alcohol polyethoxylates and alkylphenol polyethoxylates was investigated utilizing thin layer chromatography. Results showed that in the case of the readily degradable alcohol ethoxylates, two distinct mechanisms proceed simultaneously: a fission of the molecule into hydrophobic and hydrophibic entities, and a rapid oxidation of the hydrophobic group. No fission occurred in the case of the alkyl phenol ethoxylates, the more usual route of degradation being slow oxidation and hydrolysis of the alkyl groups, the aromatic ring and the ethoxy chain simultaneously. Occasionally, and at higher pH values, the hydrolysis of the ethoxy chain proceeded at a considerable increased rate. (Galwardi-Texas)
W72-13246

ON THE HYDROGEOLOGY OF THE COASTAL REGION OF SOUTHEASTERN FINLAND,
Geological Survey of Finland, Otaniemi.
For primary bibliographic entry see Field 04B.
W72-13265

ANALYSIS OF A NETWORK-MODEL FOR DISPERSIVE FLOW,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 02F.
W72-13267

RADIOLOGICAL SURVEYS OF PEARL HARBOR, HAWAII, AND ENVIRONS, 1966-1968,
Eastern Environmental Radiation Lab., Montgomery, Ala.
D. F. Cahill, H. D. Harvey, Jr., D. C. McCurry, W. D. Breakfield, and A. A. Moghissi.
Radiation Data and Reports, Vol 13, No 6, p 323-334, June 1972. 8 fig, 3 tab, 7 ref.

Descriptors: *Nuclear wastes, *Nuclear energy, *Submarines, *Harbors, *Water pollution sources, Sediments, Investigations, Sampling, Radioactive wastes, Water pollution effects, Radioactivity, Radiochemical analysis, Data collections, Environmental effects, Ecology, Cobalt radioisotopes.
Identifiers: *Pearl Harbor (Hawaii), Cobalt-60.

From April 1966 through June 1968, surveys were undertaken to determine whether nuclear submarine operations, which include berthing, repair, and servicing, had resulted in radioactivity levels in the harbor which could contribute a detectable radiation exposure to the public. The conduct of the onsite surveys performed at Pearl Harbor are described. Small but detectable quantities of cobalt-60 were found exclusively in the sediment phases of the harbor. Neither the harbor water nor any other environmental samples contained detectable cobalt-60 activity. The total amount of cobalt-60 in the harbor sediment is small compared to the natural radioactivity present in Pearl Harbor and decreased significantly from 1966 to 1968. The levels of cobalt-60 activity in the harbor were well below levels that could contribute a detectable radiation exposure to the public and do not constitute a hazard to public health or the environment. Cobalt-60 and possibly other neutron-activated corrosion products are released in a form which is not biologically available to marine or other forms of life. (Woodard-USGS)
W72-13271

A REVIEW OF CARBON MONOXIDE SOURCES, SINKS, AND CONCENTRATIONS IN THE EARTH'S ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
M. H. Bortner, R. H. Kummler, and L. S. Jaffe.
Available from NTIS, Springfield, Va 22151- NASA CR-2081 Price $3.00 paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2081, June 1972. 51 p, 15 fig, 6 tab, 74 ref. NASI-10139.

Descriptors: *Carbon, *Gases, *Toxins, *Atmosphere, *Hydrologic cycle, Environmental effects, Rain water, Oceans, Surface waters, Path of pollutants, Air pollution, Water pollution sources, Self-purification, Water chemistry, Chemical reactions.
Identifiers: *Carbon monoxide, Biological sinks.

Carbon monoxide (CO) is a toxic pollutant which is continually introduced into the earth's atmosphere. There are apparently some mechanisms operating which destroy most of the CO in the atmosphere, i.e., a carbon monoxide 'sink.' The various possible removal mechanisms which warrant serious consideration are discussed. Particular emphasis is given to chemical reactions, soil bacteria and other biological action, and transport effects. The sources of CO, both natural and anthropogenic, are reviewed. Atmospheric CO concentrations and their implications on the hydrologic cycle are discussed. (Woodard-USGS)
W72-13273

TRAVELTIME AND CONCENTRATION ATTENUATION OF A SOLUBLE DYE IN THE MONOCACY RIVER, MARYLAND,
Geological Survey, Parkville, Md.
K. R. Taylor.
Maryland Geological Survey Information Circular 9, 1970. 23 p, 9 fig, 4 tab, 7 ref.

Descriptors: Water pollution sources, *Tracking techniques, *Fluorescent dye, *Path of pollutants, *Maryland, Rivers, Tracers, Streamflow, Flow rates, Industrial wastes, Travel time, Forecasting, Analytical techniques, Water quality control.
Identifiers: *Monocacy River (Md).

Three time-of-travel studies using a fluorescent dye were made on the Monocacy River in Maryland during 1967 and 1968 at flow-duration points of approximately 95%, 70%, and 35%. Time-distance relations are defined by these studies for a range of discharges from 100 cfs to 1,000 cfs at the index gage. These relationships will enable water users to predict the traveltimes of the leading edge, peak concentration, and trailing edge of a soluble contaminant spilled into the river. Graphs are used to predict that the maximum concentration expected at the Frederick filtration plant resulting from a contaminant spill at Keysville Road bridge at an index flow of 100 cfs is only 20% greater than that expected for a similar spill at an index flow of 400 cfs. At 100 cfs flow, the time required for the contaminant to pass the filtration plant intakes is over four times as long as that for a flow of 400 cfs. At an index flow of 100 cfs, over 30 days would be required to flush the river of a contaminant spilled at the Maryland-Pennsylvania State line. (Woodard-USGS)
W72-13277

EROSION OF SOME BULGARIAN SOILS BY IRRIGATION (IRRIGATSIONNAYA EROZIYA PRI SAMOTECHNOM OROSHENII NEKOTORYKH POCHV BOLGARII),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
For primary bibliographic entry see Field 02J.
W72-13283

CONTENT OF TOXIC SALTS IN WATER EXTRACTS AND SOIL SOLUTIONS OF GYPSUM--BEARING SOILS IN THE GOLODNAYA STEPPE (SODERZHANIYE TOKSICHNYKH SOLEY V VODNYKH VYTYAZHKAKH I V POCHVENNYKH RASTVORAKH GIPSONOSNYKH POCHV GOLODNOY STEPI),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 02G.
W72-13285

SEDIMENT WATER INTERACTIONS IN SOME GEORGIA RIVERS AND ESTUARIES,
Georgia Inst. of Tech., Atlanta, Environmental Resources Center.
For primary bibliographic entry see Field 02K.
W72-13299

A PREDICTIVE MODEL FOR THERMAL STRATIFICATION AND WATER QUALITY IN RESERVOIRS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons' Lab. for Water Resources and Hydrodynamics.
M. Markofsky, and D. R. F. Harleman.
Available from GPO Sup Doc EP2.10:16130-DJH-01/71, $2.00; microfiche from NTIS as PB-211 621, $0.95. Environmental Protectis Agency Water Pollution Control, Research Series, January 1971. 283 p, 77 fig, 8 tab, 57 ref. EPA Program 16130 DJH 01/71.

Descriptors: *Reservoirs, *Density stratification, *Water quality, Forecasting, Mathematical models, Flow characteristics, Dye releases, Laboratory tests, Model studies, Estimating, Thermal pollution, Path of pollutants.

Modifications are made on a one-dimensional analytical thermal stratification prediction method to include the time required for the inflowing water to reach the dam face. A one-dimensional water quality model is developed which incorporates the internal flow pattern predicted for a stratified reservoir from the temperature model. The water quality model is designed to predict the concentration of particular water quality parameters in the outflow water as a laboratory reservoir. Good agreement is obtained between measured and predicted concentration values. The application of the mathematical model to a field case of practical interest is demonstrated by solving the coupled set of water quality equations for B.O.D. and D.O. predictions in Fontana Reservoir. Direct comparisons of the water quality model predictions with the field measurements are limited by the lack of input data. A sensitivity analysis to various assumptions on the input data is made in order to illustrate the mechanics of the water quality prediction model. It is concluded that the model is capable of predicting the effect of reservoir impoundments on water quality. (Eagle-Vanderbilt)
W72-13309

PREDICTIONS OF TEMPERATURE IN STREAMS RECEIVING THERMAL DISCHARGES BY USING A DETERMINISTIC MODEL AND COMPUTER TECHNIQUE,
F. Berger, and W. Schmitz.
Preprint 6th International Water Pollution Research Conference, Session 1, Hall A, Paper No. 2, June 19, 1972. 7 fig, 4 ref.

Descriptors: *Water temperature, *Streams, *Thermal pollution, *Computers, Mixing, Heat budget, Mathematical models, Thermal powerplants, Weather, Planning.
Identifiers: *Rhine River.

The effect of a thermal discharge into a river on the temperature of the water is not only due to mixing, but to interference with the natural heat budget of the flowing water. The principle of including the heat budget into the calculations was applied in a study to predict temperature changes expected to occur in the River Rhine between the mouth of the tributary Aare and the city of Basel after the installation of power plants in the future. The calculations of temperatures are made on a computer in the form of a one-dimensional deterministic model assuming some simplification of natural events. The temperature of the water at one-hour intervals was calculated for varying weather conditions, combinations of run-off, and initial water temperatures. Temperatures at the farthest point can be predicted to give the expectancy in number of days of exceeding certain water temperatures. Temperatures calculated from the model are in good agreement with water temperatures recorded at the Aare confluence and at Basel for observed weather conditions. The predictions can give an estimate of the duration that restrictions will be necessary on proposed powerplants if a particular upper limit of water temperature is required. (Eagle-Vanderbilt)
W72-13310

MIXING OF MERGING BUOYANT JETS FROM A MANIFOLD IN STAGNANT RECEIVING WATER OF UNIFORM DENSITY,
California Univ., Berkeley. Hydraulic Engineering Lab.
P. Liseth.
Technical Report HEL 23-1, November 1970. 181 p, 39 fig, 27 ref.

Descriptors: *Design criteria, *Outlets, *Jets, *Waste disposal, *Model studies, *Discharge coefficient, *Buoyancy, *Mixing, Waste dilution, Diffusion, Velocity.
Identifiers: *Manifold, *Merging buoyant jets, Port spacing, Port size.

The mixing of buoyant jets from a long manifold discharging into a stagnant body of water of uniform density has been studied by means of hydraulic model experiments, in order to provide the basis for design of a manifold with respect to port spacing, port size and discharge velocity of the jets. The dilution and flow pattern of buoyant jets from a manifold is altered if merging of the jets takes place. The ratio between vertical distance y above the manifoldto the port spacing L, is determines the effects of merging. For values of y/L between 9 and 5 no significant differences in the center dilution was observed as compared to that of a single jet. For y/L greater than 5 the jets gradually merged into a two-dimensional plume, cuasing a rapid reduction in the center dilution of jets, which is highest for y/L from 5 to 10. (Oleszkiewicz-Vanderbilt)
W72-13312

AN INVESTIGATION INTO THE EFFECT OF AN INDUSTRIAL HEAT AND MOISTURE SOURCE ON LOCAL ATMOSPHERIC CONDITIONS,
Naval Postgraduate School, Monterey, Calif.
J. C. Draft.
Available from the National Technical Information Service as AD-733 227, $3.00 in paper copy, $0.95 in microfiche. M.S. Thesis, September 1971. 78 p, 40 fig, 2 tab, 7 ref.

Descriptors: *Moisture, *Heat, *Meteorology, *Thermal powerplants, Industrial wastes, Atmosphere, *Air pollution, Temperature, Humidity, Vapor pressure, *Thermal pollution.
Identifiers: Helicopter aerograph, Inversion.

Using a steam generating plant as the source, an investigation was made into the local atmospheric effect of a large industrial heat and moisture source. Measurements were made on the California coast where there are common and persistent inversions. Data collection was attempted with ground- and helicopterborne equipment with a final resort to the helicopter when the ground equipment collection techniques proved unsatisfactory. Temperatures, vapor pressures, and humidity were measured. Mixing ratios were generated and vertical cross sections of temperature and mixing ratio were used to display the data. The effect of emissions from a steam power plant appears to be very strongly tied to the position of the inversion with respect to stack height and also to cloud structure, if clouds are present. If the inversion is above stack level, the base appears to be lowered in the vicinity of the source. If clouds are present, the emitted moisture tends to thicken the clouds or at least lower the cloud bases and probably the associated inversion. If the inversion base is below the stack level or there is no inversion, then it appears that the wind regime becomes important. It is apparent that the atmospheric moisture content is much more sensitive to the discharges of the stacks than is the temperature structure. (Eagle-Vanderbilt)
W72-13313

STREAM TEMPERATURE RESPONSE TO THERMAL POLLUTION,
Vanderbilt Univ., Nashville, Tenn. Dept. of Sanitary and Water Resources Engineering.
V. Novotny, and P. A. Krenkel.
Preprint, 6th International Water Pollution Research Conference, Session 1, Hall A, Paper No. 1, June 19, 1972. 7 p, 3 fig, 6 ref.

Descriptors: *Mathematical model, *Temperature, *Thermal pollution, *Streams, Rivers, Streamflow, Heat transfer, Air-water interfaces.
Identifiers: Exchange coefficients.

A mathematical model describing temperature changes in rivers was developed which takes the differences between stream flow and lakes and reservoirs into account. There are many basic differences between these two types of heat transfer phenomena; the most significant one being the dynamic character of the air-water interface where both boundaries are moving. It was concluded that, in most cases, the heat exchange between air and flowing water is governed by the heat, vapor, and radiation exchange rate in the air boundary layer. The heat (vapor) exchange coefficient in the air boundary layer is dependent on a characteristic length of the boundary layer formation and on the vectoral subtraction of the wind and water surface velocities. The heat transfer equation is divided into two simultaneous equations, one describing the natural temperature and the other depicting the steady decay of the thermal load. Costly and sometimes inaccurate measurements of cloud cover, solar radiation, and humidity are not necessary inasmuch as the overall heat exchange coefficient, K, is dependent only on wind velocity, stream surface velocity, air temperature and, to a lesser extent, on the area of the water surface. (Eagle-Vanderbilt)
W72-13315

COLUMBIA RIVER THERMAL EFFECTS STUDY - VOLUME 2 - TEMPERATURE PREDICTION.
Environmental Protection Agency, Seattle, Wash. Region X.

January, 1971, 64 p, 7 fig, 5 tab, 20 ref.

Descriptors: *Water temperature, *Forecasting, *Columbia River, *Mathematical models, Discharge, Reservoirs, Stratification, Climatic data, Hydrology, Estuaries, Meteorology, *Thermal pollution, Water quality standards.
Identifiers: Temperature prediction.

The Columbia River temperature model, consisting of the weakly stratified and the river run reservoir models, has been verified to simulate river temperatures from the Canadian - U.S. border to Bonneville Dam. For six simulations with differing input conditions, the maximum average error was 1.2 F and the maximum standard deviation was 2.4 F. The weakly-stratified reservoir model contributed 12 percent of the total downstream temperature error at the Snake River and 17 percent of the total error at Bonneville Dam. From April through November, 1967, the heat added to the river from the Hanford reactor complex raised the simulated water temperature an average of 2 F at the confluence of the Columbia and Snake Rivers. The river-run model is adequate for simulating tidallyaveraged temperatures in the Columbia River estuary. Evaporation was found to be most significant from the first of August to the end of November. (Upadhyaya-Vanderbilt)
W72-13316

SHAPE FACTORS FOR COOLING LAKES,
Towne School of Civil and Mechanical Engineering, Philadelphia, Pa.
J. E. Edinger.
Journal of the Power Division, American Society of Civil Engineers, Vol. 97, No. PO4, p. 861-867, December 1971. 3 fig, 2 tab, 4 ref.

Descriptors: *Thermal powerplants, *Heated water, Electric power, Intakes, Condensers, Heating, Heat transfer, Advection, Relocation, Temperature, Heat budget, Mathematical models, Dimensions, *Thermal pollution.
Identifiers: *Shape factor, *Cooling ponds.

Cooling lakes have many sidearms and tributary embayments. A method is presented to determine the effective surface area and the amount it would change by changing inlet and discharge locations or by changing plant pumping rates. The lake is divided into a main flow area and a series of sidearm areas and heat transfer relations are applied to each portion. A shape factor is determined from the summation of the heat balance of the sidearms. With this model, various intake-discharge schemes could be evaluated for a lake giving the intake-condenser temperature rise ratio. The principles outlined can be extended to lakes that have a large inflow and outflow compared to plant pumping rate. The relationships apply to lakes where vertical mixing between the plant discharge and river inflow is complete and where there are no substantial density underflows through the lake. The equations could also be used to find the surface temperature distribution. (Eagle-Vanderbilt)
W72-13318

SPRAY POND MATHEMATICAL MODEL FOR COOLING FRESH WATER AND BRINE,
Oklahoma State University, Stillwater. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 05D.
W72-13320

THE CRISIS IN POWER-PLANT SITING,
Oak Ridge National Lab. Tenn.
M. M. Yarosh.
Journal of Mechanical Engineering, p 10-13, June 1971. 3 fig, 2 tab, 15 ref.

Descriptors: *Electric power demand, *Nuclear powerplants, *Planning, *Thermal powerplants, Thermal pollution, Economic feasibility, Political aspects, Air pollution, Resources development, Cooling towers, Offshore platforms, Islands, Radioactivity, Safety, Water pollution.
Identifiers: *Fossil-fuel powerplants, Underground power transmission.

If future power shortages are to be averted in the United States, approximately 250 new steam electric power plants, each of over 500-Mw capacity, will be required by 1990. Difficulties in finding acceptable sites for these plants are due to economic, safety and environmental constraints. Possible solutions to siting problems such as an underground cryogenic power transmission system and dry-cooling towers are reviewed and found to have limited application. Offshore power plants are viewed as a possible solution to many siting problems. Long-range regional and national planning of energy requirements and sites is necessary and must include assessments of future demands of air, water and land resources, technical research and development, and social, economic and political considerations. Standards and guidelines for electric utilities, methods of streamlining site approvals and greater utility recognition of responsibility concerning environmental problems are also necessary. Figures show how power plant size has increased with time, give projected locations of power plants with above 500-Mw capacity in 1990, and show population near some reactor plants as a function of distance from the plant. Statistics concerning electrical power consumption and sources of air pollution are also included. (Bass-Vanderbilt)
W72-13321

THE CONTROL OF RIVER HEATING BY ACCURATE DIGITAL SIMULATION,
Motor-Columbus Engineering Co., Baden (Switzerland).
For primary bibliographic entry see Field 05G.
W72-13322

NUCLEAR POWER PLANTS: FEWER AND FARTHER BETWEEN.

Chemical Week, Vol 109, No 18, p 15-16, November 3, 1971. 1 photo.

Descriptors: *Nuclear powerplants, Electric power production, Cooling water, Thermal pollution, Costs, *Chemical Industry.
Identifiers: *Atomic Energy Commission.

A change in AEC certification procedures for nuclear powerplants will bring a short term slowdown in the trend to nuclear power generation. The Atomic Energy Commission decided to accept a court ruling that it scrutinize each nuclear power plant for its total environmental impact, including thermal effects. Previously, AEC certifications were based mainly on such factors as equipment reliability and control of radioactive emissions. The immediate effect will be a delay in the startup of some 120 nuclear power units in various stages of design, construction, and alteration. Implications for the chemical process industries are: (1) a slowdown in demand for fuel, coolants, moderators and other components of nuclear power plants, (2) higher costs of fossil fuels (coal, petroleum and natural gas) and fossil fuel derivatives that are used as chemical feedstocks, (3) spot shortages of low-cost, interruptible power for aluminum smelters, chlor-alkali plants and other large users of electricity. In the long run the nuclear power industry is expected to have a growth rate of roughly 15% per year. (Eagle-Vanderbilt)
W72-13324

'REAL-TIME' THERMAL-PROFILE MONITOR IS GIVEN A CHECKOUT.

Electrical World, p 46-47, January 1, 1972.

Descriptors: *Monitoring, *Temperature, *Thermal pollution, *Electric powerplants, Regulation, Profiles, Electronic equipment, Data collections.

An automated temperature-monitoring system for determining real-time thermal profiles of powerplant water bodies produces data which can be used as an indication whether or not a power plant will meet thermal-discharge requirements and regulations. The monitoring system consists of telemetering buoys and a shore-based data-collection and processing center. In a study at Boston Edison's Pilgrim station, telemetering buoys were located at fixed sites, determined from thermal-plume isotherm maps. Continuous temperature signals were transmitted to shore by underwater cable. The system was found to offer great flexibility in number and location of data buoys. Long periods of unattended operation are possible. (Eagle-Vanderbilt)
W72-13327

PROJECTION AND DISTRIBUTION OF WASTE THERMAL ENERGY,
Rand Corp., Santa Monica, Calif.
S. M. Greenfield.
Available from the National Technical Information Service as AD-731 259, $3.00 in paper copy, $0.95 in microfiche. Rand Paper P-4540, December 1970. 6 p, 2 fig, 1 tab, 1 ref.

Descriptors: *Projections, *Energy loss, *Heat, Spatial distribution, Electric power, Evaporation, Heated water, *Thermal pollution.

The world estimate of total thermal energy available as waste heat for the environment is, at best, crude. The rate of increase of electrical power cannot be distinguished from the total energy used from information available. The rate of increase from 1957 to 1967 and the rate from 1964 to 1967 were examined. The smallest rate is assumed to apply to the period between 1970 and 2000. Projections of thermal waste energy are made for 1970, 1980, and 2000 for worldwide geographic locations, based on a U.N. paper. Projected yearly thermal energy release is also shown for two areas of the U.S., a growing urban area (Los Angeles) and a larger area in North Central New England and the Mid-Atlantic States. It is estimated that 15 to 30 percent of this heat energy will go into the atmosphere by the evaporation-latent heat route and most of the remainder of the heat will go through the sensible heat route. (Eagle-Vanderbilt)
W72-13331

MERCURY IN SEDIMENTS FROM THREE VIRGINIA ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
R. J. Huggett, M. E. Bender, and H. D. Slone.
Chesapeake Sci, Vol 12, No 4, p 280-282, 1971.
Identifiers: *Estuaries, *Mercury, *Sediments, *Virginia, Organic matter, Water pollution sources.

A survey of Hg levels in sediments (< 63 microns) from Virginia's 3 main estuaries was conducted. Results indicated that the Hg was associated with the organic fraction of the bottom material. Statistical analyses showed no differences (5% significance level) within rivers with respect to distance from the mouth or between rivers. Comparison of the estuarine levels to those of oceanic and freshwater sediments show the oceanic to be more closely related to the estuarine with respect to Hg concentrations.--Copyright 1972, Biological Abstracts, Inc.
'V72-13336

COMPARISON OF MERCURY LEVELS IN AN OLIGOTROPHIC AND A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W72-13340

ON THE CONTENT OF COBALT IN WATER MEDIUM (K OBSAHU KOBALTU VE VODNIM PROSTREDI),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
O. Albertova.
Bulletin VUR Vodnany, No 3, p 33-41, 1970. 6 tab, 31 ref. English Summary.

Descriptors: *Cobalt, *Aquatic environment, *Aquatic life, *Reviews, Aquatic plants, Mud, Plankton, Fish, Analytical techniques, Bioassay, Assay, Neutron activation analysis, Colorimetry.
Identifiers: Activation analysis, 2-nitroso-1-naphtol, N-R-S salt.

Literature data concerning cobalt in the water medium are surveyed. Results of determinations of cobalt in experimental organisms after the addition of cobalt to feed and to the water medium are mentioned. Cobalt content in some water plants, in mud, plankton and fish, obtained through activation analysis and colorimetrically through the use of 2-nitroso-1-naphthol and N-R-S salt are presented. The checking of the method of the determination of cobalt content in fish through separation by means of 1-nitroso-2-naphthol, and through direct determination by means of N-R-S salt revealed that only 70% of the cases of cobalt could be found on repetition of the analysis. For this reason, the method could not be used. (Svensson-Washington)
W72-13345

POLLUTION OF WATERS IN CZECH SOCIALIST REPUBLIC IN RELATION TO FISHERIES (ZNECISTOVANI VOD V CSR VE VZTAHU K RYBARSTVI),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
J. Havelka, and J. Kavalec.
Buletin VUR Vodnany, No 4, p 3-7, 1971. 2 fig. English summary.

Descriptors: *Water pollution sources, *Water pollution control, *Fishing, Analysis, Fisheries, Commercial fishing, Sport fishery.
Identifiers: *Czechoslovakia, Economy, Permanent pollution, Emergency pollutions.

An analysis is presented of the causes and extent of emergency and permanent pollution of waters covered by the Czech Anglers' Union. The analysis contains the proportions of different pollution sources according to the type of production which devastate the waters and cause losses in the fishing economy; these data cover the past five years. At the same time emphasis is laid on the active efforts of the fishing organizations and research in the avoiding and elimination of the losses caused by pollution. (Svensson-Washington)
W72-13346

SLUDGE DUMPING IN THE FIRTH OF CLYDE,
Clyde River Purification Board, East Kilbride (Scotland).
D. W. Mackay, W. Halcrow, and I. Thornton.
Marine Pollution Bulletin, Vol 3, No 1, p 7-11, January 1972. 6 fig, 5 tab, 13 ref.

Descriptors: *Sewage sludge, *Heavy metals, *Estuarine environment, Aquatic animals, Aquatic environment, Trace elements, Lead, Copper, Chromium, Zinc, Nickel, Cadmium, Manganese, Titanium, Sediments, Molybdenum, Industrial wastes, Geochemistry.
Identifiers: Gallium, Silver, Tin, Crangon spp., Pandalus spp., Buccinum spp., *Firth of Clayde.

Sewage sludge contaminated with a variety of heavy metals has been dumped into the Firth of Clyde for some years. Since 1969 a survey of heavy metal contamination of sediments and animals has been carried on. The findings are summarized. Trace elements studied include lead, copper, chromium, zinc, nickel cadmium, manganese, titanium, molybdenum, gallium, silver and tin. All except manganese tended to have higher values in the center of the dumping ground. Copper, lead, tin and zinc showed strong association with organic matter, while cobalt and iron were correlated to a lesser extent, and nickel and manganese appeared to be independent. Animals from near the center of the deposit area contained considerably higher levels of trace elements than those from further afield. The dumping ground showed a marked departure in fauna from its surrounding area. (Svensson-Washington)
W72-13351

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.

Available from the National Technical Information Service as PB-210 355, $4.85 in paper copy, $0.95 in microfiche. National Water Commission Report, NWC-EES-72-046, May 1972, 79 p.

Descriptors: *Electric power production, *Thermal pollution, *Electric powerplants, *Cooling water, *Water pollution, *Planning, *Forecasting, Heat transfer, Thermodynamics, Thermal capacity, Aquatic environment, Cooling towers, Consumptive use, Electric power demands, Transmission (Electric), Technology, Research and development.
Identifiers: *Site selection.

The cause, magnitude, and possible effects are assessed of heat discharges to water from steam electric power generation and related aspects of condenser cooling system operation. Attention is focused on electrical energy growth and siting requirements, means of more efficiently using electric energy, problems of concentrated heat release, the lack of an adequate environmental research program for determining thermal effects and setting environmental standards, problems related to increased consumptive use of water, the need to more fully consider aspects of steam electric power generation in water resources planning, and the need to establish in national policy a recognition of the waste assimilative capacity of water. The timing and potential impact of technological developments in power generation, condenser cooling, transmission, new siting alternatives, and beneficial and multiple uses of waste heat are assessed in light of their possible effects on reducing waste heat discharge in the near, intermediate and long term. Recommendations are made with the objective of providing better information for making decisions affecting the near to intermediate term. For the longer term, a greatly expanded R and D effort is recommended. (NWC)
W72-13355

STUDIES ON MINERALIZATION OF UREA IN SOME SOILS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Microbiology Dept.
R. Siddaramappa, and Rao T. Seshagiri.
Mysore J Agric Sci. Vol 5, No 2, p 150-158. 1971.
Identifiers: Capacity, India, Mineralization, Nitrogen, *Soils, Transformation, *Urea.

In red sandy loam, laterite and black soil the pattern of transformation of added urea at 200, 400 and 800 ppm N under moisture levels of 40, 60 and 80% of maximum water-holding capacity (MWHC) was studied. After incubation at constant temperature (25 C) soil samples drawn at weekly intervals up to the 6th wk were examined

for pH, ammoniacal and nitrate N. Urease activity was determined in the original soils. At 60% MWHC maximum ammoniacal and nitrate N were produced. Transformation was most rapid in laterite soil followed by red and black soils. Rapidity of transformation increased N concentration up to 400 ppm. Urease activity was highest in laterite soil and lowest in black soil.--Copyright 1972, Biological Abstracts, Inc.
W72-13385

EFFECT OF SOIL TYPE AND IRRIGATION METHOD ON LATERAL MOVEMENT OF CYCLOATE,
Oregon State Univ., Corvallis. Dept. of Farm Crops.
C. E. Stanger, and A. P. Appleby, Jr.
Weed Sci. Vol 19, No 6, p 709-711. 1971.
Identifiers: *Carbamate pesticides, *Path of pollutants, Soil treatment, Cycloate, Echinochloa crusgalli M, Grass M, Irrigation effects, Movement, Soils, Soil types.

In greenhouse studies, lateral movement and toxicity of S-ethyl N-ethylthiocyclohexane-carbamate (cycloate) to barnyardgrass (Echinochloa crusgalli (L.) Beauv.) was greater in a loamy sand soil than in two silt loam soils when cycloate was applied by subsurface line injection. Greatest movement and effectiveness resulted from injection into a preirrigated soil without further irrigation. Lateral movement was adequate under furrow irrigation, but the treated band was displaced. Movement of the cycloate was inadequate under sprinkler or subirrigation. Cycloate was more effective when mechanically mixed with the soil than when injected. Cycloate moved more readily in moist soils than in dry soils. When cycloate was injected into a dry loamy sand soil, movement was similar whether irrigation was applied immediately or after 24 hr.--Copyright 1972, Biological Abstracts, Inc.
W72-13388

POLLUTION OF RESERVOIRS BY CARCINOGENIC HYDROCARBONS,
Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).
A. P. Il'Nitskii, and L. G. Rozhkova.
Vop Onkol. Vol 16, No 7, p 78-82. 1970. Illus. English summary.
Identifiers: *Organic compounds, *Carcinogens, Plankton, Plants, Reservoirs, Silt, USSR, Water pollution, *Benzapyrene.

The results of an investigation of plankton, silt and water plants from reservoirs in Moscow Province are reported. The concentration of benz (a)pyrene (BP) was 4-13 mg/kg in polluted water, 2.5-5 mg/kg in water plants and 1.8-5 mg/kg in silt. In the Moscow river, the BP concentration was 10-100 times higher downstream from the city of Moscow.--Copyright 1972, Biological Abstracts, Inc.
W72-13397

HYGIENIC EVALUATION OF THE APPLICATION CONDITIONS OF HERBICIDES IN RICE GROWING,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. S. Buryi, V. A. Zakordonets, and N. A. Popovich.
Gig Sanit, Vol 35, No 5, p 98, 1970.
Identifiers: *Path of pollutants, *Herbicides, *Rice M.

Study of a 2756 ha rice field and the effect of its 12-15 m3/sec drainage into the Shavat Canal, which summer flow rate is 100-150 m3/sec, on waters reaching populated areas 5 km downstream indicates that application of the herbicide STAM F-34 at a nominal recommended dose of 6 kg/ha vill yield residual amounts in the canal waters of 0.36 mg/l the day following application, and 0.045 mg/l on the 8th day.--Copyright 1972, Biological Abstracts, Inc.
W72-13408

RESIDUAL ACTIVITY OF PARAQUAT IN SOILS: II. ADSORPTION AND DESORPTION,
Ontario Agricultural Coll., Guelph.
E. M. Watkin, and G. R. Sagar.
Weed Res, Vol 11, No 4, p 247-256, 1971, Illus.
Identifiers: *Pesticide residues, *Adsorption, *Desorption, Lolium perenne M, *Paraquat, Soils, Sphagnum, Toxicity.

Glasshouse studies showed that low doses of paraquat inhibited the germination of Lolium perenne L. broadcast directly onto the paraquat-sprayed surfaces of a sphagnum and a peat soil, but that higher doses were necessary to produce phytotoxic symptoms on mineral soils, a compost and a loam. On all soils residual activity increased rapidly with increasing dose once the minimum phytotoxic dose was reached. On a sandy soil, residual activity increased almost linearly from the lowest to the highest dose applied. At 9.0, 4.5 and 2.24 kg/ha phytotoxicity on a compost was not affected by changes in the volume of application, but at 1.68 kg/ha and lower, reducing the volume from 562 l/ha to 281 and 112 l/ha resulted in increased phytotoxicity. Phytotoxic residues were eluted from paraquat-treated compost surfaces by percolating de-ionized water up soil columns but residual activity was not removed from the eluted surfaces. Surface irrigation of paraquat-treated surfaces with water previously percolated through columns of untreated soil reduced residual activity by 45%.--Copyright 1972, Biological Abstracts, Inc.
W72-13409

DEGRADATION OF BROMOXYNIL IN REGINA HEAVY CLAY,
Department of Agriculture, Saskatoon (Saskatchewan); and Regina Research Station (Saskatchewan).
A. E. Smith.
Weed Res, Vol 11, No 4, p 276-282, 1971, Illus.
Identifiers: *Bromoxynil, Clays, *Degradation (Decomposition), *Herbicides.

A spectrophotometric method was developed to detect bromoxynil in Regina heavy clay, and the breakdown under different temperature and moisture conditions was studied. At rates equivalent to 14 kg/ha, over 50% of the applied bromoxynil was degraded in 2 wk at 25C and at moisture levels in excess of the wilting point. Losses at 18C were slightly slower. Little breakdown occurred in sterile soil, indicating that microbial degradation could be an important factor contributing to bromoxynil breakdown under field conditions. Paper and thin-layer chromatographic techniques were used to isolate and identify soil degradation products. In addition to the parent compound small amounts of 3,5-dibromo-4-hydroxybenzamide and 3,5-dibromo-4-hydroxybenzoic acid were detected.--Copyright 1972, Biological Abstracts, Inc.
W72-13411

AMINO ACID CONTENTS OF THE BRAIN AND THE MUSCLE OF YOUNG SALMON (SALMO SALAR L.) AT PARR AND SMOLT STAGES,
Museum National d'Histoire Naturelle, Paris (France).
M. Fontaine, and J. Marchelidon.
Comp Biochem Physiol A Comp Physiol, Vol 40, No 1A, p 127-134, 1971.
Identifiers: *Fish physiology, *Amino acids, Fish behavior, Brain, Fish migration, Minerals, Muscle, Parr, Regulation, *Salmon, Smolt.

During the parr-smolt transformation of S. salar L. in freshwater, variations in the concentration of some free amino acids in the brain and the muscle were observed. An increase of threonine and glutamine in the brain and a decrease of the total free amino acids--particularly glycine and taurine--in the muscle are especially important. The results are discussed in relation with migratory behavior and hydromineral regulation.--Copyright 1972, Biological Abstracts, Inc.
W72-13416

PLANTS AND INDUSTRIAL WASTE,
Liverpool Univ. (England).
For primary bibliographic entry see Field 05C.
W72-13418

OCEANIC DIFFUSION DIAGRAMS,
Johns Hopkins Univ., Baltimore, Md. Chesapeake.
A. Okubo.
Deep Sea Research, Vol 18, No 8, p 789-802, August 1971. 4 fig, 2 tab, 25 ref.

Descriptors: *Diffusion, *Dye dispersion, *Diffusivity, Dye release, *Tracking techniques, Fluorescent dye, Analytical techniques, *Path of pollutants, Turbulence.
Identifiers: *Diffusion diagrams, Similarity theory of turbulence.

A study of the oceanic diffusion of contaminants utilizing fluorescent dyes was conducted to establish diffusion diagrams for comparative studies and for the prediction of the rate of horizontal spread from a given source. Vertical distribution, velocity field, initial conditions of release, shape information, and background oceanographic and wind conditions were used as basic data standards. The general behavior of horizontal variance and apparent diffusivity varied from the similarity theory of turbulence deductions. (Ensign-PAI)
W72-13433

MEASUREMENT OF THE RADIOACTIVE CONTAMINATION OF SURFACE WATERS,
Controle Radioprotection, Brussels (Belgium).
R. Boulenger.
Ann Gembloux. Vol 77, No 1, p 49-59. 1971.
Identifiers: *Water pollution sources, *Radioactivity, Contamination, Measurement, Radioactive wastes.

The control of radioactive contamination appears to be more simple than that of chemical pollution considering the effect mechanism: the dose of irradiation. However, many agronomical studies should continue to be made in order to determine the advance of radioactive elements through the biological cycles into foods and humans. The main sources of radioactive contamination are nuclear testing, factories were irradiated, nuclear combustibles are treated, nuclear reactors, radioisotope production centers, laboratories where labelling agents are synthesized, factories where minerals rich in natural radioactive elements are treated (for U and Ra production), factories where minerals low in natural radioactive elements are treated for the production of chemical compounds such as fertilizers, and laboratories and hospitals where radioactive elements are used. In the case of nuclear energy (retreatment factories) the discharges into fresh water that are possible are insignificant considering the activities treated. However, factories where so-called 'inactive minerals' are treated should be watched carefully because if these 'inactive minerals' do have a slight activity, the activity will be discharged into the nearby streams. In the case of isotope utilization in medicine and research, discharging of the quantities used into sewers may be done with few precautions (these include storage for a few days before discarding) because of the low half-lives and the low activities used. The means of measuring alpha, beta, and gamma emissions, Ra-226, Sr, and tritium were briefly reviewed.--Copyright 1972, Biological Abstracts, Inc.

W72-13434

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS - II, ESTUARIES AND COASTAL WATERS,
Water Pollution Research Lab., Stevenage (England).
A. L. Downing.
International Journal of Environmental Studies, Vol 2, No 3, p 221-226, November 1971. 4 fig, 3 ref.

Descriptors: Water pollution effects, Analytical techniques, *Dispersion, *Salinity, *Radio isotopes, *Forecasting, Water pollution control, Sewage effluents, Water quality, *California, *Estuaries, *Path of pollutants.

A review of current methods for predicting pollution effects on estuaries and coastal waters yielded two basic methods. The distribution of salinity was the basis on which to calculate the rate of dispersion of pollutants in vertically homogeneous estuaries at any given tidal state. Dispersion patterns of polluting discharges in coastal waters were determined with the aid of radio-isotopes. Mathematical models are used and examples are given. (Ensign-PAI)
W72-13437

UPTAKE OF COBALT-58 BY MUSSEL, MYTILUS EDULIS,
Tokyo Univ. (Japan). Dept. of Fisheries.
M. Shimizu, T. Kajihara, I. Suyama, and Y. Hiyama.
Journal of Radiation Research, Vol 12, No 1, p 17-28. March 1971, 8 fig, 6 tab, 9 ref.

Descriptors: Cobalt radioisotopes, Water pollution effects, *Bioindicators, *Shellfish, *Mussels, *Tracers, Fallout, Water pollution, Radioactivity, Analytical techniques.
Identifiers: *Mytilus edulis, *Cobalt-58.

Radioactive contamination studies were conducted using mussel, Mytilus edilus, as an indicator organism and cobalt-58 as a tracer element. Cobalt 58 concentration factors were low in the mantle and adductor muscle, and high in the alimentary tract. High accumulation in the shell and byssus was due to surface adsorption rather than physiological deposition. (Ensign-PAI)
W72-13440

FERTILIZED SEA URCHIN EGGS AS AN INDICATORY MATERIAL FOR MARINE POLLUTION BIOASSAY, PRELIMINARY EXPERIMENTS,
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 05C.
W72-13442

BUMINES DATA PROMISE HELP IN IDENTIFYING PETROLEUM-SPILL SOURCES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 05A.
W72-13443

DDT INHIBITS NA+, K+, MG2+ -ATPASE IN THE INTESTINAL MUCOSAE AND GILLS OF MARINE TELEOSTS,
Mt. Desert Island Biological Lab., Salisbury Cove, Maine.
For primary bibliographic entry see Field 05C.
W72-13444

INCIDENCE OF R+ ESCHERICHIA COLI IN COASTAL BATHING WATERS OF BRITAIN,
Animal Health Trust, Stock (England). Farm livestock Research Centre.
H. W. Smith.
Nature, Vol 234, No 5325, p 155-156, November 19, 1971.

Descriptors: *Water pollution effects, *Water pollution sources, *Sewage effluents, *E coli, *Coliforms, *Pathogenic bacteria, Recreation, Beaches, Water quality control.
Identifiers: Britain.

Studies of bathing areas contaminated by insufficiently treated human sewage revealed the waters as a possible agent for dissemination of coliforms and pathogenic organisms into the human community. The life span of R+ E. coli in sea water indicated proper sewage treatment as the solution. (Ensign-PAI)
W72-13445

NATURAL VIRUS INACTIVATION PROCESSES IN SEAWATER,
Hadassah Medical School Jerusalem (Israel).
H. I. Shuval, A. Thompson, B. Fattal, S. Cymbalista, and Y. Wiener.
Journal of the Sanitary Engineering Division, American Socity of Civil Engineers, Vol 97, No SA5, p 587-600, October 1971, 5 fig, 3 tab, 18 ref.

Descriptors: *Viruses, *Marine bacteria, *Self-purification, *Bioindicators, *Analytical techniques, *Pollutant identification, Enteric bacteria, Coliforms, Pathogenic bacteria, Water pollution.
Identifiers: Red Sea, Mediterranean Sea.

A study of virus inactivation in seawater revealed biological factors to be the primary mode of inactivation. Enteroviruses were more resistant to natural antiviral activity than coliform organisms. Enteroviruses were detected in polluted coastal areas showing relatively low coliform counts, which suggests further investigation of coliforms as pollution indicator organisms. Fluctuation of physical factors altered the rate of virus inactivation, and no antiviral elements could be demonstrated without the presence of bacteria. (Ensign-PAI)
W72-13447

VARIATIONS OF SILVER IN THE SEA WATER AROUND MONACO,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
R. Fukai, and L. Huynh-Ngoc.
Journal of the Oceanographic Society of Japan, Vol 27, No 3, p 91-101, June 1971, 4 fig, 6 tab, 22 ref.

Descriptors: *Radioactive wastes, *Analytical techniques, *Saline water - fresh water interface, *Water pollution sources, Pollutant identification, Fallout, Radioisotopes.
Identifiers: *Silver-110m, *Monaco.

Studies on the radioecological considerations of the silver radionuclides in the marine environment by spectrophotometric analysis revealed the average silver concentration in surface sea water to be 0.14 micro g Ag/l. The maximum concentration of silver in adjacent rivers was estimated at 2.3 micro g/Ag/l of fresh water, offering the possibility of a sea water increase up to 0.09 micro g/Ag/l. This increase was not observed, suggesting the possibility of a silver removal process at the sea water - fresh water interface. (Ensign-PAI)
W72-13449

HOPKINS MARINE STATION,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
J. L. Cox.
California Cooperative Oceanic Fisheries Investigations Reports, State of California Marine Research Committee. Vol 14, p 7-10, September 1970, 2 fig, 1 tab, 19 ref.

Descriptors: *Bioindicators, *Pesticide residues, *DDT, *Nutrient requirements, *Phytoplankton, Pesticide kinetics, Trace elements, Agricultural chemicals, Water pollution effects, Analytical techniques, Polychlorinated biphenyls.

Due to the entrance of DDT into all facets of the world ecosystem, the retention of DDT residues at different levels of the food chain offers a potential indication for the study of energy requirements of pelagic organisms. DDT residue levels in phytoplankton were quantified and varied relative to the carbon content of analyzed samples. Standing crop size at the time of sampling and short term variations in environmental DDT levels significantly affected results. Utilization of DDT as an energy tracer depends upon the effects the variability of phytoplankton DDT concentrations show on the DDT-based estimate of the phytoplankton carbon contribution to consumer growth. (Ensign-PAI)
W72-13450

HAWAII'S SUGAR INDUSTRY FACES TOUGH PROBLEMS.
Environmental Science and Technology Vol 5, No 12, p 1174-1175, December 1971.

Descriptors: *Water pollution sources, *Air pollution sources, *Food processing industry, *Sugar cane, *Industrial wastes, Effluents, Economic feasibility, Water pollution control, *Hawaii.

Increased environmental controls enforced by the Environmental Protection Agency have created economic problems in Hawaii's sugar industry. Immediately effective solutions to marine pollution from inadequately treated mill effluents, and air and water pollution caused by harvesting techniques have been declared economically infeasible. (Ensign-PAI)
W72-13451

JET TYPE MODEL FOR THE THREE-DIMENSIONAL THERMAL PLUME IN A CROSS-CURRENT AND UNDER WIND,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
H. Stefan, and P. Vaidyaraman.
Water Resources Research, Vol 8, No 4, p 998-1014, August 1972. 12 fig, 37 ref.

Descriptors: *Mixing, *Jets, *Convection, *Currents (Water), *Path of pollutants, *Mathematical models, *Thermal pollution, Turbulence, Turbulent flow, Heat transfer, Mass transfer, Dispersion.

A dynamic three-dimensional model for predicting water temperatures in a thermal plume was formulated and tested. The plume that results from the discharge of heated water is described in terms of a buoyant, turbulent half jet. The effects of a crosscurrent and wind can be accommodated by the model. Mixing by turbulence, lateral spread due to buoyancy, heat transfer at the water surface, and deflection of the main trajectory under wind shear stress in a current are accounted for. Although it was necessary to make several broad assumptions, for example that all cross-sectional temperature distributions are similar and that there is no distortion of the cross section by wind, the results show the overall behavior of the plume reasonably well. The model does not account for the effects of solid boundaries; its main features are its simplicity and comprehensiveness, its combination of the several processes having a major effect on plume behavior, and its ability to include possible future experimental or theoretical results without major changes in the program. (Knapp-USGS)
W72-13472

TURBULENT TRANSFER AND MIXING OF SUBMERGED HEATED WATER JET,
Rutgers - The State Univ., New Brunswick, N.J. Ballantine Hydrodynamics Lab.
E. L. Bourodimos.
Water Resources Research, Vol 8, No 4, p 982-997, August 1972. 9 fig, 2 tab, 44 ref.

Descriptors: *Mixing, *Mass transfer, *Convection, *Jets, *Path of pollutants, *Thermal pollution, Turbulence, Turbulent flow, Heat transfer, Dispersion, *New York.
Identifiers: *Hudson River (NY).

The turbulent diffusion, transfer, and mixing of a warm submerged jet discharged horizontally into a body of water of different temperature in a river or lake are analyzed. When a jet of heated effluent is discharged into a receiving body of water at some depth below its surface, it rises as a plume to the surface and then spreads laterally and longitudinally at the free surface. The rising of the plume is a combination of both the initial momentum flux and the net buoyant force due to the difference in density between the heated effluent and the surrounding ambient flow water. On the basis of conservation laws for heat, mass, and momentum transfer, numerical solutions were developed and compared with existing experimental data. The practical objective of this analysis is to find the parameters of turbulent mixing, entrainment, and dilution and thereby to establish theoretical and practical engineering criteria for preventing thermal discharges. The results of these numerical model techniques (suitable for high-speed digital computation) have already been successfully employed in predicting patterns of actual hydrodynamics and thermal behavior of heated jet discharges from powerplants along the Hudson Estuary and River in New York. (Knapp-USGS)
W72-13473

ON AN AERIAL MEASUREMENT OF RADIATIVE TEMPERATURE PATTERNS OVER THE THERMAL POLLUTED WATER (IN JAPANESE),
Toba Merchant Marine Coll. (Japan).
H. Ochiai.
UMI to SORA, The Marine Meteorological Society, The Kobe Marine Observatory, Nakayamate, Ikuta-ku, Kobe, Japan, Vol 46, No 3-4, p 67-75, March 1971. 12 fig, 4 ref.

Descriptors: *Thermal pollution, *Hydroelectric plants, *Water pollution sources, *Thermal properties, Thermocline, Water pollution, Infrared radiation, Analytical techniques.
Identifiers: *Owase Bay, *Japan.

Studies on thermal pollution in Owase Bay waters were conducted with infrared thermography and infrared thermometers. Thermal effluent from steam generators extended up to 1500 meters as a surface layer, with temperatures up to 34C near the discharge point. The thermal gradient at the edge of the hot effluent was 4C/10 m. The thermal effluent and its distribution were effected by the tidal current from the Naka River. (Ensign-PAI)
W72-13483

OIL POLLUTION - CAUSES AND CURES,
International Tanker Owners Pollution Federation Ltd., London (England).
J. Wardley-Smith.
Engineering, Vol 211, No 6, p 644-648, September 1971. 5 fig.

Descriptors: *Oil pollution, *Oil spills, *Water pollution sources, *Water pollution control, *Water pollution treatment, Cleaning, Chemicals, Gels, Burning, Salvage value, Absorption, Mechanical control.

The tremendous increase in international shipping has brought a parallel increase in the frequency and severity of oil spills. Various means of dispersal and removal from spill sites have been attempted, including salvage, burning, chemical dispersants and absorbants, and mechanical containment and removal. Floating booms represented the currently preferred method for combating floating oil slicks. (Ensign-PAI)
W72-13484

A COASTAL POLLUTION PROBLEM AND ITS SOLUTION - THE DESIGN AND CONSTRUCTION OF A SUBMARINE SEWER OUTFALL AT EASTBOURNE,
For primary bibliographic entry see Field 05D.
W72-13485

TRACE ELEMENTS DETAILED IN LAKE MICHIGAN.
Chemical and Engineering News, Vol 50, No 30, p 59, July 24, 1972.

Descriptors: *Radioactive wastes, *Trace elements, *Lake Michigan, *On-site data collection, Nuclear powerplants, Sediments, Phytoplankton, Zooplankton, Benthos, Analytical techniques, *Path of pollutants, Water pollution sources.
Identifiers: Scandium concentrations.

The distribution of 35 trace elements in Lake Michigan water, sediment and three levels of invertebrates-phytoplankton, zooplankton and benthos was determined in order to see if there were possible radioactivity hazards to Lake Michigan from nuclear power plants now operating or being constructed. It was concluded that there would be no hazards if the plants operate in accordance with Atomic Energy Commission guidelines. The study showed that elements released in radioisotope form do not continually increase in concentrations up through the food chain. The study required the development of a method based on scandium concentrations in sedimentation and biological material, to correct for the masking effect of sediment contaminating samples. (Galwardi-Texas)
W72-13489

FIELD STUDY AND MATHEMATICAL MODEL OF THE SLACK-WATER BUILDUP OF A POLLUTANT IN A TIDAL RIVER,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
W. J. Grenney, and D. A. Bella.
Limnology and Oceanography, Vol 17, No 2, March 1972, p 229-236. 7 fig, 7 ref.

Descriptors: *Pollutant identification, *Mathematical models, *Tracers, *Tidal waters, Tidal effects, Outlet works, Effluents, On-site data collections, Diffusion, *Oregon, *Path of pollutants, Water pollution sources.
Identifiers: Dispersion coefficient, Rhodamine B tracer, *Yaquina River (Oregon).

The accumulation of a pollutant in the vicinity of an outfall during slack-water periods in a tidal river was studied through a field investigation and a mathematical model. A diffuser was installed across the main channel of the Yaquina River and 35 km from the mouth at Newport, Oregon. Rhodamine-B was injected at a constant rate for 10 hours and over 400 water samples were taken. The data indicate a significant buildup during periods of slack water. A one-dimensional, time dependent, finite-difference model developed for the field study simulated average trends reasonably well, but calculated peak values were consistently lower than field observations. Concentration profiles from the model were sensitive to the dispersion coefficient and the grid parameters when large concentration gradients were present. (Galwardi-Texas)
W72-13494

POLLUTION IN AREAS NEAR THE POMPAN BEACH SEWAGE OUTFALL,
Florida Atlantic Univ., Boca Raton. Dept. o Biological Sciences.
H. A. Hoffmann.
Quarterly Journal of the Florida Academy o Sciences, Vol 34, No 3-4, September-Decembe 1971, p 243-256. 5 fig, 4 tab, 12 ref.

Descriptors: *Pollutant identification, *Coliform *Sewage effluents, Ocean circulation, Ocean cu rents, *Florida, *Outlets, Sewage disposal, Mathe matical studies, *Path of pollutants.
Identifiers: Marine outfall, *Pompano Beac (Florida).

Studies were described which attempt to predi the extent of pollution from a marine sewage ou fall in a location where the affected areas wer subject to possible pollution from a second source an Intracoastal Canal. The data obtained fro coliform counts combined with measurements o the Florida Current strongly indicated that existin and planned marine outfalls on the southeast coa of Florida do and will contribute low levels of po lution to off-shore and beach waters. Mathemat cal relations were obtained between colifor counts and distance from the outfall. (Galward Texas)
W72-13504

PAPER MILL FIBER AND CHIP TAGGIN AND TRACING TECHNIQUE,
Washington State Univ., Pullman. Coll. of En gineering Research Div.; and Washington Stat Univ., Pullman. Radioisotopes and Radiation Lab.
For primary bibliographic entry see Field 05A.
W72-13510

POPULATION GROWTH AND NONINDUSTR AL WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-13558

POLYCHLORINATED BIPHENYLS AND TH ENVIRONMENT.
For primary bibliographic entry see Field 05C.
W72-13569

MEASUREMENT OF VELOCITY-CONCENTR ATION COVARIANCE,
Geological Survey, Bay St. Louis, Miss.
R. S. McQuivey, and T. N. Keefer.
Journal of the Hydraulics Division, America Society of Civil Engineers, Vol 98, No HY9, Pap 9184, p 1625-1646, September 1972. 13 fig, 4 tab 12 ref, append.

Descriptors: *Mixing, *Diffusion, *Dispersion *Path of pollutants, *Instrumentation, Mas transfer, Turbulence, Conductivity, Velocity, Tu bulent flow, Roughness (Hydraulic).
Identifiers: *Hot-film anemometers.

A single-electrode conductivity probe in a bridg circuit and a hot-film sensor and anemometer wer used to make the first known measurements of th longitudinal velocity-concentration covarianc along a diffusing plume in a flow. The measur ments were made in a 3.87-ft wide flume ov three boundary roughnesses. From these measur ments the Boussinesq-type mass transfer coeff cient was directly evaluated and compared wit the longitudinal-diffusion coefficients obtaine from a floating-particle study at the water surfac Within experimental accuracy, the Boussines type transfer coefficient is an adequate model f describing the scalar transport process. (Knapp USGS)
W72-13574

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 02F.
W72-13578

OBSERVED AND CALCULATED DISTRIBUTION OF LINDANE IN SOIL COLUMNS AS INFLUENCED BY WATER MOVEMENT,
California Univ., Riverside. Dept. of Soil Science.
F. Huggenberger, J. Letey, and W. J. Farmer.
Soil Science Society of America Proceedings, Vol 36, No 4, p 544-548, July-August 1972. 7 fig, 4 tab, 9 ref.

Descriptors: *Path of pollutants, *Mass transfer, *Adsorption, *Pesticide residues, *Soil water movement, Ion exchange, Leaching, Organic matter, Infiltration, Mathematical models.
Identifiers: *Lindane.

Observed and calculated distribution of lindane in soil columns of infiltration experiments were compared. Three mineral soils with different organic matter contents and particle size distributions were used in the study. The adsorption coefficient and rate of adsorption were determined in independent experiments. As predicted by the theory, application of a greater amount of lindane to the soil surface increased the concentration of lindane but did not influence the depth of penetration. Under leaching conditions, the depth of water penetration divided by the adsorption coefficient was a good estimate of the observed depth of maximum concentration of lindane. The theory failed in general to predict the shape of the distribution curve of lindane. (Knapp-USGS)
W72-13580

INFLUENCE OF WATER AND TEMPERATURE ON ADSORPTION OF PARATHION BY SOILS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
B. Yaron, and S. Saltzman.
Soil Science Society of American Proceedings, Vol 36, No 4, p 583-586, July-August 1972. 6 fig, 2 tab, 13 ref.

Descriptors: *Pesticide residues, *Adsorption, *Soil water, *Path of pollutants, Pesticide kinetics, Soil chemistry, Soil physics, Temperature, Hydration, Organic matter, Solubility, Carbon radioisotopes, Tracers.
Identifiers: *Parathion.

Temperature and water effect on the adsorption of parathion by soils was studied using parathion tagged with C-14. The parathion was applied in aqueous solutions and in hexane over a concentration range of 1-10 micrograms/ml. The parathion is adsorbed by soils from aqueous solution without any appreciable thermic effect. In a dry soil-hexane-parathion system the slightly polar parathion molecules efficiently compete with the apolar hexane molecules for adsorption sites. In hydrated soil-hexane-parathion systems there was no parathion adsorption. Generally as the soil water content increases, parathion adsorption decreases. Rise of temperature in the soil-hydrated parathion-hexane system favors the endothermic process of water desorption, resulting in greater free adsorption sites, and consequently, in increasing parathion adsorption. (Knapp-USGS)
W72-13581

RELATION OF SUSPENDED ORGANIC MATTER, BOTTOM SEDIMENTS, AND BENTHOS TO BIOLOGICAL PRODUCTION (SVYAZ' ORGANICHESKOGO VESHCHESTVA VZVESI, DONNYKH OSADKOV I BENTOSA S BIOLOGICHESKOY PRODUKTIVNOST'YU),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W72-13594

5C. Effects of Pollution

INTERACTION OF HERBICIDES AND SOIL MICROORGANISMS.
Boyce Thompson Inst. for Plant Research Inc., Yonkers, N.Y.

Copy available from GPO Sup Doc, EP2.10:16060 DMP 03/71, $0.75; microfiche from NTIS as PB-211 566, $0.95. Environmental Protection Agency Water Pollution Control Research, March 1971. 73 p, 6 fig, 17 tab, 36 ref. EPA Program 16060 DMP 03/71.

Descriptors: *Water pollution effects, *Herbicides, *Soil-water-plant relationships, *Microorganisms, Investigations, Analytical techniques, Soil water, Chemical reactions, Soil properties, Nutrients, Pesticide toxicity.
Identifiers: DCPA, IPC.

In pure culture and in soils the addition of 2,3,5,6-tetrachloroterephthalate (DCPA) had little effect upon bacterial growth, and several microorganisms appeared to utilize the herbicide as a carbon source. Methyl-2,3,5,6-tetrachloroterephthalate and 2,3,5,6-tetrachloroterephthalic acid were identified as degradation products. The encouragement of the soil microflora by the addition of nutrient broths resulted in a reduction of toxicity to plants of a number of herbicides. These results indicate that the decontamination of soil by the degradative activities of the natural microflora may be accelerated by the addition of suitable nutrient sources. Isopropyl N-phenylcarbamate (IPC) degrading organisms, when added to soil, accelerated the degradation of IPC and related compounds. A membrane 'biological filter' device for reducing waterborne biodegradable pollutants was also demonstrated using these organisms. (Woodard-USGS)
W72-13044

EFFECTS OF NONIONIC SURFACTANTS ON MONOCOTS,
California Univ., Riverside. Dept. of Plant Pathology; and California Univ., Riverside. Dept. of Soils and Plant Nutrition.
R. M. Endo, J. Letey, N. Valoras, and J. F. Osborn.
Agronomy Journal, Vol 61, p 850-854, November-December 1969. 11 fig, 13 ref. OWRR B-072-CAL (2).

Descriptors: *Water pollution sources, *Surfactants, *Water pollution effects, *Soil-water-plant relationships, *Monocots, Agronomy, Barley, Grasses, Toxicity, Investigations, Experimental farms.

The effects of two commercial nonionic surfactants, Aqua Gro and Soil Penetrant, on seed germination, shoot growth, and root growth of various monocots were investigated in solution culture and soil. Plant species included in the studies were barley, common ryegrass, creeping bentgrass, Kentucky bluegrass, tall fescue, and common bermuda. Both surfactants were more toxic to plants in solution as compared to soil. This was because of adsorption of surfactant by soil thus reducing its toxicity. Other than a few specific exceptions, Soil Penetrant was more toxic than Aqua Gro -- especially in the soil experiments. The mode of action of either surfactant is not known, but the cytological observations suggest that the effects may be on cellular membranes. (Woodard-USGS)
W72-13050

IRON AND MANGANESE PROFILES IN A COASTAL POND WITH AN ANOXIC ZONE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W72-13057

LAKE WATER QUALITY PREDICTIONS,
Ontario Water Resources Commission, Toronto.
B. S. Kohli, and M. D. Palmer.
Journal of Water Pollution Control Federation, Vol 44, No 8, p 1575-1580, August 1972. 1 fig, 5 tab, 8 ref.

Descriptors: *Water pollution effects, *Lakes, *Forecasting, *Regression analysis, Data collections, Water quality, Correlation analysis, Mathematical models.

Multiple regression analyses of the effects of waste water on lake water quality produced a large number of statistically significant prediction equations with similar standard errors of estimate. The equations were not sensitive to changes in the independent variables or to omission of some readings in the input data sets. Input data from several years are necessary for equation development, and multiple regression techniques for water quality estimation should be used with caution. Nevertheless, by judiciously selecting appropriate equations it is possible to estimate effects of waste water loadings on lake water chemistry. (Knapp-USGS)
W72-13060

EFFECTS OF TIDAL FLATS ON ESTUARINE WATER QUALITY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05B.
W72-13063

A CRITICAL COMPARISON OF METHODS FOR MEASURING FISH RESPIRATORY MOVEMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
A. G. Heath.
Water Research, Vol 6, p 1-7, 1972. 2 fig, 19 ref.

Descriptors: *Fish behavior, *Methodology, *Respiration, *Fish physiology, Measurement, Monitoring.
Identifiers: Fish respiration, Respiratory movements.

Six different methods for detecting and measuring fish respiratory movements are reviewed and compared. Several yield only breathing frequencies, which may not reflect alterations in the ambient water. The disturbance to the fish by certain methods is discussed. The method giving the most information appears to be the measurement of buccal and opercular pressures with indwelling catheters and sensitive pressure transducers. Where simplicity is important, breathing frequency may be obtained from the recording of the changing potentials between two external electrodes not actually attached to the fish. (LeGore-Washington)
W72-13095

EFFECTS OF DIELDRIN-CONTAMINATED FOOD ON THE DEVELOPMENT OF LEPTODIUS FLORIDANUS LARVAE,
Duke Univ., Durham, N.C. Dept. of Zoology.
C. E. Epifanio.
Marine Biology, Vol 13, No 4, p 292-297, April 1972. 1 fig, 5 tab, 15 ref.

Descriptors: *Pesticide toxicity, *Path of pollutants, *Crabs, *Toxicity, *Food chains, Pesticide residues, Brine shrimp, Crustacea, Aquatic animals, Pesticides, Dieldrin, Chlorinated hydrocarbon pesticides.
Identifiers: *Sublethal effects, Contaminated food, Biological magnification, Secondary toxicity, Animal development, Leptodius spp.

Leptodius floridanus (Decapoda: Xanthidae) larvae were fed dieldrin-contaminated Artemia nauplii throughout their development to megalopa. Sublethal effects were noted at dieldrin concentra-

tions as low as 5.49 mg/kg, and no larvae completed their development when fed Artemia containing 33.0 mg/kg dieldrin. Organochlorine pesticide residues were measured in zooplankton collected from Onslow Bay, North Carolina. These residue levels were much lower than those found to affect Leptodius larvae in the laboratory. (LeGore-Washington)
W72-13096

OIL POLLUTION AND WILDLIFE AND FISHERIES IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles.
D. Straughan.
In: Transactions of the 36th North American Wildlife and Natural Resources Conference, March 7-10, 1971, p 219-229. 10 ref, discussion.

Descriptors: *Water pollution effects, *On-site investigations, *Oil pollution, *California, *Oil spills, *Birds, *Waterfowl, Water pollution sources, Water pollution, Oily water, Evaluation, Toxicity, Water birds, Shore birds, Gulls, Baseline studies, Fisheries, Fish, Marine fisheries, Mammals.
Identifiers: *Santa Barbara, Loons, Grebes, Cormorants, Pelicans, Marine mammals, Whales, Seals (Mammals), Porpoises, Gray whales, Pilot whales, Eschrichtium spp., Dolphins, Sea lions, Seafood.

The known biological effects of the Santa Barbara (California) oil spill of January 28, 1969 are reviewed. Areas of ignorance are noted, and difficulties in obtaining reliable baseline data are commented upon. The total loss of birds attributed to the spill was 3,686 by May 31, 1969. Loons and grebes were the most abundant dead birds, while cormorants and pelicans were the second most abundant. Populations of marine mammals were apparently not seriously affected. Similarly, no significant effect on fish was observed, although a decrease in commercial landings was caused by a decrease in local fishing effort during and immediately after the spill. No flavor taint was found in fish or invertebrates. (LeGore-Washington)
W72-13099

INFLUENCE OF KRAFT MILL EFFLUENT ON THE FLAVOR OF SALMON FLESH,
Oregon State Univ., Corvallis; Dept. of Fisheries and Wildlife.
D. L. Shumway, and G. G.Chadwick.
Water Research, Vol 5, p 997-1003, 1971. 3 fig, 1 tab, 12 ref.

Descriptors: *Taste, *Water pollution effects, *Pulp wastes, *Salmon, Organoleptic properties, Absorption, Industrial wastes, Organic wastes, Wood wastes, Pulp and paper industry, Water pollution.
Identifiers: *Seafood, *Coho salmon, Silver salmon, Taint.

In a laboratory study measurable impairment of the flavor of cooked flesh of jack coho salmon resulted from exposure of the fish to untreated kraft pulp and paper mill effluents for 72-96 hr at concentrations of about 1.0-2.0% by volume and above. No flavor impairment was noted when fish were exposed to a concentration of 2.9% by volume, the highest level tested, of biologically treated effluent. (LeGore-Washington)
W72-13100

EFFECTS OF TURBIDITY-PRODUCING SUBSTANCES IN SEA WATER ON EGGS AND LARVAE OF THREE GENERA OF BIVALVE MOLLUSKS,
Bureau of Commercial Fisheries, Milford, Conn. Biological Lab.
H. C. Davis, and H. Hidu.
The Veliger, Vol 11, No 4, p 316-323, April 1969. 7 fig, 2 tab, 6 ref.

Descriptors: *Turbidity, *Water pollution effects, *Particle size, *Oysters, Clams, *Growth stages, Aquatic environment, Silts, Clays, Shellfish, Mollusks, Embryonic growth stage, Larvae, Bioassay, Mortality, Animal growth, Animal physiology, Growth rates.
Identifiers: Fuller's earth, Silicon dioxide, Crassostrea spp., Ostrea spp., Mercenaria spp.

The effects of several concentrations of silt, clay, and Fuller's earth on embryonic development of the American oyster (Crassostrea virginica) and on survival and growth of larvae of the American oyster and the European oyster (Ostrea edulis) are reported. A series of experiments was also run to compare the effects of different-sized particles of pure silicon dioxide on embryos and larvae of hard clams Mercenaria mercenaria and American oysters, in an attempt to determine the effect of particle size of a suspended material, as opposed to possible effects of its chemical composition. (Svensson-Washington)
W72-13101

FIELD TESTING FOR WATER QUALITY CONTROL AT KRAFT PULP MILLS,
British Columbia Research Council Vancouver.
T. E. Howard, D. L. Bowen, and C. C. Walden.
Pulp and Paper Magazine of Canada, p 2-4, May 17, 1968. 4 fig, 2 ref.

Descriptors: *On-site laboratories, *On-site investigations, *Water pollution effects, Research facilities, *Laboratories, Bioassay, On-site tests, Toxicity, Pulp wastes, Evaluation, Respiration, Fish physiology, Physiological ecology, Research equipment, *Pulp wastes.
Identifiers: *Mobile laboratories, Water pollution evaluation, Median tolerance limits, Hematocrit.

A mobile laboratory is described, which, when on site at a pulp mill, permits field evaluation of the following parameters relating to toxicity of individual effluents to salmonid fish; median tolerance limits to mortality, hematocrit and respiration. Specialized equipment for measurement of buccal pressure changes, as an index of respiration, is described in detail. (LeGore-Washington)
W72-13102

SENSITIVITY OF THE WHITE AMUR TO FISH TOXICANTS,
Bureau of Sport Fisheries and Wildlife La Crosse, Wis. Fish Control Lab.
L. L. Marking.
The Progressive Fish-Culturist, Vol 34, No 1, p 26, January 1972.

Descriptors: *Pest control, *Pesticide toxicity, *Piscicides, *Chemcontrol, *Fish control agents, Pesticides, Antimycin A, Rotenone, Aquatic weeds, Eutrophication, Bioassay, Fish establishment.
Identifiers: *White amur, Ctenopharyngodon spp., Salicylanilide I, Juglone, Bayluscide, Noxfish.

Investigations are in progress to determine the suitability of the exotic white amur (Ctenopharynodon idellus) for controlling aquatic weeds. The white amur consumes huge quantities of aquatic plants, which are storehouses of plant nutrients. The removal of these nutrients in the form of protein generated by the white amur can only decrease the normal rate of eutrophication. This species could, however, become undesirable in some habitats by unwise stocking or natural reproduction. The application of direct controls against the fish might be warranted in such cases. Tests were initiated to determine the sensitivity of the white amur to several registered fish toxicants and candidate fish toxicants in laboratory bioassays. The results suggest that the white amur is approximately as sensitive as the common carp (Cyprinus carpio) to these chemicals, and chemical control of undesired populations is feasible. (Svensson-Washington)
W72-13103

A CO-OPERATIVE RESEARCH PROGRAM ON KRAFT PULP MILL EFFLUENT QUALITY,
British Columbia Research Council Vancouver.
C. C. Walden, and T. E. Howard.
Pulp and Paper Magazine of Canada, p 3-7, February 16, 1968. 7 fig, 1 tab, 5 ref.

Descriptors: *Pulp wastes, *Toxicity, *Water pollution effects, *Bleaching wastes, *Bioassay, *Lethal limit, Water pollution, Water pollution sources, Wood wastes, Industrial wastes, Sulfite liquors, Water quality, Biochemical oxygen demand, Salmonids, Growth, Fish physiology, Pathology, Adsorption, Pink salmon.
Identifiers: *Sublethal effects, *Acclimation, *Kraft effluents, Acute toxicity, Sialic acid, Mucus production, Buccal pressure, Hematocrit, Fish pathology, Kokanee, Coho salmon, Silver salmon.

The mechanics of administering a cooperative research program, supported jointly by a number of British Columbian companies, are described. Studies have accentuated the sublethal effects of kraft effluents on salmonids. Acute bioassays, used routinely for effluent evaluation, indicated a number of visual sublethal effects. Of these, condition factor (growth) of juvenile salmonids was unaffected by neutralized bleach kraft effluent (NBK). Excess mucus production was evidenced by increased sialic acid formation above 2-5% effluent levels. A sensitive technique for measuring buccal pressure has been developed to a quantitative procedure for evaluating sublethal effects on fish respiration. Hematocrit changes were evident in juvenile kokanee after 10 days exposure to 5% NBK. Some data substantiating the ability of juvenile salmonids to acclimate to sublethal levels of effluent are presented. Toxic fractions in the effluent are adsorbed on anion exchange columns. Typical biochemical oxygen demand data for a bleach kraft mill are presented. (LeGore-Washington)
W72-13106

EFFLUENT CHARACTERISTICS OF BLEACHED KRAFT PULP MILLS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
T. E. Howard, and C. C. Walden.
Pulp and Paper Magazine of Canada, Vol 72, No 1, p 1-7, January 1971. 7 fig, 7 tab, 17 ref.

Descriptors: *Pulp wastes, *Water pollution sources, *Biochemical oxygen demand, *Toxicity, *Analysis, Water pollution, Bleaching wastes, Wood wastes, Industrial wastes, Sulfite liquors, Bioassay, Water pollution effects, Chemical analysis, Organic compounds, Carbon, Lethal limit, Pollutant identification, Salmonids.
Identifiers: *Total organic carbon, *Organic carbon, *Caustic extraction, Characterization, Effluent characterization.

Values are given for the toxicity, biochemical oxygen demand (BOD sub 5), and total organic carbon (TOC) from 1131 samples collected from major process streams and the combined outfall at 7 British Columbian bleached kraft mills over a 40-day period. The most toxic process stream was the first caustic extraction, followed by the unbleached white water and first chlorination effluents. Combined outfall samples were less toxic than the process streams. No ranking sequence could be established for BOD sub 5 or TOC. Interrelationships between these variables are not useful for direct prediction of one from the other. (LeGore-Washington)
W72-13108

WATER POLLUTION AND THE KRAFT PULP MILL INDUSTRY,
British Columbia Research Council Vancouver. Div. of Applied Biology.

C. C. Walden.
Western Fisheries, Vol 71, No 1, October 1965. 4 p, 21 ref.

Descriptors: *Pulp wastes, *Toxicity, *Water pollution effects, Water pollution sources, *Fisheries, Water pollution, Water pollution control, Bleaching wastes, *Industrial wastes, *Sulfite liquors, Bioassay, Water pollution treatment, Water quality, Biochemical oxygen demand, Salmonids, Lethal limit, Sulfur, Reviews.
Identifiers: Mercaptan.

Basic considerations of pulp mill waste disposal problems are reviewed. Discussion is presented on the characteristics of kraft pulp mill discharges, methods for measuring toxicity, effects of these discharges on salmonid fish, protection of fisheries, future answers to the problem, and the status of current research. (LeGore-Washington)
W72-13109

POLLUTION AND TOXICITY CHARACTERISTICS OF KRAFT PULP MILL EFFLUENTS,
British Columbia Research Council Vancouver. Div. of Applied Biology.
T. E. Howard, and C. C. Walden.
TAPPI (Technical Association of the Pulp and Paper Industry), Vol 48, No 3, p 136-141, March 1965. 6 tab, 17 ref.

Descriptors: *Pulp wastes, *Toxicity, *Water pollution effects, *Bleaching wastes, *Water pollution treatment, *Lethal limit, Water pollution, Water pollution sources, Water pollution control, Wood wastes, Hydrogen ion concentration, Industrial wastes, Wastes, Sulfite liquors, Bioassay, Water quality, Biochemical oxygen demand, Sockeye salmon, Salmonids, Resistance, Sulfur, Public health.
Identifiers: Sublethal effects, Mercaptan, Acute toxicity, Lebistes spp., Guppies, Onchorhynchus spp., Acclimation, Soluble solids, Condensate stream.

The oxygen demand, sulfide and mercaptan content, and toxicity of various individual kraft mill effluent streams have been examined. Apart from the condensate streams, toxicity of effluents is not related to sulfide or mercaptan content, and its relationship to biochemical oxygen demand (BOD) is not close. Toxicity previously ascribed to kraft effluents has been largely due to pH, and inherent toxicity is low. Bleach plant wastes constitute the largest oxygen demand source in a mill and have an appreciable absolute toxicity. Bioassays of kraft effluents examined reflected shock stress as much as inherent toxicity. Salmonid fish become acclimated to living in absnormally high concentrations of bleach plant waste. Simple storage and fermentation reduce the inherent toxicity of bleach plant wastes. Mixing kraft effluent with silty river water reduces soluble solids. (LeGore-Washington)
W72-13110

SAMPLING OF FISH MUSCLE FOR M.S. 222 AND QUINALDINE RESIDUES,
Bureau of Sport Fisheries and Wildlife Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 05A.
W72-13111

THE INFLUENCE OF DE-FREEZING LIQUID AND OF CERTAIN AROMATIC SUBSTANCES ON LOWER AQUATIC ANIMALS AND ON FISH, (IN CZECH),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
J. Havelka, and O. Albertova.
Zivocisna Vyroba, Vol 13, p 519-526, 1968. 2 tab, 6 ref. English summary.

Descriptors: *Aromatic compounds, *Toxicity, *Fishkill, *Bioassay, Organic compounds, Lethal limit, Mortality, Daphnia, Carp, Tubificids, Waste water (Pollution), Sampling.
Identifiers: *Ethylene glycol, *Isooctanol, *Styrene, Sublethal effects, Monoethylene glycol, Diethylene glycol, Triethylene glycol, Lebistes spp., Guppies, Tubifex spp.

Attention is drawn to the difficulty of accurately determining the kinds of aromatic substances causing mass fish mortalities and of determining the toxicity of aromatic substances contained in waste waters. Related to the volatility of aromatic substances, this difficult situation is undoubtedly influenced by the timeliness and technical competence in sampling the water and in gathering peripheral data. A substantial deficiency in the complex estimation of the harmfulness of aromatic substances in natural waters--in fact, all harmful substances in waste waters--is the fact that data on the physical properties of the water involved are often inadequate. In practice, the determination of the effluent which is the carrier of the acute values of aromatic substances is, with regard to the volatility of its toxic substances, especially difficult. In this study, the harmful values of examined substances have been determined and summarized. These are purely informative values that must be, in practice, evaluated within the scope of overall conditions in the natural environment. (LeGore-Washington)
W72-13112

EFFECTS OF THE WATER-SOLUBLE COMPONENT OF OIL POLLUTION ON CHEMORECEPTION BY CRABS,
City of Hope National Medical Center, Duarte, Calif.
J. S. Kittredge.
Available from the National Technical Information Service as AD-738 505, $3.00 in paper copy, $0.95 in microfiche. 1971. 5 p, 4 ref. ONR N00014-71-C-0103 NSF GB-27703.

Descriptors: *Crabs, *Animal physiology, *Oil pollution, *Water pollution effects, Absorption, Animal behavior, Water pollution, Oil spills, Oily water, Bioassay, Water chemistry, Inhibition, Marine animals, Marine biology.
Identifiers: *Crude oil toxicity, *Chemoreception, *Pheromones, *Oil spill effects, *Sex pheromone, Lined shore crab, Pachygrapsus spp., Feeding response, Sisquoc sand crude oil, California crude oil.

The minor water soluble component of crude oil is potentially the most dangerous fraction to marine life. The feeding response and sex pheromone response of the lined shore crab, Pachygrapsus crassipes, were used to assay the possibility that chemoreception is particularly susceptible to the water soluble component of crude oil. Very dilute solutions of the water soluble extracts of two crude oils tested completely inhibited both the feeding response and the response to the sex pheromone. The recovery period for ten crabs tested varied from three to six days. (Svensson-Washington)
W72-13113

A REVIEW OF AUTECOLOGICAL AND SAPROBIOLOGICAL DATA ON FRESHWATER CILIATES, (EINE ZUSAMMENSTELLUNG VON AUTOKOLOGISCHEN UND SAPROBIOLOGISCHEN BEFUNDEN AN SUSSWASSERCILIATEN),
Bonn Univ. (West Germany). Zoological Inst.
H. Bick, and S. Kunze.
Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 3, p 337-384, 1971. 1 tab, 142 ref.

Descriptors: *Protozoa, *Biological properties, *Systematics, Bacteria, Salinity, Aquatic animals, Ammonia, Carbon dioxide, Hydrogen sulfide, Dissolved oxygen, Acidity, Bioindicators, Water temperature, Aquatic microorganisms, Biochemical oxygen demand, Hydrogen ion concentration, Resistance, Nutrient requirements.
Identifiers: *Ecological valencies, *Saprobiological valencies, Substrate utilization, Blepharisma lateritium, Acineria incurvata, Amphileptus spp., Askenasia volvox, Aspidisca spp., Aspidisca turrita, Brachonella spiralis, Bursaria truncatella, Bursellopsis spumosa, Carchesium polypinum, Chaetospira mulleri, Chaetospira remex, Chilodonella spp.

Ecological data for 132 species of ciliated protozoans are summarized in tabular form. The data concern ecological valencies (limits of tolerance) in relation to temperature, pH, O2 (D.O.), percentage of oxygen saturation, BOD5, free CO2, NH4, free NH3, H2S, salinity and number of bacteria. The saprobiological valencies of 72 ciliates are also provided. (Snyder-Battelle)
W72-13144

LOCALIZATION OF FISH-LICE AND LEECHES IN CARPS DURING THE AUTUMN FISHING,
Vysoka Skola Veterinarni, Brno (Czechoslovakia).
For primary bibliographic entry see Field 02H.
W72-13155

A STATISTICAL ANALYSIS OF THE MERCURY CONTENT OF FRESH WATER FISH IN NEW YORK STATE,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
P. Boulton, and L. J. Hetling.
February 1972. 16 p, 3 fig, 5 tab.

Descriptors: *Mercury, *Fish, *New York, *Water pollution effects, *Industrial wastes, *Analytical techniques, Water quality, Pollutant identification, Toxins, Heavy metals, Freshwater fish.
Identifiers: *Mercury concentration.

Because of the concern for mercury concentrations in the fish in New York State, chemical analyses were made of the mercury concentrations in more than 3200 fish from 142 locations. The average mercury level for all fish was 0.44 ppm and the highest level found was 8.20 ppm in fish from Onondaga Lake. Excluding the findings for Onondaga Lake, the maximum concentration found was 3.40 ppm. Field personnel were instructed to wrap each fish in a separate plastic bag and freeze immediately. The frozen samples were collected at the Rome, New York Department of Environmental Conservation's Fish Pathology Laboratory and then sent to the Department of Health's Laboratory in Albany where they were stored in large freezers until the analyses were made. Fish muscle tissue excluding bone was processed for mercury analysis. The wet sample was digested in a mixture of sulfuric acid and hydrogen peroxide. Hydroxylamine HCl-NaCl solution and stannous chloride solution were then added simultaneously to the digestate to reduce the mercury to the ground state prior to analysis by atomic absorption spectroscopy on a Techtron Model A.A. 4 atomic absorption spectrophotometer. The absorbance of the mercury was recorded by a Sargent-Welch Model SRLG recorder. The value of the mercury in the fish was determined by comparison with a standard mercury solution. The data printouts and statistical analyses were done utilizing an IBM 360/50 computer and two programs from the University of California biomedical computer program package. (Poertner)
W72-13163

MERCURY POLLUTION INVESTIGATION IN GEORGIA, 1970-1971.
Georgia Water Quality Control Board, Atlanta.

1971. 117 P, 2 FIG, 9 TAB.

Descriptors: *Mercury, *Georgia, *Fish, *Analytical techniques, *Water pollution effects, Water quality, Industrial wastes, Pollutant identification, Toxins, Heavy metals, Freshwater fish.
Identifiers: *Mercury concentration.

Mercury concentrations were determined in fish, crabs, shrimp and shellfish in Georgia. In regions of high mercury concentrations in the biota, mud samples were also analyzed. Excessive mercury concentrations (above 0.5 microgram/gram) were found in two regions, both regions having received waste discharges from mercury-cell-type chlor-alkali plants. The areas of concern in Georgia are the Savannah River between the cities of Augusta and Savannah and the Brunswick and Turtle Rivers upstream from U. S. Highway 17 at Brunswick, Georgia. Regions not having a history of receiving wastes from mercury-cell-type chlor-alkali plants did not provide a cause for concern of mercury contamination. Areas surveyed included seven major river basins and the Georgia estuaries from Savannah Harbor to Cumberland Sound. Following notification by the State Water Quality Control Board, the chloralkali plants in Augusta and Brunswick reduced their mercury discharges to levels below 0.25 lbs. per day. Effluent monitoring is now a part of their operating procedures. An effective program to control mercury discharge must be maintained consistently to protect the State's waters and provide for the purposes for which they are classified. (Poertner)
W72-13170

TOXICITY OF COMBINED CHLORINE RESIDUALS TO FRESHWATER FISH,
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
J. A. Zillich.
Journal of the Water Pollution Control Federation, Vol 44, No 2, p 212-220, February 1972. 1 fig, 5 tab, 9 ref.

Descriptors: *Chlorine, Water pollution sources, *Water quality, *Toxicity, *Water chemistry, *Freshwater fish, Chlorination, Water purification, Water quality control, Water treatment, Sewage treatment, Chemical reactions, Bioassay, Hydrogen ion concentration, Dissolved oxygen, Water temperature, Water analysis, Conductivity, Nickel, Copper, Chromium, Zinc, Effluents, Waste water (Pollution), Fish physiology, Minnows, Sodium compounds, Sunfishes, Bullheads, Ammonia, Ammonium compounds.
Identifiers: *Chlorine residuals, *Chloramines, *Pimephales spp., Cyanide, Fathead minnows, Sublethal effects, Avoidance, Sodium thiosulfate, Detoxification, Hypochlorites.

A considerable amount of study of the use of chlorine to disinfect wastewater, lower its biochemical oxygen demand, and retard the degradation of receiving streams has been completed. However, very little has been done to determine the effect of chlorine on fish in these streams. Chlorine combines with a number of materials, especially ammonia, to form very toxic compounds. Recent studies conducted by the Michigan Water Resources Commission and other work on the toxicity of such residual chlorine are discussed. (Svensson-Washington)
W72-13174

EFFECTS OF CHEMICAL WASTES ON MARINE ORGANISMS,
Queen Mary Coll., London (England). Dept. of Zoology and Comparative Physiology.
R. C. Newell, and B. Brown.
Marine Technology, Vol 2, No 5, p 217-223, 1971. 6 fig, 3 tab, 18 ref.

Descriptors: *Water pollution effects, *Aquatic life, *Food chains, *Chemical wastes, *Public health, *Path of pollutants, Water pollution, Water pollution sources, Absorption, Aquatic environment, Food webs, Balance of nature, Productivity, Heavy metals, Pesticide residues, Phenols, Pesticides, Insecticides, Toxicity, Copper, Zinc, Cadmium, Chromium, Iron, Manganese, Nickel, Lead, DDT, DDE, Pesticide toxicity, Polychlorinated biphenyls, Marine animals, Marine plants, Reviews.
Identifiers: *Biological magnification, *Sublethal effects, Biological concentration, Marine organisms.

The accumulation and effects of toxic substances in marine organisms are discussed in this review. Toxic compounds considered include salts of heavy metals such as lead, mercury, zinc and copper; polychlorinated biphenyls; phenols; and chlorinated hydrocarbon pesticides such as DDT and DDE. It is concluded that if animals high in the marine food chains are to be used as a major source of food for man, it will be necessary to adopt stringent measures to prevent the discharge of apparently lethal amounts of persistent toxins into the sea. (Svensson-Washington)
W72-13175

CHEMICAL INHIBITION OF SPERM-EGG INTERACTION IN THE SEA URCHIN,
Albion Coll., Mich. Dept. of Chemistry; and Albion Coll., Mich. Dept. of Biology.
R. J. Flaherty, and R. D. Mortensen.
Bios, Vol 42, No 1, p 10-16, March 1971. 4 tab, 16 ref.

Descriptors: *Inhibitors, *Animals physiology, *Enzymes, Heavy metals, Copper, Iron, Zinc, Flourine, Biochemistry, Sea water, Water pollution effects.
Identifiers: *Sea urchin eggs, *Sea water chemistry, Sea urchins, Strongylocentrotus spp., Hyaluronidase.

The effect of various agents on activation of eggs in the sea urchin, Strongyolocentrotus purpuratus, has been studied; Cu (2+), Fe (3+), Fe (2+), Zn (2+), and F (-) are effective inhibitors of what is probably the hyaluronidase-hyaluronic acid system. Analysis suggests that the enzyme or enzymes may have two different sites where the inhibition occurs: one site where cation-S complexes are formed and perhaps distort the enzyme molecule, and the other site, perhaps the active site, where an H bond-ionic-size effect results in competitive inhibition. Results indicate that all of the major components of seawater are necessary for normal activation. Ca (2+) and HCO3 (-) are particularly important. (Svensson-Washington)
W72-13176

A SMALL BIOASSAY LABORATORY DESIGNED FOR EXPERIMENTAL THERMAL EFFECTS EVALUATION,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 05A.
W72-13177

EXPERIMENTAL DRIFTS OF JUVENILE SALMONIDS THROUGH EFFLUENT DISCHARGES AT HANFORD, PART II. 1969 DRIFTS AND CONCLUSIONS,
Batelle-Pacific Northwest Labs., Richland, Wash.
C. D. Becker, C. C. Coutant, and E. F. Prentice.
Available from the National Technical Information Service as BNWL-1527, $3.00 in paper copy, $0.95 in microfiche. Atomic Energy Commission Research and Development Report BNWL-1527, UC-48, January 1971. 61 p, 16 fig, 8 tab, 22 ref. AEC AT (45-1)-1830.

Descriptors: *Thermal pollution, *Heated water, *Water pollution effects, *Salmonids, *Columbia River, Water pollution, Nuclear powerplants, Water temperature, Water pollution sources, Toxicity, Chinook salmon, Bioassay, Rainbow trout, Fish barriers, Fish migration, Fish populations, Fishkill, Juvenile fish, Discharge (Water), Mortality.
Identifiers: *Thermal shock, Coho salmon, Silver salmon, Steelhead, Salmo spp., Oncorhynchus spp., Thermal mixing, Liveboxes.

Field investigations were conducted from March to September, 1968 and 1969 to determine the effect of heated reactor effluents on juvenile salmonids passing through the central Columbia River. The fundamental approach was to drift groups of fish held in liveboxes through areas representing maximum thermal increments while monitoring exposure temperatures and subsequently comparing survival or mortality among test and control groups. Shoreline drifts resulted in significant mortalities among only a few test groups whereas midriver drifts resulted in losses only under unfavorable late summer conditions. The most important environmental features regulating thermal dose were river temperature and river discharges, which ranged from about 2.0 to 20C and 40,000 to 280,000 cf/sec, respectively, throughout the year. The greatest potential for thermal damage exists from mid-July to August when river temperatures peak near 20C and discharges drop below 100,000 cf/sec. Most chinook migrants produced in the Hanford area have departed seward by this time. However, the migration timing of juvenile salmonids from above Hanford is retarded by the reservoir complex until July and August when river conditions are more hazardous. Nevertheless, the disproportionate ratio of effluent volume to total water mass and the rapid decline of plume temperatures after discharge tend to minimize the actual proportion of migrating juveniles that are exposed to sublethal and lethal thermal shock. (Svensson-Washington)
W72-13178

THE EFFECTS OF SELECTED FUNGICIDES AND SOIL FUMIGANTS UPON THE MICROFUNGI OF A CATTAIL MARSH,
Wisconsin Univ., Madison. Water Resources Center.
L. L. Tews.
Proceedings, 14th Conference on Great Lakes Research, 1971, p 128-136. 8 tab, 6 ref. OWRR A-025-WIS (3).

Descriptors: *Microfungi, *Pesticides, *Eutrophication, *Phytoplankton, Marshes, *Wisconsin.
Identifiers: Captan, Vapam, Vorlex, Dexon, Dithane, Terraclor, Thiram, Zineb, Soil fumigants.

Six commonly used fungicides (Captan, Dexon, Dithane, Terraclor, Thiram and Zineb) are two commonly used soil fumigants (Vapam and Vorlex) were applied to cultures of the predominant microfungi of a cattail marsh, i.e., to Hansenula saturnus (Klocker) H. and P. Sydow, Mucor hiemalis Wehmer, Penicillium stipitatum Thom and Trichoderma viride Pers. ex Fr. Captan, Vapam and Vorlex inhibited the growth of all four fungi at field concentrations. Captan, Terraclor, Thiram, Vapam and Vorlex were the most inhibitory to the growth of T. Viride in culture and subsequently applied to plots in a cattail marsh. In the field study, only Vapam and Vorlex significantly reduce the number of microfungal propagules in the litter, water and mud. The results of the three fungicide studies were inconclusive.
W72-13180

SURFACE SEDIMENTS IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology; and California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 02J.
W72-13196

RADIOLOGICAL SURVEYS OF PEARL HARBOR, HAWAII, AND ENVIRONS, 1966-1968,
Eastern Environmental Radiation Lab., Montgomery, Ala.
For primary bibliographic entry see Field 05B.
W72-13271

AN OUTBREAK OF INFECTIOUS HEPATITIS IN VILLAGE PUNDI IN SANGLI DISTRICT: AN EPIDEMIOLOGICAL REPORT,
Miraj Medical Coll. (India).
M. G. Nadkarni, and B. G. Sahastrabudhe.
Indian J Med Res. Vol 59, No 7, p 1163-1171. 1971. Illus.
Identifiers: *Public health, *Water pollution effects, Epidemiology, Flies, Genetics, Hepatitis, India, Pundi (India), Resistance, Sangli (India).

An outbreak of infectious hepatitis affecting 6.6% of the population of 1233, in a small rural community consuming well water is described. Insanitary wells and fly nuisance have played a role in transmission. The observation that Mahars and Mangs are not affected leaves ground for further study of genetic resistance of this community to infectious hepatitis. Attack rates in relation to age and sex are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13276

CONTROL OF WATER MILFOIL IN WISCONSIN,
Wisconsin Univ. Center, Marinette.
T. W. Thompson.
Paper presented at National Meeting of the Weed Science Society of America, St Louis, Missouri, February 8-9, 1972. 11 p, 13 ref. OWRR B-046-WIS (7).

Descriptors: *Wisconsin, *Aquatic weed control, Harvesting, Chemcontrol, Biocontrol, Sediments, Lakes, Aquatic plants, Social aspects, Water quality, Herbicides, Economics, Tourism, Water pollution control, Eutrophication, Recreation, Costs, Governmental interrelations.
Identifiers: *Mechanical harvesting, *Water milfoil, Lake Noquebay (Wis), Silvex.

Myriophyllum spicatum in southern and M heterophyllum in northeastern Wisconsin are offensive nuisances. They thrive on muck bottoms in three to twelve feet of water and may crowd out more desirable aquatic plants. In Dane and Marinette Counties mechanical harvesting offers the most attractive means of controlling these aquatic weed growths. Biological control lacks tested natural enemies of water milfoil in northern areas and there is a beneficial effect of the root systems in stabilizing loose sediments. Winter drawdown offers little hope of controlling Myriophyllum, which reaches maximum densities in water four to six feet and extends at least 15 feet. Chemical control adversely affects water quality, clarity, and dissolved oxygen by failing to remove biomass. Aquatic herbicides not target specific imperil the food chain upon which fish depend and eliminate desirable as well as problem plants. Economic attractiveness of chemical control appears deceptive considering large areas to be treated and ineffectiveness of some herbicides in controlling M heterophyllum. Mechanical harvesting is target specific, removes problem biomass, leaves root systems intact and can improve fishing. On a long term basis only enlightened shoreland management can solve the milfoil problem in Wisconsin. (Jones-Wisconsin)
W72-13291

GROWTH AND MINERAL ACCUMULATION OF SUBMERSED VASCULAR HYDROPHYTES IN PLEIOEUTROPHIC ENVIRONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
C. D. McNabb, Jr., and D. P. Tierney.
Available from the National Technical Information Service as PB-211 609, $3.00 in paper copy, $0.95 in microfiche. Michigan Institute of Water Research, East Lansing, Completion Report, May 1972. 33 p, 6 fig, 2 tab, 4 ref. OWRR A-031-MICH (1).

Descriptors: Ponds, Environments, Nitrogen, Phosphorus, *Eutrophication, Aquatic plants, Nutrient requirements.
Identifiers: Waste water ponds, *Pleioeutrophic waste water ponds, Ambient water concentration, *Submersed vascular hydrophytes, Transplanted and indigenous populations, *Ceratophyllum demersum, Egeria densa, Eledea nuttallii, Lagarosiphon major.

Ceratophyllum demersum, Egeria densa, Elodea nuttallii and Lagarosiphon major have been studied in pond environments. A maximum net yield near 700 gm/m2 ash-free dry weight can be expected from the best adapted of these growing for 60-70 days in pleioeutrophic wastewater ponds. Luxury consumption of nitrogen and phosphorus occurred in transplanted and indigenous populations. Ceratophyllum demersum had 5.34% nitrogen by ash-free dry weight across a mean seasonal ambient water range of 0.52 to 13.38 mg/L of inorganic-N. A significant regression of mean seasonal tissue percentage on mean seasonal ambient water concentration for C. demersum in regard to soluble phosphorus (as P) was $y = 0.62 + 0.29 x$ plus or minus 0.06 where $r = 0.84$. The ambient range was 0.10 to 3.28 mg/L. C. demursum was not a special case in regard to these relationships. Cr, Ni, Co, Cu, Zn and Pb in submersed vascular hydrophytes appear to be related to the amount of the elements in the environment.
W72-13294

VARIATION IN DIATOM MORPHOLOGY AND WATER POLLUTION,
Connecticut Univ., Storrs. Inst. of Water Resources.
F. R. Trainor.
Technical Completion Report, June 1972. 4 p, 3 ref. OWRR A-014-CONN (4).

Descriptors: *Diatoms, Freshwater, Brackish water, *Salinity, *Sodium, Bioindicators, Life cycles, *Environmental effects, Reproduction.
Identifiers: *Cyclotella meneghiniana, *Cyclotella cryptica, *Polymorphism, *Induced sexual phase, Culture studies, Species concept.

Morphological responses of fresh- and brackish-water diatoms to changes in the physical and chemical environment were studied using culture technique. Findings show the wall morphology of the diatom species studied were not stable in different environments throughout the organism's life cycle, an assumption upon which identification of these organisms is based. The brackish-water diatom 'Cyclotella cryptica' was capable of producing the wall pattern characteristic of another species, 'C. meneghiniana,' in freshwater or in very low salinity. Results show also that speciation is not always precisely correlated with wall characteristics as assumed. Four distinct biological entities (species) were found capable of producing the wall pattern characteristic of 'Cyclotella meneghiniana.' Information concerning the process of sexual reproduction in the diatoms studied was obtained also. The sexual process of 'C. meneghiniana,' a common centric diatom which occupies habitats from fresh- to brackish-water, is correlated with the concentration of sodium salts in the medium. It can be induced in culture by Na+ stress. The sexual phase in 'C. cryptica' and several other diatom species, on the other hand, was correlated with a change in total salinity rather than in a single ion.
W72-13297

A PILOT PROGRAM TO DETERMINE THE EFFECT OF SELECTED NUTRIENTS (DISSOLVED ORGANICS, PHOSPHORUS, AND NITROGEN) ON NUISANCE ALGAL GROWTH IN AMERICAN FALLS RESERVOIR,
Idaho Univ., Moscow. Water Resources Research Inst.
F. L. Rose, and G. W. Minshall.
Available from the National Technical Information Service as PB-211 612, $3.00 in paper copy, $0.95 in microfiche. Moscow, Completion Report, June 1972, 37 p, 15 fig, 5 tab, 9 ref, append. OWRR A-039IDA (1).

Descriptors: *Algal control, *Phosphorus, *Nitrogen, *Idaho, *Chlorophyll, *Anabaena, Nutrients, Dissolved solids, Phytoplankon, Water pollution effects.
Identifiers: *Glucose, *Snake River (Idaho), *Dissolved organic carbon, *American Falls Reservoir, *Aphanizomenon, Algal growth.

A field investigation was conducted to determine the feasibility of using polyethylene tubes as in situ culture chambers in assessing the influence of selected nutrient factors on algal growth. The study was carried out in American Falls Reservoir, a large multipurpose impoundment on the Snake River in S.E. Idaho, during the summer of 1971. The tubes contained added amounts of phosphorus or phosphorus and organic carbon (glucose) and were subsequently 'seeded' with naturally occurring algal species. Periodic water samples taken from the tubes were analyzed for total and soluble phosphorus, total and soluble orthophosphorus, ammonium-N, nitrite-N, nitrate-N, particulate and dissolved organic carbon, total dissolved solids, chlorophyll a, and abundance of major phytoplankton species. Results were compared with those from ambient water collected both at the location of the experimental work and at other sites in the reservoir. Growth of planktonic organisms, especially Aphanizomenon and Anabaena, reached levels 10 times more numerous in the experimental tubes than in the ambient water. Although modification of some parts of the technique are suggested the use of polyethylene tubes appears to be of considerable promise in future investigations.
W72-13300

PHASES I AND II: EFFECTS OF PULP AND PAPER MILL EFFLUENTS ON GROWTH AND PRODUCTION OF FISH,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
C. E. Warren.

Descriptors: *Pulp wastes, *Chinook salmon, *Biochemical oxygen demand, *Salmonids, *Waste dilution, Amphipoda, Snails, Waste, Water (Pollution), *Effluents, Toxicity.

In aquarium studies, concentrations of 0.5 mg/l BOD (0.25 percent by volume) and greater of primary treated kraft effluent were found to decrease the growth rate of chinook salmon fed on tubificid worms. Neutralized bleached kraft effluent at concentrations as high as 3 percent by volume (about 4 mg/l BOD) did not adversely affect salmon growth rate. Salmon exposed to a 6 percent concentration, however, did exhibit important reductions in growth rate. Biologically stabilized effluent from mill A remained more toxic to fish than stabilized effluent. Production of chinook salmon was reduced during spring in laboratory streams receiving primary treated effluent at 1.5 percent by volume (3 mg/l BOD) but not in streams receiving 0.5 percent by volume (1 mg/l BOD). During summer experiments, primary treated and stabilized kraft effluent appeared to be less toxic. In laboratory stream experiments conducted during the spring, winter and fall, stabilized effluent reduced salmon production at a concentration of 1.5 percent by volume (0.5 mg/l BOD and lower). No difference in diversity of the insect

community could be attributed to the 0.5 mg/l level of either primary treated or biologically stabilized kraft mill effluent.
W72-13305

WARM WATER DISCHARGES INTO RIVERS AND THE SEA,
Central Electricity Generating Board, London (England).
F. F. Ross.
Water Pollution Control, Vol 70, No 3, p 269-274, 1971. 4 ref.

Descriptors: *Cooling water, *Nuclear powerplants, *Thermal pollution, *Heated water, Fish conservation, Fish farming, Insects, Plankton, Sewage effluents, Clams, Cooling towers, Water reuse.
Identifiers: Croydon (Britain).

The progress report examines some of the ecological fears associated with nuclear power plants and alternatives to using natural waters for thermal discharge and cooling. Fear of plankton death resulting from a trip through the cooling system appears to be unfounded. Adverse effects of thermal discharges on insect hatching are said to be non-existant. Heated discharges are not viewed as being harmful to fish or bottom-dwelling animals unless the heated water is mixed with the receiving water. Reduced dissolved oxygen due to thermal discharges is not seen as a problem because most water bodies used by nuclear plants are not saturated with oxygen and the 'oxygen sag curve' does not take rapidity of heat loss into account. Power plants located in lakes should, however, draw cooling water from the lake bottom to prevent disruption of overturn cycles. The use of thermal discharges in growing clams, plaice, soles and prawns is favorably discussed. The use of sewage effluent for cooling at Croydon is detailed and favorable results are reported. Extensive use of cooling towers is made in Britain. Despite problems with mineral salt buildup, the towers are said to be effective water purifiers. (Bass-Vanderbilt)
W72-13319

THE EFFECT OF RESIDUAL CELLULOSE WATERS ON AQUATIC INVERTEBRATES,
Institutul de Medicina si Farmacia, Iasi (Rumania). Catedra de Igiena.
S. Apostol.
Stud Cercet Biol Ser Zool, Vol 23, No 4, p 349-357, 1971, Illus, English summary.
Identifiers: *Water pollution effects, *Industrial wastes, Aquatic animals, Cellulose, Daphnia magna, Invertebrates, Paramecium caudatum.

The noxious action of cellulose plant wastes was determined in acute and chronic bioassays on Paramecium caudatum and Daphnia magna. A chronic action of these pollutants was recorded affecting especially the reproduction process. It is necessary that the dilution of effluents in the stream waters be of 1/100,000 (even much greater), so that the autopurification process is not disturbed.--Copyright 1972, Biological Abstracts, Inc.
W72-13333

PHYTOPLANKTON PRODUCTION AND THE DISTRIBUTION OF NUTRIENTS IN A SHALLOW UNSTRATIFIED ESTUARINE SYSTEM NEAR BEAUFORT, N.C.,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
G. W. Thayer.
Chesapeake Sci, Vol 12, No 4, p 240-253, 1971, Illus.
Identifiers: *Phytoplankton, *Beaufort (NC), Distribution, *Estuarine environment, *North Carolina, Nutrients, Photosynthesis, Production, Estuaries.

Photosynthesis, nutrients, and phytoplankton standing crop were measured for 1 yr at 32 stations in a system of shallow estuaries near Beaufort, N. C. Photosynthesis and chlorophyll had pronounced and similar seasonal distributions which roughly followed the cycle in water temperature. Production was generally minimal during Dec. and maximal during June and July. Annual production at individual stations ranged from 16 g C/m2 to 153 g C/m2, and averaged 66.6 g C/m2 for the 400 km2 system. Phosphate concentrations were generally low throughout the year, ranging from of 0.00-1.46 micro gA/l. Nitrate values ranged from 0.00-2.65 micro gA/l, and ammonia from 0.00-4.30 micro gA/l. Maximum available N and phosphate concentrations slightly preceded the period of maximum photosynthesis. N and P were both probably limiting to phytoplankton in this system, but N:P ratios suggest that N was the more limiting.--Copyright 1972, Biological Abstracts, Inc.
W72-13337

CHANGES IN THE PHYTOPLANKTON OF THE DEVELOPING VOLTA LAKE,
Volta Lake Research Project, Akosombo (Ghana).
S. Biswas.
Ghana J Sci. Vol 10, No 2, p 85-92. 1970. Illus.
Identifiers: Cyanophyta, Diatoms, Flagellates, Ghana, *Lakes, *Phytoplankton, *Volta Lake.

The phytoplankton of the developing Volta Lake consisted of more than twice the number of taxa found in the river system before the impoundment. Such an increase in taxonomic diversity was not uniform in all the classes as the green algae increased 4 times, the euglenoids 8 times and the blue-green algae more than twice. The flagellates barely increased while the diatoms decreased due to the disappearance of some of the taxa common in the tributaries. There was a greater abundance of phytoplankton in the lower reaches than in the upper ones. In general, classes of algae represented by a few taxa showed a high density of population. This was especially the case with the diatoms in the lower reaches and occasionally the flagellates in all parts of the lake. In the river the phytoplankton varied from a near absence to a high peak of short duration before the flood. Such extreme variations were not observed in the lake. The peak initially showed no definite seasonal pattern but later it settled to the dry season following the flood. In the lower reaches of the lake the dominant organisms changed from the blue-green algae to the diatoms and then again to the former. Quantitatively, however, there has been a considerable decline of blue-green algae. Most of the organisms occurred vegetatively in all parts of the lake throughout the year. They were present in the upper layers during the months of stratification. Periodic mixing distributed them throughout the depth, especially during the months of floods and wind-action.--Copyright 1972, Biological Abstracts, Inc.
W72-13339

COMPARISON OF MERCURY LEVELS IN AN OLIGOTROPHIC AND A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
F. M. D'Itri, C. S. Annett, and A. W. Fast.
Mar Technol Soc J., Vol 5, No 6, p 10-14. 1971. Illus.
Identifiers: Airborne pollution, Eutrophication, Fallout, Hazards, *Lakes, *Mercury, Michigan, Oligotrophy, Water pollution, Rainbow trout, Water pollution sources.

The overall Hg burden of rainbow trout in 2 lakes was studied. The removal of Hg by adsorption onto organic particulate matter probably is a key factor in the different Hg levels of fish in the 2 lakes. This adsorption mechanism makes the Hg from pollution less available for accumulation by the fish that feed in the water column. Therefore, the persistence of Hg compounds in these 2 isolated lakes appears to be related to the organic character of each lake. Accordingly, Hg pollution appears to pose a greater environmental hazard in oligotrophic than in eutrophic lakes. And the same is true for the persistence of chlorinated hydrocarbon pesticides (Hamelink, et al., 1971; Terriere, et al., 1966). Since Section Four and Hemlock Lakes have no direct point discharge sources of Hg, the cause of their Hg pollution is unknown. Their location in a remote, undeveloped natural area of Michigan is 45 m downwind from cement manufacturing plants and fossil fuel burning communities. One causal theory, then, is that the airborne fallout of Hg may account for a substantial portion of the Hg loading to these lakes.--Cpyright 1972, Biological Abstracts, Inc.
W72-13340

HETEROTROPHIC MICROFLORA OF AMU DARYA RESERVOIRS AND ITS ROLE IN MINERALIZATION OF ORGANIC MATTER,
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Microbiology and Virology.
N. S. Sagidullaev, and M. I. Novozhilova.
Mikrobiologiya. Vol 40, No 4, p 714-717. 1971. English Summary.
Identifiers: *Microorganisms, Achromobacter liquefaciens, Achromobacter nitrificans, Achrombacter thalassium, Bacillus albus, Mineralization, *Organic matter, Reservoirs, USSR, Amu Parya.

The specific composition of heterotrophic bacteria was studied for the first time in reservoirs of the lower reaches of Amu Darya delta. Various species of heterotrophic microflora were detected in the reservoirs: 125 strains of water bacteria belonged to 12 genera and 64 spp. Non-sporeforming microorganisms prevailed (89.1%), especially rod-like forms. The following species were widely distributed: Bacillus albus album Copeland (1899), Achromobacter nitrificans Chester (1901), A. liquefaciens Jordan (1890), A. thalassium Zo Bell et Upham (1944). Among the identified species 58.3% microorganisms expressed proteolytic activity, 30%-ammonifying activity and 64%-denitrifying activity. Therefore, heterotrophic microorganisms are involved in the total turnover of organic matter in the reservoirs of Karakalpakia.--Copyright 1972, Biological Abstracts, Inc.
W72-13341

THE EFFECT OF OIL SLICK DISPERSANT, ESSO COREXIT 7664 AND THE JOINT EFFECT WITH CRUDE OIL ON THE SURVIVAL OF MARINE GLASS FISH, AMBASSIS SP. AND PALAEMONID SHRIMPS
Ministry of Agriculture and Lands, Kuala Lumpur (Malaysia). Fisheries Div.
S. A. Latiff.
Malysian Agricultural Journal, Vol 48, No 1, p 13-19, 1971. 4 fig, 2 tab, 5 ref.

Descriptors: *Oil pollution, *Bioassay, *Toxicity, *Water pollution effects, Oily water, Oil spills, Emulsifiers, Shrimp, Aquatic animals.
Identifiers: *Oil dispersants, *Corexit, *Glass fish, *Palaemonid shrimp, Crude oil, Dispersants, Oil slicks, Ambassis spp.

The median tolerance limit for 24 hr for the glass fish was 1.04 ml corexit/l of sea water without crude oil, and 1.07 ml/l with crude oil. The corresponding figures for palaemonid shrimps appeared to be 2.08 and 1.68 ml/l, respectively. Threshold toxicity for the glass fish was raised from 0.12 ml to 0.51 ml/l after the addition of crude oil; for the shrips there was only a slight rrise from 0.12 to 0.21 ml/l. Percentage survival of test animals is inversely proportional to the concentration of ESSO Corexit, but on the addition of crude oil it shows a negative exponential relationship with concentration. For the glass fish, the joint effect of Corexit 7664 and crude oil considered as a whole proves to be less toxic than the lone effect of the dispersant at lower concentrations and more

toxic at higher concentrations. For palaemonid shrimps, toxicity of Corexit is reinforced at higher and lower concentrations. Finally, Corexit is much less toxic than the other emulsifiers tested. (Svensson-Washington)
W72-13343

SOME EFFECTS OF LOW OXYGEN TENSIONS ON THE DISTRIBUTION OF THE THREE--SPINED STICKLEBACK GASTEROSTEUS ACULEATUS L. AND THE NINE-SPINED STICKLEBACK PUNGITIUS PUNGITIUS (L.),
Hull Univ. (England).
D. B. Lewis, M. Walkey, and J. G. Dartnall.
Journal of Fish Biology, Vol 4, p 103-108, 1972. 2 fig, 1 tab, 15 ref.

Descriptors: *Oxygen requirements, *Fish physiology, *Sticklebacks, *Gasterosteus species, *Pungitius species, *Distribution, *Aquatic environment, Oxygen, Dissolved oxygen, Biochemical oxygen demand, Eutrophication, Oxygen sag, Photosynthetic oxygen, Respiration, Fish populations, Freshwater fish, Bioassay, Lethal limit.
Identifiers: *Oxygen tension, Respiration rates.

During extensive sampling of populations of sticklebacks for parasites, it became apparent that marked differences existed in the distribution of the two British freshwater species. Observation of the survival, respiratory rates and distribution of three-spined and nine-spined sticklebacks from a variety of habitats supports the suggestion that physiologically, the nine-spined stickleback is much better adapted to life in closed, shallow, weedy, eutrophic waters, depleted in oxygen. By comparison, G. aculeatus favors more open, well oxygenated water. (Svensson-Washington)
W72-13344

CONTAMINATION OF MARINE LITTORAL AND SEA FOODS BY PESTICIDES, (CONTAMINATION DU LITTORAL MARITIME ET DES FRUITS DE MER PAR LES PESTICIDES),
Poitiers Univ. (France). Faculte de Medicine et de Pharmacie.
J. Brisou.
Mededelingen Faculteit Landbouw-Wetenschappen GENT, Vol 35, No 2, p 739-743, 1970. 3 tab, 3 ref. English summary.

Descriptors: *Pesticide residues, *Aquatic life, *Aquatic environment, *Water pollution, *Path of pollutants, *Public health, Enzymes, Analytical techniques, Pesticides, Fungicides, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Carbamate pesticides, Organic pesticides, Herbicides, Water pollution sources, Plankton, Oysters, Shellfish, Algae, Mud, Sediments, Gas chromatography, Colorimetry.
Identifiers: Mercurial pesticides, Thin layer chromatography, Growth inhibition.

A systematic investigation of the French coasts of the Channel, the Atlantic and the Mediterranean Sea shows a significant pollution of muds, sediments, algae, plankton, and shellfish by pesticides. The per cent of contamination by one or several products is by approximation: oysters - 72%, other shellfish - 67%, algae - 66%, plankton- 100%, and water - 0%. The plankton is one of the most contaminated materials because mercurial fungicides are more prevalent than other pollutant products, and they are concentrated by the plankton. Data have been obtained using several techniques: growth inhibitions, anticholinesterase activity of extracts, thin layer chromatography, spectrocolorimetry, and in a few instances gas chromatography. (Svensson-Washington)
W72-13347

THE EFFECTS OF VARIATIONS IN OXYGEN TENSION ON CERTAIN ASPECTS OF RESPIRATORY METABOLISM IN PACIFASTACUS LENIUSCULUS (DANA) (CRUSTACEA:DECAPODA),
California Univ., Davis. Dept. of Zoology; and California Univ., Davis. Inst. of Ecology.
G. A. Moshiri, C. R. Goldman, G. L. Godshalk, and D. R. Mull.
Physiological Zoology, Vol 43, No 1, p 23-29, January 1970. 3 fig, 1 tab, 24 ref.

Descriptors: *Respiration, *Crayfish, *Metabolism, Oxygen, Dissolved oxygen, Biochemical oxygen demand, Oxygen requirements, Animal physiology, Water temperature, Ventilation, Lakes, Streams.
Identifiers: *Ventilation rates, *Oxygen utilization, Pacifastacus spp., *Lake Tahoe.

Responses of the crayfish, Pacifastacus leniusculus, from Lke Tahoe to variations in oxygen tension were determined under laboratory conditions. These results were supplemented by experiments which yielded data on ventilation rates, also under conditions of varying oxygen levels. Results show the relationship between oxygen concentration and uptake to be linear within the range tested. Ventilation rate remained constant with a decrease in oxygen level down to 2.5 ml/1, at which point it started to decline. The efficiency of oxygen utilization showed a mean of 22.1% down to a concentration of 3.88 ml/1, at which point it began to increase. In addition, a direct relationship was observed between utilization efficiency and increase in temperature. These results indicate that in this species the patterns of ventilation and oxygen utilization are direct consequences of a decrease in metabolism rather than adaptations for the regulation of oxygen uptake. (Svensson-Washington)
W72-13350

SLUDGE DUMPING IN THE FIRTH OF CLYDE,
Clyde River Purification Board, East Kilbride (Scotland).
For primary bibliographic entry see Field 05B.
W72-13351

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.
For primary bibliographic entry see Field 05B.
W72-13355

BENTHIC MACROINVERTEBRATES OF LAKE KOJIMA, WITH PARTICULAR REFERENCE TO POLLUTION EFFECTS OF INDUSTRIAL AND MUNICIPAL WASTES,
Ehime Univ., Matsuyama (Japan). Inst. of Biology.
Takeo Ito, Kazuo Kuwada, and Motomu Nikaido.
Mem Ehime Univ Nat Sci Ser B Biol. Vol 6, No 3, p 145-158. 1970. Illus. Map.
Identifiers: *Water pollution effects, *Benthos, Industrial wastes, Invertebrates, Japan, Lake Kojima (Japan), Limnodrilus sp, Municipal wastes, Water pollution, Tendipes halophilus, Tendipes plumosus.

Fauna and distribution of benthic macroinvertebrates of Lake Kojima were studied with special regard to the effects of the water pollution by industrial and municipal wastes, in Feb., Aug. and Nov. of 1967. Lake Kojima is a man-made shallow freshwater lake formed by damming across Kojima Bay opening into the Inland Sea of Japan. Fauna of the benthic macroinvertebrates showed a simple composition which consisted of 12 sp. and was dominated mostly by tubificid, Limnodrilus sp. and a tendipedid larva, Tendipes pulmosus or T. halophilus. BOD (Biochemical Oygen Demand) values of bottom waters indicated a considerably polluted condition with organic substances all over the study area ranging from 15 to 180 ppm. The maximum value was observed always at the station just below the outfall of paper-mill wastes in the Sasagase River. Dissolved O2 in the bottom water showed considerably lower concentrations in the Sasagase area, but it presented a supersaturation mostly in the lake proper area. In the deep region along the fairway extending over about 2 km below the outfall of the mill wastes, even the tubificid was not found possibly owing to the effects of the wastes and domestic sewages. In the northeastern deep part near the closure dam of the lake proper, no macrobenthos was found probably on account of a higher chlorinity and the presence of a large amount of sulfide in the habitat. The macrobenthos were most abundant in the study areas of the Kurashiki River, southwestern part of the lake proper and the flood-storage basin. Standing crops of the macrobenthos in the deep part along the fairway of the rivers and the lake proper were largest in Feb. and smallest in Aug.--Copyright 1972, Biological Abstracts, Inc.
W72-13366

OFFENSIVE-ODOR SUBSTANCE IN THE EVIL--SMELLING FISH FROM THE SEA-POLLUTED BY PETROLEUM AND PETROCHEMICAL INDUSTRIAL WASTE: I. IDENTIFICATION OF OFFENSIVE-ODOR SUBSTANCE,
Okayama Univ. (Japan). Dept. of Public Hygiene.
For primary bibliographic entry see Field 05A.
W72-13379

INFLUENCE OF INSECTICIDES ON ORGANOLEPTIC AND PHYSICO-CHEMICAL PROPERTIES OF WATER, (IN POLISH),
Jerzy Luczak.
Rocz Panstw Zakl Hig. Vol 22, No 2, p 113-132. 1971. Illus. English summary.
Identifiers: *Water pollution effects, Aldrin, *Insecticides, Methyl/palathion, Methoxychlor, Organoleptic properties, Physicochemical properties, Thiometon.

The levels of 4 pure insecticides (aldrin, methoxychlor, methylparathion, thiometon) and of 7 commercial formulas containing these products which cause changes in the color, odor or taste and result in foaming were determined for distilled and tap water. Pure thiometon caused change in the odor and taste of water at concentrations of 0.01 mg/l, while for aldrin a concentration of 1.0 mg/l was necessary. All commercial formulas caused changes in the odor and taste of both distilled and tap water at all levels investigated. The influence of pure insecticides and their derivatives on the course of nitrogen and oxygen transformation in the natural water taken from the Vistula river was also studied. All liquid commercial formulas caused a distinct increase of the index of absolute oxygen consumption of the water. Commercial formulas containing technical insecticides, mineral carriers, organic solvents, emulgators, stabilizers, and other substances added to improve the applicability of the formulas differ in their influence on organoleptic and physico-chemical properties of water from that of pure insecticides. In all investigations dealing with the influence of insecticides on the properties of water, the important practical aspect is the testing of commercial insecticides used.--Copyright 1972, Biological Abstracts, Inc.
W72-13393

INTERACTIONS OF LIGHT, TEMPERATURE AND MOISTURE ON TERBUTRYN TOXICITY,
Missouri Univ., Columbia. Dept. of Plant Pathology.
L. D. Houseworth, and B. G. Tweedy.
Weed Sci. Vol 19, No 6, p 732-735. 1971.
Identifiers: Avena sativa M, Cucumis sativus D, *Herbicides, Interactions, Light, Moisture, Temperature, *Terbutryn, *Toxicity, Triazine.

Toxicity of soil-applied 2- (tert-butylamino)-4 (ethylamino)-6- (methylthio)-s-triazine (terbutryn) to cucumbers (Cucumis sativus L. 'Gemni') and oats (Avena Sativa L. 'Nodaway') was increased 2.2 times when the light intensity was raised from 11,000 to 22,000 rumens/m2 and 1.5 times when the moisture level was raised from low (25 to 50% field capacity) to high (75 to 100% field capacity). When the temperature was raised from the low level (19 C day, 14 C night) to the high level (29 C day, 24 C night) toxicity of terbutryn to oats was increased 1.6 times and toxicity to cucumber was increased 1.3 times. Analysis of interactions of the 3 variables on toxicity of terbutryn showed that environmental conditions favoring rapid growth resulted in an increase in phytotoxicity.--Copyright 1972, Biological Abstracts, Inc.
W72-13395

CORRELATION BETWEEN PRIMARY PRODUCTION, PLANKTON GROWTH AND LIGHT IN THE KUMMEROWER LAKE (MECKLENBURG),
Rostock Univ. (East Germany). Institut fuer Hygiene.
For primary bibliographic entry see Field 02H.
W72-13401

THE VERTICAL DISTRIBUTION OF THIAMINE, BACTERIA AND PHYTOPLANKTON IN THREE LAKES IN EAST HOLSTEIN,
Muenster Univ. (West Germany). Botanisches Institut und Botanischer Garten.
H. Hagedorn.
Ber Deut Bot Ges, Vol 82, No 3/4, p 223-234, 1969, Illus, English summary.
Identifiers: *Limnology, *Bacteria, Distribution, Germany, Lakes, *Phytoplankton, *Thiamine.

The relationship between heterotrophic bacteria, phytoplankton and thiamine content of some lakes in East Holstein, Germany was studied. The bacteria were the most important producers of thiamine. The phytoplankton had no direct influence on the vitamin content of the water.--Copyright 1972, Biological Abstracts, Inc.
W72-13402

PLANTS AND INDUSTRIAL WASTE,
Liverpool Univ. (England).
A. D. Bradshaw.
Bot Soc Edinburgh Trans, Vol 41, No 1, p 71-84, 1970.
Identifiers: *Industrial wastes, Metals, Mines, Moisture, Nutrients, *Plants, Toxicity.

The growth of plants on man-made habitats, such as old metal mine workings, was studied. Metal toxicity, a shortage of major plant nutrients, and soil moisture deficiency characterize these habitats; it is suggested recent evolution has produced a tolerance for these conditions on the part of plant pioneers.--Copyright 1972, Biological Abstracts, Inc.
W72-13418

CALEFACTION AND PHYTOPLANKTON,
Maryland Univ., College Park, Md. Dept. of Botany.
C. Sorokin.
Bioscience. Vol 21, No 23, p 1153-1159. 1971. Illus.
Identifiers: *Thermal pollution, *Algae, *Phytoplankton, Temperature.

The overall biological effects of increase in temperature of aquatic habitats range from harmful to beneficial. Observations on green high-temperature algae indicate that the most competitive of these organisms not only tolerate higher temperatures but actually outperform the low-temperature forms over a wide temperature range. A planned seeding of natural waters, with an assemblage of organisms selected for their adaptability and competitive performance at higher temperatures, merits consideration among possible solutions of the calefaction problem.--Copyright 1972, Biological Abstracts, Inc.
W72-13420

THE ROLE PLAYED BY THE FISHERIES RESEARCH BOARD OF CANADA IN THE 'RED' HERRING PHOSPHORUS POLLUTION CRISIS IN PLACENTIA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
P. M. Jangaard.
A.R.O. Circular Number 1, Fisheries Research Board of Canada, 1970. 20 p, 10 fig, 2 tab.

Descriptors: *Herrings, *Fishkill, *Phosphorus, Water pollution effects, *Bioassay, *Pollution abatement, Pollution identification, Water pollution sources, Industrial wastes, Bottom sediments, Toxicity.
Identifiers: *Red herring, *Placentia Bay, (Newfoundland).

Red herring fishkills caused by phosphorus in industrial wastes caused acute problems in Placentia Bay, Newfoundland. The use of phosphorus in production resulted in a highly toxic effluent which caused hemolysis of the blood and a breakdown of the lining of gill lamellae in local fish populations. Sensitivity to phosphorus poisoning was detected at concentrations of 2.5 ppb. Retention in harbor sediments coupled with high effluent discharge resulted in retention and treatment of all effluents and dredging of the harbor bottom. (Ensign-PAI)
W72-13439

UPTAKE OF COBALT-58 BY MUSSEL, MYTILUS EDULIS,
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 05B.
W72-13440

EFFECT OF PESTICIDE CHEMICALS ON MARINE ORGANISMS,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
J. H. Phillips.
In: Agricultural Chemicals - Harmony or Discord for Food, People, Environment, 1971, University of California, Division of Agricultural Sciences, J. E. Swift, editor. p 68-79.

Descriptors: *Water pollution effects, *Pesticide residues, *Water pollution treatment, *Pesticide toxicity, *Water pollution sources, Chemical wastes, Pesticides, Agricultural chemicals, Pollution abatement, Bioassay, DDT, Mercury.

Pesticide residues accumulating in the marine environment offer serious economical and biological effects. Condemnation of fish products due to pesticide residue content is increasing. Residue levels in marine organisms have been correlated with abnormalities and population declines. The results of preventive measures are extremely long term as illustrated by increased residue levels in sediments where input has declined. (Ensign-PAI)
W72-13441

FERTILIZED SEA URCHIN EGGS AS AN INDICATORY MATERIAL FOR MARINE POLLUTION BIOASSAY, PRELIMINARY EXPERIMENTS,
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
Publications of the Seto Marine Biological Laboratory, Vol 18, No 6, p 379-406, March 1971, 2 fig, 8 tab, 16 ref.

Descriptors: *Bioassay, Water pollution effects, Aquatic animals, *Bioindicators, *Embryonic growth stage, *Fertilization, *Pollution identification, Heavy metals, Salinity, Density.
Identifiers: *Sea urchin eggs, Hatakejima Island (Japan).

A series of bioassays were made to measure pollution around Hatakejima Island using sea urchin eggs and embryos as indicator organisms. Normal fertilization, cleavage to gastrulation and the anomalies of polyspermic cleavage, permanent blastula and exogastrula were used for pollution indicators. In polluted water samples, no fertilization occurred, and when density was increased some fertilization took place with development to gastrula, though first cleavage was retarded and a high percentage of permanent blastula resulted. Heavy metals induced multicells, permanent blastula and exogastrula. Other chemicals caused similar results with less polyspermy and exogastrucation. (Ensign-PAI)
W72-13442

DDT INHIBITS NA+, K+, MG2+ -ATPASE IN THE INTESTINAL MUCOSAE AND GILLS OF MARINE TELEOSTS,
Mt. Desert Island Biological Lab., Salisbury Cove, Maine.
R. H. Janicki, and W. B. Kinter.
Nature New Biology, Vol 233, No 39, p 148-149, September 29, 1971, 1 fig, 1 tab, 18 ref.

Descriptors: *DDT, *Teleosts, *Marine fish, *Pesticides, *Toxicity, Enzymes, Chlorinated hydrocarbon pesticides, Pesticide residues, Osmosis, Sodium, Potassium, Magnesium.
Identifiers: ATPase, Intestinal mucosae, Gills, Frenchman Bay - Gulf of Maine.

The interaction of the organochlorine insecticide DDT, with sodium-potassium-activated, magnesium dependent, adenosine triphosphatase inhibits the osmoregulatory functions of Na+, K+, Mg2+ -ATPase in the intestinal mucosae and gills of marine teleosts. Concentrations between 1 and 50 ppm of DDT restricted sodium transport as much as 54%, a function which is believed affected by the enzyme Na+, K+, Mg2+ -ATPase. (Ensign-PAI)
W72-13444

INCIDENCE OF R+ ESCHERICHIA COLI IN COASTAL BATHING WATERS OF BRITAIN,
Animal Health Trust, Stock (England). Farm livestock Research Centre.
For primary bibliographic entry see Field 05B.
W72-13445

HOPKINS MARINE STATION,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
For primary bibliographic entry see Field 05B.
W72-13450

THERMAL POLLUTION IN UNCHARTED WATERS.

Environmental Science and Technology, Vol 5, No 12, p 1170-1171, December 1971.

Descriptors: *Thermal pollution, *Water pollution treatment, *Water pollution effects, *Hydroelectric plants, Heated water, Water pollution sources, Pollution abatement, Environmental engineering, Resources.

Additional investigations into the extent and allowable limit of thermal pollution caused by industrial use of water is required for the adequate protection of the environment. Effective heat treatment methods have been developed, but economic factors must be considered. Studies in utilization

of waste heat for industrial and biological production have proposed thermal pollution as a potential resource of the future. (Ensign-PAI)
W72-13452

LAKE SUPERIOR--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-13480

LAKE MICHIGAN--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-13481

LAKE HURON--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02H.
W72-13482

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VI. THE AQUATIC FLORA OF CONESUS LAKE,
State Univ. Coll., Geneseo, N.Y.
H. S. Forest, and E. L. Mills.
Proc Rochester Acad Sci. Vol 12, No 2, p 110-138. 1971. Illus. Maps.
Identifiers: *Aquatic plants, Angiosperms, Coliforms, *Conesus Lake (N.Y.), New York, Phosphorus, Plants, Sewage, Water pollution effects.

Included in the ecological consideration of the lake are: a study of the sewage increase and its relationship to coliform counts and the pollution of the environment and an analysis of the pattern of P content and distribution in the lake. Preliminary distribution data and quantitative community analysis of the flora, including 26 genera and 43 spp. of angiosperms, are presented and discussed. (See also W72-13488)--Copyright 1972, Biological Abstracts, Inc.
W72-13487

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): VIII. ALGAE OF CONESUS LAKE, LIVINGSTON COUNTY, NEW YORK: INITIAL REPORT,
State Univ. Coll., Geneseo, N.Y.
P. G. Savard, and D. N. Bodine.
Proc Rochester Acad Sci. Vol 12, No 2, p 146-159. 1971. Map.
Identifiers: *Aquatic, Algae, Cladophora, *Conesus Lake (N.Y.), New York, Plankton, Plants, Seasonality, Species.

The floral list consists of 66 genera and 101 spp. A dense planktonic bloom and a profuse growth of Caldophora have been given special attention. The monthly distribution of plankton algae during 1967 is summarized. (See also W72-13487)--Copyright 1972, Biological Abstracts, Inc.
W72-13488

TRACE ELEMENTS DETAILED IN LAKE MICHIGAN.
For primary bibliographic entry see Field 05B.
W72-13489

COMPARISONS OF TWO ANTARCTIC LAKES WITH DIFFERENT TROPHIC STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
G. L. Samsel, Jr., and B. C. Parker.
Va J Sci, Vol 22, No 4, p 177-182, 1971, Illus.
Identifiers: *Limnology, Antarctic, *Lakes, Minerals, Photosynthesis, Oligotrophy, Eutrophication, Water pollution effects.

Compared were primary productivity, physical features, and chemical and biological composition of an oligotrophic and an eutrophic lake during Jan. 1970 at Anvers Island, Antarctica. Both lakes, less than 500 m apart, had partial ice cover the entire season and were underlain with similar silica-rich granite. Striking dissolved chemical differences were Cl- (7.5 and 35.0 mg/l), NH4+-N (0.1 and 2.5 mg/l), and organic C (0.97 and 6.94 mg/l), total PO4 -P (0.03 and 1.7 mg/l), respectively, for the oligotrophic and eutrophic lake. Particulate organic C was 0.031 and 0.144 mg/l. Extractable total chlorophyll ranged from 15-41 mg/m3 and 35-112 mg/m3 in the 2 lakes during the 3 wk study period. Ranges in net photosynthesis were 0.78-3.5 and 9.0-72.0 mg C/m3/hr, respectively, in the oligotrophic and eutrophic lakes. Diel ranges for chlorophyll and C fixation also fell within these values. The advanced degree of eutrophication of one lake over the other apparently was induced initially by surpluses of NH4+-N and PO4 -P.--Copyright 1972, Biological Abstracts, Inc.
W72-13511

THE ENVIRONMENTAL ACCEPTABILITY OF NTA: CURRENT RESEARCH AND AREAS OF CONCERN,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
R. D. Hamilton.
In: Nutrients and Eutrophication: The Limiting-Nutrient Controversy, Feb. 11-12, 1971, W. K. Kellogg Biological Station, Michigan State University, East Lansing. Special Symposia, Vol. 1, 1972, p 217-221. 1 tab, 5 ref.

Descriptors: *Nitrilotriacetic acid, *Detergents, Water pollution sources, *Aquatic animals, Phosphates, *Toxicity, *Testing procedures, Regulation, Standards, Water pollution effects.
Identifiers: *NTA.

The detergent industry and the governments of several countries have extensively tested nitrilotriacetic acid (NTA) as a potential replacement for phosphates in detergents. An outline of the testing procedures is discussed with consideration of the possibility that in the future tests may be required of all compounds introduced into the environment. It is suggested that test protocols for various classes of compounds, based on usage and toxicity, be established. Registration might be required with periodic review. Large scale priority research of test organisms in order to assay responses to stress other than that of death might be initiated. (See also W72-09175) (Ensign-PAI)
W72-13548

POLYCHLORINATED BIPHENYLS AND THE ENVIRONMENT.

Interdepartmental Task Force on PCBs Report, May 1972. 181 p, 10 fig, 40 tab.

Descriptors: *Water pollution sources, *Water pollution effects, *Polychlorinated biphenyls, *Toxins, Environmental effects, Ecology, Public health, Reviews, Federal Government, Inter-agency cooperation, Industries, Pollution abatement, Chemical properties, Physical properties.
Identifiers: Polychlorinated biphenyl uses, Government policies.

The chemicals known as PCBs--polychlorinated biphenyls--were reviewed by Five Federal agencies, with participation by other agencies. The Interdepartmental Task Force on PCBs coordinated its scientific efforts to better understand PCBs and to strengthen the Government's ability to protect the public from hazards associated with them. The task force made nine findings, conclusions, and recommendations, emphasizing that PCBs should be restricted to essential or nonreplaceable uses which would minimize the likelihood of human exposure or leakage to the environment. Supplementing the 20-page report are eight appendices detailing current knowledge about various aspects of PCBs, including their use replaceability; occurrence, transfer, and cycling in the environment; occurrence and sources in food; and PCBs effects on man and animals. (Woodard-USGS)
W72-13569

REVIEW OF THE RELATION OF WATER QUALITY AND SIMPLE GOITER,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W72-13607

5D. Waste Treatment Processes

SOLUBLE PHOSPHORUS REMOVAL IN THE ACTIVATED SLUDGE PROCESS - PART I - CHEMICAL-BIOLOGICAL PROCESS PERFORMANCE.
Soap and Detergent Association, New York

Copy available from GPO Sup Doc EP2.10:17010 EIP 05/71, $1.25; microfiche from NTIS as PB-211 563, $0.95. Environmental Protection Agency Water Pollition Control Research Series, May 1971. 119 p, 27 fig, 18 tab, 53 ref. EPA Program 17010 EIP 05/71.

Descriptors: *Phosphorus, *Chemical precipitation, *Activated sludge, *Aluminum, *Efficiencies, *Nitrification, Waste water treatment, Effluents, Costs.
Identifiers: *Operations, *Alum, *Aluminate, *Chemical removal, Waste sludge, Dosages.

The objective was to develop and evaluate, at full plant scale, the combined chemical-biological process of phosphorus removal. Phase I investigations indicated an Al/P (filt. ortho) weight ratio of 2.25/1 was necessary to reduce the influent phosphorus of approximately 10 mg P/l to approximately 0.3 mg P/l in the filtered effluent. Alum proved to be a more effective precipitant than sodium aluminate in the moderately alkaline wastewater available for this study. The best results were obtained when the chemical was added at or near the effluent end of the aeration tank. Total phosphorus concentration of the unfiltered effluent was dependent upon effluent suspended solids levels as on effluent soluble phosphorus concentrations. Removal of organic matter was improved as a result of chemical addition in the chemical-biological process. The chemical-biological process produced approximately twice as much weight of sludge as did the parallel control. Alum addition did not reduce the sludge volume index (SVI) of the mixed liquor whereas sodium aluminate addition resulted in significant decreases. Costs for chemical precipitation of phosphorus in the chemical-biological process are estimated to vary from 7.3 cents/1000 gal in a 1 MGD plant to 4.1 cents/1000 gal in a 100 MGD plant for 97% removal. (See also W72-13040) (EPA abstract)
W72-13039

SOLUBLE PHOSPHORUS REMOVAL IN THE ACTIVATED SLUDGE PROCESS, PART II, SLUDGE DIGESTION STUDY.
Soap and Detergent Association, New York.

Copy available from GPO Sup Doc EP2.10:17010 EIP 10/71, $0.65; microfiche from NTIS as PB-211 564, $0.95. Environmental Protection Agency Water Control Research Series, October 1971. 59 p, 20 fig, 4 tab, 23 ref. EPA Program 17010 EIP 10/71.

Descriptors: *Phosphate, *Chemical precipitation, *Domestic wastes, *Activated sludge, Sludge digestion, Solubility, Separation techniques, Nutrients, Nitrification, Dewatering, *Waste water treatment.
Identifiers: *Aluminum, Sludge gasses, Sludge dewatering, Alkalinity, Volatile acids.

Sludges containing aluminum phosphorus precipitates from an activated sludge wastewater treatment plant were digested in a high-rate digester. Sodium aluminate and liquid alum were used to precipitate the phosphorus from the wastewater. Analyses on both raw and digested sludges showed that once precipitated from the wastewater and incorporated into a sludge the phosphorus did not redissolve while undergoing anaerobic digestion. Most of the soluble phosphorus in both the raw and digested sludges was in the orthophosphate form, and the addition of the inorganic aluminum phosphorus complexes did not adversely effect the anaerobic digester. High concentrations of soluble aluminum ion did not appear in the anaerobic digester, and the use of alum for phosphorus removal caused no additional hydrogen sulfide production during sludge digestion. Analyses also indicated the addition of aluminum compounds enhanced the dewatering properties of the raw sludges. (See also W72-13039) (Lowry-Texas)
W72-13040

GRANULAR CARBON ADSORPTION IN COLUMNS,
Texas A and M Univ., College Station. Environmental Engineering Div.
T. Reynolds.
April 1972. 80 p, 29 fig, 2 tab, 24 ref. EPA Program 17090 DHA.

Descriptors: *Waste water treatment, Filters, *Carbon filters, *Carbon, *Adsorption, Granules, Design, Equations.
Identifiers: *Counter-current carbon columns, *Carbon columns, *Fixed and moving bed columns.

The reclamation of wastewaters to obtain high quality waters is being done in some parts of the United States now. In the future, water reuse will undoubtedly become widespread in many of the states. Granular carbon is one of the most promising unit processes for removal of organic matter from wastewater. Counter-current carbon columns provide the most efficient uses of granular carbon. The objective was to develop equations for the design of counter-current carbon filters. The equation derived is based on McBain's isotherm. Although the equation was verified, sensitivity studies should be made to obtain the range of application. In addition to this equation, another equation, based on Langmuir's isotherm, was developed for fixed carbon columns. Additional studies to apply the equation to counter-current conditions would be useful. (EPA abstract)
W72-13041

THE COST OF CLEAR WATER, VOLS I AND II.
Environmental Protection Agency, Washington, D.C.

Annual Report of the Administrator of the Environmental Protection Agency to the Congress of the United States, Senate Document No. 92-23, June, 1971. 128 p, 11 fig, 31 tab, 1 append.

Descriptors: *Water pollution, *Waste treatment, *Treatment facilities, Local governments, Federal government, Grants, Costs, Pollution abatement, Economic efficiency.
Identifiers: *Environmental protection.

Volume I discusses the cost estimates for municipal waste treatment facility needs as of December, 1970. The estimates are based upon a survey made by the Water Quality Office, Environmental Protection Agency. The study suggests a total investment need of $12.6 billion for municipal waste treatment facilities covering the period December, 1970 through the end of Fiscal Year 1974. Because of ongoing efforts in EPA, efficiency gains may decrease this investment need to $12.0 billion. The question of efficiency is discussed in detail in Volume II. The aspects considered include (1) the distribution of investments as compared to the distribution of polluting activities and the location of water pollution, (2) the efficiency of municipal and industrial waste treatment investments in reducing oxygen demand and nutrients in sewage, (3) avoidable increases in local operating, maintenance, financing, and overhead costs of waste treatment, and (4) the questionable strategy of using investment capital essentially to forestall some future needs while at the same time permitting the persistence of existing system deficiencies. The discussion is supported by numerous stables and graphs. A National Industrial Conference Board survey questionnaire entitled 'Study of Water Pollution Abatement Costs' is also included. (Settle-Wisconsin)
W72-13079

TREATMENT-COST RELATIONSHIP FOR INDUSTRIAL WASTES,
Vanderbilt Univ., Nashville, Tenn.
W. W. Eckenfelder, Jr., and J. L. Barnard.
Chemical Engineering Progress, Vol 67, No 9, p 76-85, September, 1971. 9 fig, 9 tab, 7 ref.

Descriptors: *Industrial wastes, *Treatment facilities, *Recycling, *Costs, Operating costs, Water quality standards, Water quality, Mathematical models.
Identifiers: *Multiple reuse.

Multiple reuse of water by a firm is normally called for when the supply of good water is limited and cost is high. To decide whether such multiple reuse is advisable, it is necessary to compare costs of fresh water and the treatment operations necessary to bring the waste to a required quality level. An economic balance or net cost equation can be expressed as the sum of supply-water cost, treatment-for-use cost, treatment-for-disposal cost, treatment-for-reuse cost, and treatment-for-product-recovery cost minus the value of the product recovered. Thus, the economic feasibility of recycling depends upon the net savings effected by handling a smaller volume of water, after the cost of treating the effluent for recycling has been considered. Recycling is most attractive when contaminants are either low in content or easily removed, when quality requirements are flexible, and when final effluent requirements are relatively stringent. Once-through water use systems become necessary when water quality requirements are inflexible, as in food processing and brewing operations. The capital and operating cost estimates necessary for system evaluation are obtainable from survey data or from data generated by mathematical cost models. (Settle-Wisconsin)
W72-13083

MICROBIOLOGICAL UTILIZATION OF SULPHITE LIQUOR,
British Columbia Research Council Vancouver.
J. C. Mueller, and C. C. Walden.
Process Biochemistry, June 1970. 4 p, 1 fig, 3 tab, 40 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste disposal, *Ultimate disposal, *Biodegradation, *Anaerobic digestion, *Waste treatment, *Biological treatment, *Microbial degradation, Wood wastes, Industrial wastes, Biochemical oxygen demand, Disposal, Byproducts, Lignins, Carbohydrates, Organic compounds, Proteins, Yeasts, Fermentation, Alcohols, Methane, Hydrogen sulfide.
Identifiers: *Waste conversion, *Wood sugars, *Waste utilization, Usable byproducts, Sugars, Lignosulphonates, Utilization, Rhizops spp., Fumaric acid, Ethanol, Acetone, Butyl alcohol, Latic acid, Propionic acid.

Research is now directed toward disposal of, and development of saleable byproducts from, the lignin and wood sugars in spent sulphite liquor (SSL) from pulp mills. The potential of microbiological methods for treating SSL is discussed. Because no reasonable microbial degradation of lignosulphonates is yet known, suggestions for biological utilization of SSL center around commercial fermentation of the soluble sugars. Conversion of SSL carbohydrate to yeast protein and Rhizopus spp. production of fumaric acid are considered, as is the potential anaerobic production of ethanol, acetone-butyl alcohol, lactic and propionic acids, methane, and hydrogen sulfide for recycling of sulfur in the pulping process. (LeGore-Washington)
W72-13098

FERMENTATIVE UTILIZATION OF SPENT SULPHITE LIQUOR, A REVIEW AND PROPOSAL,
British Columbia Research Council Vancouver. Div. of Applied Biology.
J. C. Mueller.
Pulp and Paper Magazine of Canada, Vol 71, No 22, p 3-7, November 20, 1970. 4 tab, 31 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste disposal, *Ultimate disposal, *Biodegradation, *Anaerobic digestion, *Waste water treatment, *Biological treatment, *Microbial degradation, Wood wastes, Industrial wastes, Biochemical oxygen demand, Disposal, Byproducts, Lignins, Carbohydrates, Organic compounds, Proteins, Yeasts, Fermentation, Alcohols, Methane.
Identifiers: *Waste conversion, *Wood sugars, *Waste utilization, Sugars, Lignosulphonates, Utilization, Rhizopus spp., Fumaric acid, Lactic acid, Propionic acid, Ethanol.

Spent sulphite liquor contains 10-13% soluble organics, which represent up to 50% of the wood raw material used in the pulping process. Efforts to utilize these organics by chemical or biological techniques have been only partially successful. A number of fermentation processes which yield saleable products from spent sulphite liquor are discussed. They have in common that they center solely on the carbohydrate fraction of the spent solids, but do not utilize the lignin derivatives. It is proposed to develop new fermentation processes which would permit the degradation or transformation of lignosulphonates into useful products. (LeGore-Washington)
W72-13107

AN APPLICATION OF NETWORK THEORY TO WATER MANAGEMENT IN POULTRY PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward, D. A. Link, and W. M. Crosswhite.
Water Resources Bulletin, Vol 8, No 3, p 495-504, June, 1972. 2 fig, 3 tab, 15 ref.

Descriptors: *Water management (Applied), *Linear programming, *Networks, Poultry, *Waste water treatment, Costs, Optimization, Food processing industry, Waste treatment, *North Carolina.
Identifiers: Network theory, *Poultry processing wastes, *Durham (NC).

With greater importance now being attached to conserving the quantity and quality of water resources, poultry-processing plants face the prospect of rising costs for water and waste treatment. A technique is presented for choosing an op-

timum combination of proposed modifications to minimize water flow through a poultry processing plant. A particular class of modifications is considered: changes in water-flow arrangements and process characteristics to reduce fresh water intake and waste-treatment costs. Existing and proposed flows are represented as a network, and linear programming is used to solve the minimum-flow problem for the network. The technique is applied to a typical plant in Durham, North Carolina. Results show fresh water intake can be reduced by 45% to 51%. Poultry processing plant modifications are classified by type, and the relative importance and effectiveness of each type are discussed. (Bell-Cornell)
W72-13137

AN 'OPTIMIZED MODULE' APPROACH TO WASTE WATER RECLAMATION DESIGN,
Kennedy Engineers, San Francisco, Calif.
R. A. Ryder, and M. T. McGovern.
Water Research, Vol 6, Nos 4/5, p 357-364, April/May, 1972. 2 fig, 1 tab.

Descriptors: *Waste water (Pollution), *Reclamation, *Treatment facilities, *Aerobic treatment, *Hawaii, Water supply, Eutrophication, Systems analysis, Optimization, Planning, Irrigation, Water quality, *Water reuse, Effluents, Quality control.
Identifiers: Coastal waters.

The concept of a number of relatively small waste water reclamation facilities rather than provision of centralized collection and treatment is particularly attractive when there is a broad need for irrigation with the reclaimed waste water, and concurrent development and growth of contiguous areas is not likely to occur. In concept, the modular approach immediately satisfies two primary goals: maximum standardization of process and mechanical equipment, and unlimited capability for expansion. Presented is a discussion of the optimization of a matrix created by 10 waste water reclamation design objectives and their relative degrees of dependent improvement. Included among these objectives are: minimum operational and maintenance cost; maximum process flexibility; and optimum power demand to system demand relationships. The result is the creation of a reclamation module utilizing aerobic biological treatment. The area being planned for is the Ka'u district of Hawaii. It is determined that the largest treatment module that could be constructed considering initial cost, projected growth, service area, and nearby land requiring irrigation would provide the most economic overall selection. The treatment process is designed to provide optimum effluent quality for reuse as irrigation water for golf courses, parks, pastures, orchards, and urban greenbelt. (Bell-Cornell)
W72-13138

MECHANISM OF DEGRADATION OF WOOD AND PULP PRODUCTS IN WATER SOLUTION,
Arizona Univ., Tucson. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-13181

THE PROBLEM OF WASTE WATER AND OF SLUDGE IN RURAL SETTLEMENTS,
G. P. Schmidt, and K.-H. Bollow.
Z Gesamte Hyg Grenzgeb. Vol 17, No 7, p 498-503. 1971.
Identifiers: *Rural areas, Sludge treatment, *Waste water treatment, *Activated sludge.

The economic, hygienic, and constructional aspects of various waste water purification installations in rural settlements where the composition of waste water is subjected to wide fluctuations are discussed and the advantages and limitations of aeration and activated-sludge ditches, of small activated sludge plants, of small clearing plants and of aeration and stabilization ponds are outlined. All aeration waste water purification methods require the periodic removal of accumulated sludge. Small activated sludge plants with extended aeration developed in the USA which do not require sludge removal suffer from problems of a hydraulic nature. Aeration and stabilization ponds with or without preliminary unaerobic treatment tanks are probably the most satisfactory method of waste water treatment under rural conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-13214

TIME-INTEGRATED THERMAL EFFECTS OF FOREST IRRIGATION,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
R. Lee, and W. E. Sharpe.
Forest Science, Vol 15, No 2, June 1969, p 114-120. 3 fig, 2 tab, 11 ref. OWRR A-012-PA (5).

Descriptors: *Sewage effluents, *Water reuse, *Irrigation effects, Forests, Microclimatology, *Air temperature, *Soil temperature, *Thermal conductivity.
Identifiers: Evaporative cooling, *Red pine, *Hardwoods.

Closed stands of planted red pine and mature hardwoods were irrigated with either 1 or 2 inches per week of treated sewage effluent. Vertical temperature profiles obtained with the sucrose hydrolysis method showed that air temperatures at breast height and in the canopy were 0.1 to 0.8C lower in treated stands as a result of additional evaporative cooling. Soil temperatures in treated stands were as much as 1.2C higher due to increased thermal conductivity. Magnitudes of the effects varied with forest stratum and forest type, and with the amount and mode of irrigation, and with seasonal weather. (Galwardi-Texas)
W72-13247

FACTORS AFFECTING BIOLOGICAL DENITRIFICATION OF WASTEWATER,
Environmental Protection Service, Hamilton (Ontario). Canada Centre for Inland Waters.
R. N. Dawson, and K. L. Murphy.
Preprint, presented at 6th International Water Pollution Research Conference, Session 15, Hall C, Paper No 31, June 23, 1972. 10 p, 7 fig, 1 tab, 19 ref.

Descriptors: *Denitrification, Design criteria, Design data, Biological treatment, *Waste water treatment, Hydrogen ion concentration, *Nitrates, Temperature, Activated sludge, Time, Retention, Statistical methods, Laboratory tests, Laboratory equipment.
Identifiers: Denitrification rate, *Carbon-nitrate rates, *Pseudomonas denitrificans, Variance analysis.

A laboratory study was conducted to determine the relative importance and interactions between variables affecting the unit denitrification rate, namely, pH, organism concentration, nitrate concentration and carbonnitrate ratio. The concentration versus time curves and analysis of variance of the experimental designs indicate that the denitrification rate was independent of carbon and nitrate concentration providing sufficient organic carbon was added to satisfy the nitrate reduction and organism growth. The optimum pH for denitrification with Pseudomonas denitrificans was 7.0. Activated sludge from an extended aeration plant denitrified at 27C as if 20-25% by weight were composed of organisms with an equivalent unit nitrate reduction rate as P. denitrificans. The unit denitrification rate of Pidenitrificans can be approximated by an Arrehmius type temperature dependency between 3C and 27C. At 5C the unit rate was sufficiently high to allow use of this process if stirred tank detention times of 3 to 8 hours and higher organism populations, 5,000 mg/l, were used. (Galwardi-Texas)
W72-13250

NUTRIENT REMOVAL THROUGH NATURAL SAND BEDS,
Rensselaer Polytechnic Inst., Troy, N.Y. Bio-Environmental Engineering Div.
T. P. Glavin, and J. A. Romero.
Master's Thesis, August 1968. 106 p, 19 fig, 12 tab, 39 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Filtration, Sands, Nutrients, Performance, Efficiencies, Depth, Biochemical oxygen demand, Coliforms, Nitrates, Phosphates, *New York.
Identifiers: *Nutrient removal, *Sand filters, *Lake George (NY).

In recent years an increase in nutrient concentration has been noted at the south end of Lake George near Lake George Village, N.Y. An investigation was conducted to determine if the wastewater treatment plant had any effect on this increased nutrient concentration. The treatment plant discharges its effluent onto natural sand seepage beds which are greater than 25 ft. deep. The removal efficiency of the sand beds with respect to coliforms, BOD, chlorides and nitrogen and phosphorus compounds was investigated. Results showed that when the sand beds were dosed, they were no longer saturated at 15 feet. Ten feet of sand was found to remove coliforms by 99% and BOD by 96%. However, nitrates, phosphates, and chlorides remained in significant concentrations after 10 feet of sand filtration. (Galwardi-Texas)
W72-13251

THE MICROBIOLOGY OF AN ACTIVATED SLUDGE WASTEWATER TREATMENT PLANT CHEMICALLY MODIFIED FOR PHOSPHORUS REMOVAL,
Pennsylvania State Univ., University Park. Dept. of Microbiology.
J. A. Davis.
Ms. Thesis, June 1972. 94 p, 4 fig, 16 tab, 78 ref. OWRR A-018-PA (2).

Descriptors: Microbiology, *Activated sludge, *Chemical precipitation, *Waste water treatment, *Microorganisms, *Phosphorus, Coliforms, Biological treatment.
Identifiers: *Alum treatment, Fecal coliforms, *Fecal streptococci, Most probable number.

The microbiology of a full scale activated sludge treatment plant modified to permit chemical precipitation of phosphorus employing aluminum sulfate as the precipitant was investigated. The investigation consisted of: enumeration of microorganisms present in activated sludges with and without the aluminum precipitates formed by alum addition to mixed liquor, and most probable number estimates of activated sludge microorganisms and levels of total coliforms, fecal coliforms and fecal streptococci present in the wastewater treatment plant effluent. It was concluded that the microflora of conventional activated sludge was modified to some extent by the addition of alum, probably by aluminum hydroxopolymers. Alum treatment of wastewater appeared to enmesh microorganisms. Also, alum treatment augmented reduction of wastewater bacteria, total coliforms, fecal coliforms and fecal streptococci. (Galwardi-Texas)
W72-13252

OIL/WATER SEPARATION SYSTEM WITH SEA SKIMMER.
AiResearch Mfg. Co., Los Angeles, Calif.
For primary bibliographic entry see Field 05G.
W72-13253

OPTIMIZATION OF AMMONIA REMOVAL BY ION EXCHANGE USING CLINOPTILOITE.
California, Univ., Berkeley. Sanitary Engineering Research Lab.

Copy available from GPO Sup Doc EP2.10:17080-DAR-09/71, $1.50; microfiche from NTIS as PB-211 605, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, September 1971. 189 p, 35 fig, 29 tab, 105 ref. EPA Program 17080 DAR 09/71.

Descriptors: *Tertiary treatment, *Ion exchange, *Municipal wastes, *Ammonia, Nitrogen, Cation exchange, Zeolites, *Waste water treatment, Cost analysis, Estimated costs, Optimization, Performance, Efficiencies, Water reuse, Hydrogen ion concentration.
Identifiers: Clinoptilolite, Chemical-physical treatment, Advanced waste water treatment, Regeneration.

The zeolite ion exchanger clinoptilolite was investigated with the objective of optimizing its application to ammonia removal from wastewaters. The study included multiple cycle pilot plant operations at three municipal sewage treatment plants. Particular attention was given to cation interference with exhaustion performance and with minimum cost regeneration. The ammonia capacity of clinoptilolite was found to be nearly constant over the pH range of 4 to 8, but diminished rapidly outside this range. In regeneration the pH was critical in determining the NaCl requirements, a higher pH favoring lesser amounts of salt. However, at a pH over 12.5 zeolite attrition became excessive and exchanger makeup contributed significantly to operating costs. An average ammonia removal of 95.7% was obtained in demonstration studies on three municipal wastes having an NH3-N content of about 20 mg/l. The cost of ammonia removal using clinoptilolite for a 10-mgd plant operating under these conditions was estimated to be $0.082/1000 gallons. Ammonia removals down to less than 0.5 mg/l NH3-N is technically feasible, but only with shorter exhaustion runs and greater regenerant requirements. (Galwardi-Texas)
W72-13254

ADSORPTION OF INORGANIC COMPOUNDS BY ACTIVATED CARBON,
Westvaco Corp. Covington, Va.
E. A. Sigworth, and S. B. Smith.
Journal of the American Water Works Association, Vol. 64, No. 6, p. 386-391, June 1972, 1 fig., 5 tab., 6 ref.

Descriptors: *Water treatment, *Waste water treatment, *Public health, Sanitary engineering, *Adsorption, *Toxins, *Activated carbon, *Inorganic compounds.
Identifiers: *Trace metals.

The merits of activated carbon for removal of organic compounds from water have been well documented, but the potential for adsorption of inorganic compounds has received very little publicity. Studies published have generally been made on industrial water concentrations rather than the dilute concentrations ordinarily encountered in water supply. It is much more difficult to adsorb the low concentrations of materials. It is necessary to remove only very small amounts to eliminate the hazards. Information is presented from published literature, laboratory studies of the Westvaco Corp., and a two-year study by the Colorado School of Mines. Laboratory test results and/or educated guesses as to adsorbability are reported for individual items. Some metals having high to good carbon adsorption potential are antimony, arsenic, bismuth, chromium (Hexavalent C 96), tin, silver, mercury, cobalt and zirconium. Metals of fair to good adsorption potential are lead, nickel, titanium, vanadium and iron. Metals of low or unknown carbon adsorption potential include copper, cadmium, zinc, beryllium, barium, selenium, molybdenum, manganese and tungsten. Other items mentioned are phosphorus, free halogens and halides. (Bean-AWWARF)
W72-13260

EFFECT OF FOREIGN COMPONENTS ON THE PRECIPITATION OF PHOSPHATE BY ALUMINUM,
Rutgers - The State Univ., New Brunswick, N.J.
Wen Lin Yuan, and Pa Ho Hsu.
Paper presented at the 5th International Water Pollution Research Conference, July-August 1970, Published by Pergamon Press Ltd. Spring 1971, p I-16/1--I-16/12. 12 p, 8 tab, 13 ref. OWRR A-031-NJ (1).

Descriptors: *Phosphates, *Chemical precipitation, *Aluminum, *Waste water treatment, Water treatment, Nutrient removal, *Coagulation.
Identifiers: Aluminum phosphate.

A hydroxy-aluminum solution of NaOH/Al mole ratio = 2.6 was mixed with phosphate under a variety of conditions. It was found that the effectiveness of hydroxy-aluminum polymers to precipitate phosphate was greatly influenced by the ratio of phosphate to aluminum and also by the nature and concentration of foreign components present. Solution pH was found not to be a reliable criterion for controlling phosphate precipitation but the optimum pH varied with the nature and concentration of foreign components present. The results suggest that the diverse effects indicated by various foreign components are attributable to the following two mechanisms of opposing effects: (a) Foreign components, when added to a partially phosphated aluminum polymers, tend to neutralize the residual positive charge on the polymers and thus, precipitate both phosphate and aluminum together; and (b) these components can also compete against phosphate in reacting with hydroxy-aluminum polymers, thereby reducing the effectiveness of phosphate precipitation. It is thus concluded that the composition of the waste water to be treated and that of coagulants used must be taken into consideration in any laboratory study or practical process of phosphate removal.
W72-13290

DISINFECTION OF SEWAGE FROM ANTITUBERCULOUS DEPARTMENTS OF THE HEALTH SERVICE IN THE LIGHT OF LATEST RESEARCH,
State Inst. of Hygiene, Warsaw (Poland).
W. Dozanska.
Biul Suzby Sanit Epidemiol Wojewodztwa Katowickiego. Vol 15, No 1, p 101-107. 1971.
Identifiers: *Sewage treatment, *Waste water treatment, Chlorination, *Disinfection, Public health, Heat, Light, Sewage, Tubercle bacilli.

Neutralization and disposal of sewage contaminated with tubercle bacilli has been enforced under provisions of a regulation issued in June 1962. Sewage should be subjected to preliminary mechanical and biological treatment followed by disinfection. Chlorination or heat treatment are practiced. The thermal method is more reliable but costly.--Copyright 1972, Biological Abstracts, Inc.
W72-13317

SPRAY POND MATHEMATICAL MODEL FOR COOLING FRESH WATER AND BRINE,
Oklahoma State University, Stillwater. Dept. of Mechanical Engineering.
A. M. Elgawhary, and A. M. Rowe.
(1971). 8 p, 8 fig, 15 ref. OWRR A-019-OKLA (2).

Descriptors: *Cooling, *Heated water, *Mathematical models, *Ponds, Evaporation, *Thermal pollution.

Spray ponds are a proposed method for reducing the effects of thermal pollution. A mathematical model that simulates the cooling and evaporating process of spray cooling ponds is presented for fresh water and brine. Model predictions compared favorably with published data. Using the model, spray pond performance curves were generated for different nozzle diameters, various wind velocities, 3 staged freshwater ponds, brine at various salt concentrations and a comparison of fresh and salt water staged ponds. Model predictions found that increasing the wind velocity increased the cooling range, NaCl in water droplets increased cooling, and reducing droplet diameter increased the cooling range. The model is viewed as a useful tool in solving spray pond problems and the curves are presented as an aid to engineers considering spray ponds for thermal pollution control. (Bass-Vanderbilt)
W72-13320

UP COOLING TOWER CAPACITY WITHOUT ADDING NEW CELLS,
Phelps Engineering Co., Kentfield, Calif.
P. M. Phelps.
Heating, Piping, and Air Conditioning, p 82-84, March 1971. 4 fig, 1 tab.

Descriptors: *Cooling towers, Heated water, Water cooling, Electric powerplants, *Design.
Identifiers: *Increased capacity, Corrugated fill, Air velocity, Crossflow, Counterflow.

It is desirable to be able to add to cooling tower capacity without installing more cells to avoid problems with space, weight, wiring, noise, and aesthetics. Replacing the conventional wood lath fill with thin wall corrugated fill can significantly improve performance. This is particularly true in small towers. A design was developed to take advantage of the available volume in larger cooling towers. Crossflow cooling sections are installed along the sides of the tower. A space is left below the crossflow packing of sufficient height to permit passage of a predetermined amount of ambient air to the inner portion of the tower, which is filled with counterflow packing. This configuration develops a much greater volume of narrow packed sections than would be possible if the packing were installed in a counterflow or a crossflow plane only. Increases in mechanical equipment sizes are possible since the fan is set to give a higher air volume and a lower air velocity through the packing. This design method results in lower drift losses because of lower velocity. An example is described, giving methods of increasing capacity up to 250 percent. (Eagle-Vanderbilt)
W72-13325

WASTE HEAT USES CUT THERMAL POLLUTION,
Oak Ridge National Lab., Tenn.
S. E. Beall, Jr.
Mechanical Engineering, p 15-19, July 1971. 3 fig, 3 tab, 4 ref.

Descriptors: *Beneficial use, *Heated water, *Water reuse, *Electric powerplants, *Thermal pollution, Cities, Rural areas, Heating, Air conditioning, Evaporation, Water reuse, Greenhouses, Poultry, Aquiculture, Irrigation.

A combination of uses of heat from steam-electric power stations could consume a large fraction, if not all, of the heat normally wasted. Both urban and rural sites offer opportunities for applying low-temperature heat to useful purposes. The Department of Housing and Urban Development concluded that 300 to 380 F steam or hot water from a 500 Mwe plant can be competitive with present heat sources if the power plant is within 10 miles of the heat distribution point. In most U.S. cities, more heat can be used for air cooling during the crucial (from a thermal pollution standpoint) summer period than is needed for residential and commercial wintertime heating. Waste water sent through a vertical-tube evaporator can have the

dissolved solids content lowered. With proper treatment, this water can be reused. Heating and cooling of greenhouses and poultry houses and/or heating of aqua-culture ponds are constant, profitable uses of waste heat. Studies have shown the possibilities of using warm water effluents for growing algae and increasing yields of fish, oysters, lobsters, and shrimp. In Eugene, Oregon, irrigation with water as hot as 104 F is being studied. (Eagle-Vanderbilt)
W72-13329

WASTE HEAT DISPOSAL IN POWER PLANTS,
Federal Power Commission, Washington, D.C.
R. M. Jimeson, and G. G. Adkins.
Chemical Engineering Progress, Vol 67, No 7, p 64-69, July 1971. 6 fig, 2 photos, 4 tab.

Descriptors: *Thermal pollution, *Electric powerplants, *Future planning (Projected), Projections, Energy loss, Energy dissipation, Nuclear powerplants, Cooling, Cooling towers, Cooling water, Heated water, Consumptive use, Costs, Water quality standards.
Identifiers: *Waste heat disposal.

From National Power Survey studies, it is predicted that the generating capacity of electric powerplants in the U.S. will quadruple between 1970 and 1990. Nuclear power is expected to increase in amount of total capacity from less than 2% to nearly 40%. Although the percentage of fossil fueled steam-electric plants will decline, the amount of their capacity will double by 1990. In fossil-fueled plants, about 50% of the heat input is discharged through the condensers as waste heat. The figure for nuclear plants is 70%. The total estimated waste heat for 1990 is 40% greater than the B.T.U. equivalent of the electric generation in that year by all types of generating plants. Methods of waste heat disposal now in use are once through cooling, cooling ponds, wet cooling towers and dry cooling towers. The consumptive use of water is negligible for dry cooling towers and increases from once through cooling to cooling ponds to wet cooling towers. Cost ranges for each type of system are presented. Possible effects of thermal pollution are summarized. It is concluded that no single temperature standard could be applied to the country as a whole, or even to one state. (Eagle-Vanderbilt)
W72-13330

WATER POLLUTION: DISPOSAL AND REUSE, VOLS. 1 AND 2,
J. E. Zajic.
Marcel Dekker, Inc.: New York, N.Y., 389p. (Vol 1), 648p. (Vol 2), 1971, Pr. $22.75.
Identifiers: *Waste water treatment, *Water treatment, Algae, Biological treatment, Chemicals, Control, Disposal, Microorganisms, Parameters, Plants, Water pollution, Water reuse.

This book, in 2 vols., was designed as a text book for a course in water pollution engineering but will be of interest to anyone interested in water and its purification. Following an introduction on water quality, chemical and biological parameters and terminology, the approach to waste water treatment is divided into the biological and the chemical approach. The topics include: aquatic plant and algae control, filtration, solid waste disposal, biodegradation, electrodialysis, freezing and thawing, solvent extraction and sterilization and disinfection. Tables, graphs and diagrams are found throughout and each chapter ends with a list of references. At the end of vol. 2, an author index is found as well as a microorganism index.--Copyright 1972, Biological Abstracts, Inc.
W72-13335

INTERACTIVE COMPUTING IN WATER QUALITY MANAGEMENT,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 06A.
W72-13357

URBAN WASTES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Coll. of Agriculture and Environmental Science.
For primary bibliographic entry see Field 05G.
W72-13396

ANIMAL WASTE MANAGEMENT: PROBLEMS AND GUIDELINES FOR SOLUTIONS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W72-13424

A COASTAL POLLUTION PROBLEM AND ITS SOLUTION - THE DESIGN AND CONSTRUCTION OF A SUBMARINE SEWER OUTFALL AT EASTBOURNE,
F. L. Terrett.
Journal of the Institution of Public Health Engineers, Vol LXX, No 4, p 237-262, October 1971. 6 fig.

Descriptors: *Coasts, *Outfall sewers, *Pollution abatement, *Sanitary engineering, *Conveyance structures, Water pollution control, Municipal wastes, Conduits, Sewage effluents, Analytical methods, Design standards.
Identifiers: *England, *Eastbourne.

A study was initiated to determine if sewage discharge at Langley Point resulted in pollution of beaches at Eastbourne and Pevensey Bay, and the measures necessary to eliminate any such problem found. Float patterns and bacteriological tests indicated the presence of a pollution problem. Further oceanographic and geologic surveys accompanied by seasonal capacity studies resulted in the design of a submarine outfall and a pumping station capable of 28,000 gallons per minute peak flow, with a potential of 30% increase in capacity included in the design. (Ensign-PAI)
W72-13485

RECLAIMING USED CHERRY BRINES,
Oregon Agricultural Experiment Station, Corvallis.
D. V. Beavers, C. H. Payne, M. R. Soderquist, K. I. Hildrum, and R. F. Cain.
Journal Water Pollution Control Federation, Vol 42, No 6, June 1970, p 3-19. 7 fig, 5 tab, 20 ref.

Descriptors: *Reclaimed water, *Water reuse, *Industrial wastes, *Activated carbon, Pilot plants, Performance, Cost comparisons, Food processing industry, *Brines.
Identifiers: *Sweet cherry brine, Dissolved pigments, Cost savings.

Brines used for bleaching, curing, and preserving sweet cherries were made re-usable by treatment with activated carbon. Re-use required the removal of dissolved pigment in the used brine. Results from pilot plant tests showed that dissolved pigments were reduced from 41.7 mg/l to 0.047 mg/l. During this treatment the concentration of sulfur dioxide decreased only 26 ppm, the soluble solids decreased only 0.17 percent, and the pH increased only 0.09. Cherries packed in the reclaimed brine were of higher quality than those used in the control. It appeared that the brine could be reclaimed and re-used several times. Savings would result not only from lower requirements of chemicals for making brine, but also from reduced sewerage charges when discharging into a municipal sewerage system. (Galwardi-Texas)
W72-13490

CONTINUOUS BUBBLE FRACTIONATION PROCESS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil Engineering.
L. K. P. Wang.
Ph. D. Dissertation, May 1972. 171 p, 57 fig, 9 tab, 135 ref. OWRR A-015-NJ (2).

Descriptors: *Surfactants, *Pre-treatment (Water), *Waste water treatment, Flow rates, Performance, Laboratory tests, Alkylbenzene sulfonates, *Distillation.
Identifiers: *Bubble fractionation column, Column diameter, Column height, Feed concentration, Continuous multi-column operation.

The performance of a bubble fractionation column was investigated experimentally using liquid flow rates, gas flow rate, feed material, feed concentration, feed location, column diameter and column height as variables. Surfactants tested were crystal violet chloride, methylene blue, nigrosin, branched-chain alkyl benzene sulfonate, linear alkylate sulfonate, lignosfulphonate and kraft lignin. Increasing the gas flow rate increased the effectiveness of the system. An increase in column diameter greatly increased the axial mixing and thereby diminished the concentration gradient in the column and the degree of separation. The adverse transfer of the solute by the eddy diffusion from top to bottom was found to be the factor that was limiting the effectiveness of the system. Maximum separation was obtained when all of the liquid from bursting bubbles was removed from the surface. Column height had very little effect on separation for the continuous system. Experimental results also indicated that feed location at the top was better than at the bottom. Continuous single-column operation gave only partial separation of surface active solute from its bulk solution; but continuous multicolumn operation gave a higher degree of separation. (Galwardi-Texas)
W72-13491

EFFECTS OF EXPOSING SLIMES ON ROTATING DISCS TO ATMOSPHERES ENRICHED WITH OXYGEN,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
W. Torpey, H. Heukelekian, A. J. Kaplovsky, and L. Epstein.
Preprint, presented at 6th International Water Pollution Research Conference, Session 1, Hall B, Paper No 1, June 19, 1972. 11 p, 3 fig, 3 tab, 2 ref.

Descriptors: *Waste water treatment, *Oxygen, *Slime, Biochemical oxygen demand, Nitrification, Performance, Efficiencies, Pilot plants.
Identifiers: *Rotating disc, Contact time, Stage operation.

The results of operating a 41,635 liter per day staged rotating disk pilot plant were presented for 3 modes of operation, namely, (1) the slimes in all stages exposed to ambient atmospheres, (2) the slimes in stage 1 exposed to oxygen enrichment, and (3) the slimes in stages 1 and 3 of a 3-stage operation exposed to oxygen enrichment. The first mode of operation, about 30 minutes of contact with the slimes, was sufficient to remove 90% of the BOD5 whereas the second mode of operation, 18 minutes, accomplished the same rate of removal of BOD5. In the third mode, not only was 90% of the BOD5 removed during 17 minutes of contact with the slimes but a substantial portion of the nitrogenous demand was satisfied. Nitrification normally proceeded at a rate of 22 mg/l per hour of contact with the slimes. However, during the third mode of operation, nitrification proceeded at a rate of 76 mg/l per hour of contact. (Galwardi-Texas)
W72-13492

USING ACID BLEACH EFFLUENT FOR DISINFECTING DOMESTIC SEWAGE,
Rust Engineering Co., Pittsburgh, Pa. Environmental Control Div.
D. A. Spence.
Journal of Technical Association of Pulp and Paper Industry, Vol 52, No 11, November 1969, p 2100-2102. 1 fig, 1 tab, 3 ref.

Descriptors: *Sewage treatment, *Disinfection, *Chlorine, *Pulp wastes, Coliforms, Performance, Efficiencies, Effluents, Economic feasibility, *Waste water treatment.
Identifiers: *Acid bleach effluent, Pulp bleaching operation, Residual chlorine.

The feasibility of using the untreated acid effluent from a pulp bleaching operation to disinfect domestic sewage was investigated to determine whether the use of chlorine compounds could be replaced by the acid waste at a cost savings. Laboratory tests were performed in which the ratio of domestic sewage to acid effluent was varied from a low ratio of 0.05/1.0, to a high of 0.93/1.0. After a specified contact time, residual chlorine tests were run on the combined wastes, and coliform counts were determined. Coliform hills in excess of 99.99% were obtained at a chlorine residual of 1 mg/l after a 15 minute contact period. A survey of 34 bleached kraft mills throughout the United States showed that the average residual chlorine concentration in their acid effluents was 88 mg/l. (Galwardi-Texas)
W72-13493

LIQUID MEMBRANES CLEAN WASTE WATER.

Chemical Engineering News, Vol 49, p 30, June 7, 1971.

Descriptors: *Waste water treatment, *Membrane processes, *Oil-water interfaces, Solvents, Films, Emulsions, Drops (Fluid), *Oil wastes.
Identifiers: *Refinery wastes, Liquid membranes, Saponin.

Permeable liquid membranes can be used to selectively remove contaminants from refinery effluents. Development of separation by liquid membranes resulted from the observation that saponin, a natural surfactant, forms very strong films at oil-water interfaces. By forming droplets surrounded by membranes and passing them through a solvent, contaminants in the droplets can be selectively removed. In wastewater treatment, the membrane material is used to produce an emulsion of solvent droplets. The droplets are mixed with waste water where contaminants selectively permeate the film. The emulsion phase is de-emulsified and conditioned for re-use. (Galwardi-Texas)
W72-13497

PULLING EFFLUENTS INTO LINE.

Chemical Engineering, Vol 78, No 16, p 40, July 12, 1971. 1 fig.

Descriptors: *Treatment facilities, *Industrial wastes, Oxidation ponds, Aeration, Performance, Biochemical oxygen demand, Chemical oxygen demand, Phenols, Cost comparison, Activated sludge, *Capital costs, *Operating costs, Oil wastes, *Waste water treatment.
Identifiers: *Refinery wastes, Fluoride removal, Mechanical aeration.

A semi-continuous fluoride-removal system and the conversion of stabilization ponds to mechanically aerated lagoons have provided Texas City Refining, Inc., with a flexible up-to-date waste water treatment system. The former has cut fluorides from 45 mg/l to around 8 mg/l, and the latter discharges an effluent with less than 20 mg/l BOD5, 150 mg/l COD and about 0.2 mg/l phenol. Capital costs totaled just over $100,000 while a conventional activated sludge unit, by comparison, would have cost approximately $250,000. Operating costs were estimated at $16,000/yr or approximately $0.04/1000 gallons of waste water treated. The use of a lime slurry, instead of bag lime, to treat hydrofluoric and blowdown has reduced lime costs by 75%. (Galwardi-Texas)
W72-13498

RESIDUAL TAR DISPOSAL.

Chemical and Process Engineering, p 11, March 1971.

Descriptors: *Incineration, *Industrial wastes, *Chemical wastes, Settling basins, Liquid wastes, *Waste disposal, *Waste water treatment.
Identifiers: Phenol production, *Residual tar, England.

An incinerator designed to work continuously was installed at BP Chemical's Grangemouth site for disposing of the residual tar fraction from a new 40,000 ton/day phenol plant. Residual tar from the phenol plant is first blended with other fluid residues in a storage tank to the required viscosity for good combustion and then passed to the incinerator. Two burner stations each rated to pass up to 1500 lb/hr were provided. The main furnace has a 1,800 cu ft. capacity and a minimum firing rate of 10,000 BTU/cu ft/hr and a maximum firing rate of 30,000 BTU/cu ft/hr. A large settling basin was provided for water used in air pollution control. (Galwardi-Texas)
W72-13499

OXYGEN TRANSFER AND UTILIZATION IN HIGH SOLIDS MICROBIAL SYSTEMS,
Rensselaer Polytechnic Inst., Blacksburg, Va.
R. C. Stiefel.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-6990, microfilm $3.00, Xeroxcopy $9.90. Ph. D. Dissertation, 1967. 216 p.

Descriptors: *Oxygen requirements, *Dissolved oxygen, *Activated sludge, *Mixing, Reynolds number, Impellers, Time, Pressure, Laboratory tests, Laboratory equipment, Performance, *Waste water treatment.
Identifiers: Volatile suspended solids, Oxygen transfer, Power requirements, Oxygen transfer coefficient.

The factors involved in the transfer and utilization of oxygen in high solids microbial systems that are capable of treating concentrated organic wastes were investigated. Four culture fluids with volatile suspended solids levels that ranged from 12.5 to 50 grams per liter were used in the determinations. The rates at which oxygen was transferred to the culture fluids were determined at pressures of one, three and five atmospheres, and at impeller speeds of 469, 704, 940, and 1,175 rpm. The power requirements to rotate the impeller at these speeds in the culture fluid were monitored. The oxygen utilization rate was determined by measuring the decrease in the dissolved oxygen level as a function of time after the aeration and agitation had been halted. The respiratory action in the culture fluid was chemically inhibited, and the rate at which oxygen was transferred to the fluid was determined by measuring the increase in the dissolved oxygen concentration as a function of time. The results indicated that the overall transfer coefficient and the rates at which oxygen was transferred to both the culture fluid and the fluid were all dependent on the Reynolds number. The rates were also proportional to the operating pressure. (Galwardi-Texas)
W72-13500

WASTE MANAGEMENT, TREATMENT AND DISPOSAL FOR THE FOOD PROCESSING INDUSTRY,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
N. H. Wooding, Jr.
Special Circular 113, 1968. 28 p, 1 fig.

Descriptors: *Waste water treatment, *Waste disposal, *Industrial wastes, *Solid wastes, *Liquid wastes, Waste storage, Equipment, Irrigation, Spraying, Biological treatment, Lagoons, Pennsylvania, *Food processing industry, Permits.
Identifiers: *Waste management, Discharge permits.

A comprehensive review of waste management, treatment and disposal methods for the food processing industry was presented. Fundamental principles of solid and liquid waste management were outlined. Topics included in solid waste management were: temporary storage, collection and removal equipment and methods of disposal. Basic principles of liquid waste management including primary, secondary, tertiary and quaternary of special treatment were examined. Also, methods of liquid waste disposal including stream discharge permits, discharge to municipal sewerage systems, spreading on land, sprinkler or spray irrigation and sewage lagoons were discussed. (Galwardi-Texas)
W72-13501

MERCURY REMOVED FROM WASTE EFFLUENT VIA ION EXCHANGE,
W. C. Gardiner, and F. Munoz.
Chemical Engineering, Vol 78, No 19, August 23, 1971, p 57-59. 1 fig, 1 tab.

Descriptors: *Ion exchange, *Waste water treatment, *Resins, *Byproducts, *Mercury, Industrial wastes, Performance, Capital costs, Brines, Efficiencies.
Identifiers: Regeneration, Product recovery, Mud-settler brine, Chlor-alkali plants.

A process developed by Osaka Soda, Ltd. for mercury removal and recovery from wastewater and mud-settler brine common to chlor-alkali plants was presented. The process used two ion-exchange resins, one of which was regenerable, and features a closed-loop resin regeneration system. The process was capable of reducing mercury concentration in the effluent to less than 5 ppb for inlet mercury concentration in wastewater averaging 20 ppm. Inlet concentrations of 50 to 4000 ppm in wastewater in brine settler mud were reduced to 0.1 ppm. Mercury levels were reduced to 0.1 to 0.15 ppm in the first step of the ion-exchange process and to less than 5 ppb in the second step. Resin beds utilized in the first step required regeneration approximately once per week with an inorganic salt solution which can be regenerated and recycled. Resins utilized in the second step must be replaced approximately every six months. Capital costs were $400,000 and $575,000 for 300 and 600 ton/day chlor-alkali plants. (Galwardi-Texas)
W72-13502

TREATMENT OF RINSE WATER FROM ELECTROCHEMICAL PROCESSES,
EFCO Ltd. (England).
H. Silman.
Metal Finishing, Vol 69, June 1971, p 62-66. 4 fig.

Descriptors: *Waste water treatment, *Chromium, *Chemical precipitation, *Ion exchange, Recirculated water, Water reuse, Water conservation.
Identifiers: *Electrochemical processes, Electroplating industry, Cyanide rinse waters, Integrated effluent treatment, Electrolytic processes.

Various methods of treatment of rinse water from electrochemical processes including chemical treatment, controlled recirculation, ion-exchange, electrolytic processes and integrated effluent treatment were presented. A package unit for cyanide and hexavalent chromium wastes utilizing chemical procedures was designed to convert up to 5 lbs of sodium cyanide per hour to carbon dioxide and nitrogen at a load of 30 gallons per minute by means of chlorine and caustic soda and to convert up to 10 lbs per hour of hexavalent chromium to the trivalent form by means of sulfur dioxide, followed by addition of caustic soda to precipitate chromium hydroxide. It was reported that 50 to 80% savings of water requirements could be realized by the controlled recirculation method. In integrated treatment, effluent treatment was combined with the rinsing operation itself. Work pieces were rinsed in a chemical rinse solution which destroys or precipitates the toxic cations or anions in the dragout solution which was followed by a normal water rinse. (Galwardi-Texas)
W72-13503

WASTEWATER UTILIZATION IN THE POTATO PROCESSING INDUSTRY,
Washington State Univ., Pullman. Coll. of Engineering Research Div.; and Washington State Univ., Pullman. Radioisotopes and Radiations Lab.
E. Hindin.
Washington State University, Circular 34, May 1970. 40 p, 9 fig, 12 tab, 4 ref.

Descriptors: *Water reuse, *Reclaimed water, *Industrial wastes, Potatoes, Surveys, Pollution abatement, Flow rates, Temperature, Hydrogen ion concentration, Conductivity, Alkalinity, Biochemical oxygen demand, Chemical oxygen demand, Bacteria, Phosphates, Nitrogen, Calcium, Sodium, Magnesium, Washington, *Food processing industry.
Identifiers: *Potato processing industry, Industrial survey.

The past twenty years has seen a phenomenal growth in the potato processing industry in the State of Washington. This growth has created a unique wastewater disposal problem. It was estimated that more than 3,500 million gallons of wastewater must be disposed of each year from the central Washington potato processing industry. A survey was made of the industry to determine the extent of the wastewater disposal problem. Water use and wastewater reuse studies were conducted at three processing plants whose major product was frozen French fried items. Wastewater characteristics of specific process lines were presented in tabular form for each plant. Parameters listed included: flow, temperature, pH, conductivity, alkalinity, solids, BOD, COD, carbohydrates, calcium, magnesium, sodium, phosphates, nitrogen and bacterial counts. A scheme for a more complete reuse of the wastewater in processing was proposed based on the in-plant investigations. (Galwardi-Texas)
W72-13505

TURBULENCE IN ORTHOKINETIC FLOCCULATION,
California Univ., Berkeley. Sanitary Engineering Research Lab.
F. Argaman.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-13,883, Microfilm $3.00, Xerox $9.00. Ph. D. Thesis, 1968. 218 p.

Descriptors: *Flocculation, *Turbulence flow, *Performance, Mathematical models, Laboratory tests, *Waste water treatment, Kinetics.
Identifiers: Continuous flow, Stirring devices, Residence time distribution, Energy spectrum, Velocity gradient, Power input.

The various physical parameters involved in the flocculation process, and particularly the effect of turbulence on flocculation kinetics were investigated. The theory developed showed that the physical parameters directly affecting the performance of a flocculation reactor were the residence time and its distribution, the total power input, and the energy spectrum of the turbulence field. Experimental verification of the proposed theory involved simultaneous measurements of the flocculation performance and turbulence characteristics in a continuous flow flocculation reactor. Results showed that at a given residence time the performance of a flocculation system increased with the rms velocity gradient until a maximum value was reached beyond which any further increase resulted in a decrease in performance due to excessive floc breakup. Also, the compartmentalization of a continuous flow system exerted a significant influence on the performance. A 'stake and stator' type stirrer performed better than a 'turbine' type stirrer under all conditions. (Galwardi-Texas)
W72-13506

MALTING EFFLUENTS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
P. G. G. Isaac.
Effluent and Water Treatment Journal, Vol 9, No 11, November 1969, p 597-603. 4 fig, 8 tab, 9 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Trickling filters, *Flow diagrams, Biological treatment, Organic loading, Biochemical oxygen demand, Activated sludge, Performance, Efficiencies, Total costs, Estimated costs, *Effluents, *Waste identification.
Identifiers: *Malting wastes, Pasveer ditch, Characteristics, Removal, England.

Characterization of effluents from the malting of barley was presented in tabular form showing a wide range of BOD5 levels. The BOD load was approximately 0.25 lb per bushel. Present treatment and disposal of malting effluents were discussed. Flow diagrams for biological filtration, both for single filtration with recirculation and alternating double filtration were presented. BOD removals ranged from 61 to 97%. The pasveer ditch, a modification of the activated sludge process was especially suitable for treating malting wastes if situated in a rural area. Average results showed a BOD removal from 1140 mg/l in the influent to 12 mg/l in the effluent. The total cost for the treatment plant was about 35,000 pounds. Estimated costs for the treatment and acceptance of malting wastes were presented in tabular form. (Galwardi-Texas)
W72-13507

PHOTOSYNTHETIC YIELDS AND BYPRODUCT RECOVERY FROM SEWAGE OXIDATION PONDS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
M. G. McGarry, C. D. Lin, and J. L. Merto.
Preprint, presented at 6th International Water Pollution Research Conference, Session 4, Hall C, Paper No. 7, June 20, 1972, p C/4/7/1-C/4/7/11. 6 fig, 2 tab, 17 ref.

Descriptors: *Oxidation ponds, *Algae, *Waste water treatment, *Byproducts, Mixing, Solar radiation, Organic loading, Diurnal distribution, Hydrogen ion concentration, Dissolved oxygen, Biochemical oxygen demand, Performance, Flocculation, Flotation, Economic feasibility, Costs, Estimated costs.
Identifiers: Alum, Recycling, Treatment costs, Asia.

Algal growth and sewage treatment under tropical conditions as affected by pond mixing, solar radiation and diurnal variations in pond loading were described. For mass algal culture, ponds should be thoroughly mixed daily and the mixing period limited in order to minimize turbidity. Different shading material over pond surfaces allowed a predetermined percentage of total incident radiation to reach each surface. Algal concentrations increased in a near linear fashion with radiation available. Effects of diurnal variations in pond loading and effluent removal required on pond characteristics were presented in tabular form. Normal pH, D.O., and alkalinity variations were exhibited by all ponds and filtered BOD's did not exceed 20 mg/l. Alum flocculation and downflow flotation were used to clarify the pond effluent and concentrate the algae. Aluminum recovery and recycling were investigated. The potential use of algae as a livestock feed was investigated. Estimates indicated that if sewage treatment costs were set against algae production, algae could be produced for approximately 26 cents/kg. (Galwardi-Texas)
W72-13508

CONTINUOUS AUTOMATIC CONTROL OF A BIOLOGICAL FILTRATION SYSTEM,
F. E. Long.
Effluent and Water Treatment Journal, Vol 9, No 7, July 1969, p 379-385. 5 fig.

Descriptors: *Waste water treatment, *Filtration, *Automatic control, *Biological treatment, *Trickling filters, Distribution systems, Treatment facilities, Penstocks, Valves, Pumps, Weirs.
Identifiers: Partial double filtration, Recirculation, United Kingdom.

The automatic control system for the biological filtration units of the 7.67 mgd Mitchell Laithes wastewater treatment plant was described. The biological filtration system consisted of two filter beds, the primary filter bed having a capacity of 9 mgd and the secondary filter having a capacity of 18 mgd. The system was designed for partial double filtration up to a primary flow of 18 mgd, and recirculation between 18 mgd and 27 mgd. The changeover from one system to the other was carried out automatically, with a return to partial double filtration when primary flow falls back to 18 mgd. The distribution chamber into which the primary tank effluent flows formed the basis of the whole control system. The distribution chamber has a motorized penstock which can be controlled to deliver any required flow of primary tank effluent to the primary filter bed. Any residual flow passes over side weirs into the lower cascade and so to the secondary filter bed. Three motorized valves were installed in the recirculation main from the secondary pump house and enable recirculated effluent to mix with primary tank effluent at various locations. (Galwardi-Texas)
W72-13509

MASS TRANSFER AND GROWTH KINETICS ON A SLIME LAYER, A SIMULATION OF THE TRICKLING FILTER,
Cornell Univ., Ithaca, N.Y.
W. J. Maier.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-1422, Microfilm $3.00, Xerox $9.00. Ph. D. Dissertation, September 1966. 199 p.

Descriptors: *Trickling filters, *Mass transfer, *Slime, *Growth rates, *Model studies, Laboratory equipment, Laboratory tests, Temperature, Feeding rates, Microorganisms, Laminar flow, *Waste water treatment.
Identifiers: Slime layer thickness, Molecular diffusion, Eddy motion, Glucose, Flat surface model.

A simple physical model, in the form of a flat surface covered with biologically active slime was used to simulate and study the purification of sewage in trickling filters. It was shown that the liquid film was in laminar flow as it moved over the slime surface. Mass transfer to the slime was by molecular diffusion. Studies with glucose and

minerals showed that only the top surface of the slime was active in the purification process. Increasing the thickness of the slime layer above 0.048 cm has essentially no effect on glucose removal. Process variables including feed rate, glucose concentration and temperature showed that the mass transfer was rate limiting except at high feed concentrations, above 100 mg/l. A two-fold increase in glucose utilization was observed when the liquid film was agitated to enhance mass transfer by eddy motion. Results from the process variable study on the flat surface together with the measured growth rates in agitated batch reactors indicated that the maximum growth rate of the microorganisms was substantially greater than the rates observed on the flat surface where diffusion limits availability of nutrients. (Galwardi-Texas)
W72-13512

INTERACTION OF A FLOCCULANT SOL AND GRANULAR FILTER MEDIA,
Rensselaer Polytechnic Inst., Blacksburg, Va.
For primary bibliographic entry see Field 05F.
W72-13513

OPTIMIZATION OF PHOSPHORUS REMOVAL WITH LIME TREATMENT,
Kansas Univ., Lawrence.
L. A. Schmid.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-17451, Microfilm $3.85, Xerox $13.50. Ph. D. Dissertation, 1968. 300 p.

Descriptors: *Waste water treatment, Biological treatment, *Phosphorus, *Lime, *Activated sludge, *Municipal wastes, Chemical precipitation, Hydrogen ion concentration, Chemical oxygen demand, Performance, Vacuum drying, Estimated costs, Capital costs, Operating costs, Laboratory tests.
Identifiers: Phosphorus removal, Anionic polymers, Suspended solids.

A combination chemical and biological treatment method for the removal of phosphorus from sewage consisting of lime treatment followed by a high rate completely mixed activated sludge process was developed. The addition of 150 mg/l calcium hydroxide to raw sewage resulted generally in a pH of 9.5, phosphate removals of 80%, COD removals of about 60% and suspended solids removals of 90%. The lime system resulted in a total sludge production of less than 1.5 times the conventional production. The chemical and waste activated sludge was vacuum filtered very easily and economically with the aid of anionic polymers. The total net cost of removing 90% or more of the total phosphorus from a domestic sewage, including both capital and operating costs was estimated at $2.50/million gallons of flow for a 10MGD plant. (Galwardi-Texas)
W72-13514

THE USE OF COMPARTMENTALIZATION ANALYSIS TO STUDY CARBON TRANSFER RATE KINETICS IN PURE AND MIXED NON--STEADY STATE BIOLOGICAL ENVIRONS WITH APPLICATION TO ACTIVATED SLUDGE SYSTEMS,
Rensselaer Polytechnic Inst., Blacksburg, Va.
J. S. Anderson.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-9271, Microfilm $3.60, Xerox $12.60. Ph. D. Dissertation, August 1966. 277 p.

Descriptors: *Biological treatment, *Activated sludge, *Carbon, Mathematical models, Kinetics, Radioisotopes, Laboratory tests, Growth rates, Microorganisms, Growth stages, *Waste water treatment.
Identifiers: Carbon utilization, Carbon-12, Carbon-14, Psuedomonas fluorescens.

A compartmentalization technique has been used to describe the variations of carbon with respect to time in a non-steady-state biological system. A Warburg system was used to simulate the non-steady-state system. Demands and contributions of carbon in the systems investigated were related to carbon transfer rates between the following 'carbon pools'. Specific substrate residual substrates, cell carbon, inorganics and the carbon dioxide evolved. This technique was tested with pure cultures of Pseudomonas fluorescens and mixed cultures from an activated sludge waste treatment system utilizing glutamic acid and glucose as their sole carbon source. Measurement of the two isotopes of carbon, i.e., C12 and C14 provided sufficient variables to enable mathematical analyses of the system using a series of linear differential equations. Calculated carbon transfer rates for each system were associated with specific coefficients within a proposed kinetic model for growth kinetics. (Galwardi-Texas)
W72-13515

FREEZE CONDITIONING OF WASTE ACTIVATED SLUDGE,
Alaska Univ., College. Environmental Health Engineering Program.
T. Tilsworth, R. S. Murphy, L. E. Garinger, and J. Wagner.
Alaska Institute of Water Resources Report (1972). 12 p, 7 fig, 2 tab, 11 ref. OWRR A-033-ALAS (1).

Descriptors: *Sludge treatment, *Freeze-thaw tests, *Dewatering, Depth, *Alaska, Capital costs, Operating costs, Estimated costs, Cost comparisons, Vacuum drying, Centrifugation, *Waste water treatment, *Activated sludge.
Identifiers: Natural refrigeration, Slow freezing, Sand drying beds.

The use of natural refrigeration for conditioning waste activated sludge by the freeze-thaw method was investigated. Freezing of the sludge substantially improved its settleability and dewatering characteristics. Slow freezing was more beneficial than fast freezing and improved efficiency was obtained with sludge having a solids content ranging from 1 to 2 percent. In College, Alaska, the maximum depth for freezing could be as much as 3 to 4 ft if an external heat source was provided to reduce the time of thawing. Because of the large land areas required, utilization would be limited to relatively small facilities having sufficient land in close proximity to the treatment plant. Capital and operating costs, based on a depth of 12 inches for freezing were estimated at $50 per ton of sludge as compared to $70 per ton using vacuum filtration or centrifugation and $100 per ton for sand drying beds. Waste activated sludge from extended aeration processes can be directly discharged to a sanitary landfill following freeze-thawing and dewatering. (Galwardi-Texas)
W72-13516

AEROBIC TREATMENT OF FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. McGhee, R. L. Torrens, and R. J. Smaus.
Available from the National Technical Information Service as PB-211 902, $3.00 in paper copy, $0.95 in microfiche. Paper presented at Second Annual Environmental Engineering and Science Conference, April 20-21, 1972, Louisville, Kentucky. 18 p, 4 fig, 7 tab, 14 ref. OWRR A-022-NEB (2).

Descriptors: *Waste water treatment, *Activated sludge, *Aerobic treatment, Chemical oxygen demand, Retention, Time, Biochemical oxygen demand, Laboratory tests, Performance, Efficiencies, Color, Turbidity, Coagulation, *Feed lots, *Farm wastes.
Identifiers: *Feedlot runoff, *Extended aeration, Mixed liquor suspended solids.

The treatability of feedlot runoff was investigate utilizing an extended aeration type system. T operational parameters studied were evaluated a basis of COD removal and the effects of t treatment system on the turbidity. Retention tim were 8.0, 7.2, 4.4, 3.7, 2.0, and 1.0 days. CO reductions of 60% or more were obtained at rete tion times of three days or more and at MLS values of 2,000 mg/l or more. Increased retentic times resulted in increased COD reductions. T color of the runoff was affected only slightly b aerobic treatment regardless of the retention tim However, significant reductions were obtained b heavy dosages (2000-3000 mg/l) or iron and al minum coagulants. COD analysis was superior the BOD5 determination in evaluating the efficie cy of treatment and the strength of feedlot runof (See also W72-13518 and W72-13519) (Galwarc Texas)
W72-13517

AEROBIC TREATABILITY OF FEEDLOT R NOFF,
Nebraska Univ, Lincoln.
R. L. Torrens.
MiSc Thesis, December 1971. 82 p, 15 fig, 9 tab.

Descriptors: *Waste water treatment, *Aerob treatment, *Farm wastes, Biological treatmen *Feed lots, Chemical oxygen demand, Retentio Time, Biochemical oxygen demand, Laborato tests.
Identifiers: *Feedlot runoff.

Laboratory aeration units were operated at liqu retention times of one to eight days in evaluati the feasibility of aerobic treatment of settl feedlot runoff. Routine analyses of the raw was and treated effluent included BOD, COD, organ and ammoniz nitrogen, color and turbidity and di solved and suspended solids. Oxygen uptake st dies (BOD) were conducted for up to twenty day Based upon the data obtained, the following co clusions were drawn: Aerobic systems can effe tively treat feedlot runoff with COD reduction excess of 60% at retention times of three days more; the color of the runoff is affected on slightly by aerobic treatment regardless of the r tention time; the effluent from the system is odc less and highly stable from a biological standpoir and COD analysis is superior to the BOD dete mination in evaluating the strength of this wast (See also W72-13517 and W72-13519).
W72-13518

AEROBIC TREATMENT OF FEEDLOT R NOFF.
Nebraska Univ., Lincoln.

Available from the National Technical Inform tion Service as PB-211 963, $3.00 in paper cop $0.95 in microfiche. Nebraska Water Resourc Research Institute Project Completion Repo June 1972. 16 p, 4 fig, 5 tab, 9 ref. OWRR A-02 NEB (5).

Descriptors: *Waste water treatment, *Aerob treatment, *Farm wastes, *Feed lots, Biologic treatment, Chemical oxygen demand, Retic Time, Biochemical oxygen demand, Laborato tests.

Two laboratory aeration units were operated liquid retention times ranging from one to eig days. Routine data acquired included BOD a COD of the raw and treated waste; influent, e fluent and mixed liquor suspended solids; orgar and ammonia nitrogen; mixed liquor dissolved o ygen and turbidity. BOD measurements were e tended for periods of up to 20 days. Chemic coagulation studies were conducted to determi the efficiency of treatment and the requir dosages of alum, ferric sulfate and ferric chlori The conclusions drawn were: (1) Feedlot runc may be effectively treated by an aerobic biologic system with COD reductions in excess of 60 p

ent at retention times of three days or more. (2) The color of the runoff is affected only slightly by erobic treatment but may be reduced by up to 99 ercent by heavy doses of iron or aluminum oagulants. (3) The standard five-day BOD test ields a deceptively low measurement of the ox- gen demand of this waste. (See also W72-13517 nd W72-13518)
W72-13519

WATER PURIFICATION PROCESS,
tandard Oil Co. of Indiana, Chicago, Ill. (assignee).
. F. Grutsch, and G. C. Flood.
J. S. Patent No. 3,663,435, 2 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 898, No 3, p 992, May 16, 1972.

Descriptors: *Patents, *Water purification, erated lagoons, Equipment, Pollution abatement, Separation techniques, Water pollution, Water pollution treatment, *Waste water treatment.

A process is described for removing floating matter from the surface of a bioflotation lagoon. Floating barriers confine the matter to the upstream end of the lagoon. Conventional stationary aerators at that end beat air onto the lagoon's surface. This generates surface currents which carry the floating matter towards the skimmers. (Sinha-OEIS)
W72-13520

DEVICE FOR ELECTROLYTICALLY INDUCING FLOCCULATION FOR WATER TREATMENT PLANTS,
Westinghouse Electric Corp., Pittsburgh, Pa. (assignee).
. R. Marmo.
U. S. Patent No. 3,663,413, 2 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 898, No 3, p 987, May 16, 1972.

Descriptors: *Patents, *Waste water treatment, reatment facilities, Pollution abatement, Flocculation, Aeration, *Electrodes, *Alkalis, Treatment acilities.
Identifiers: Metallic hydroxides.

Sacrificial electrodes are suspended in an aeration tank above air diffusers. The electrodes produce metallic hydroxides in solution and these act as coagulating agents. The air diffusers keep the electrodes clean and help to mix the hydroxides with the sewage particles. (Sinha-OEIS)
W72-13521

APPARATUS FOR IRRADIATING A LIQUID,
Controlex Corp. of America, Croton Falls, N.Y.
. J. Kompanek.
U. S. Patent No. 3,659,096, 6 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1438, April 25, 1972.

Descriptors: *Patents, Equipment, *Irradiation, Oxidation, *Ultraviolet radiation, *Ozone, Biochemical oxygen demand, *Sewage treatment, Waste water treatment, Radiation.

The stream of liquid is separated from the radiation source by a gaseous atmosphere such as air or oxygen. The liquid is contacted with radiation from an ionizing radiation source. Since the liquid is maintained as a thin layer, the effectiveness is enhanced to the point where less radiation intensity is required. The air or oxygen between the liquid and the radiation source is converted into ozone, at least in the presence of ultra-violet radiation. Thus are means provided for oxidizing organic molecules. The presence of oxygen can also apply a portion of the BOD of the liquid passing through the apparatus in the case of a disinfecting or sewage treating operation. (Sinha-OEIS)
W72-13523

METHOD FOR CONTROLLING AND INHIBITING THE FORMATION AND GROWTH OF SLIME IN INDUSTRIAL WATER SYSTEMS,
Muck and Co., Inc., Rahway, N.J. (assignee).
S. J. Lederer.
U. S. Patent No. 3,658,700, 4 p, 8 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1367, April 25, 1972.

Descriptors: *Patents, *Paper and pulp industry, *Slime, *Water pollution control, *Waste water treatment.
Identifiers: Benzyl bromoacetate, Paper mills, Antibacterial action, Antifungal action.

The method of controlling and inhibiting formation of slime in paper mill white water systems consists of adding benzyl bromoacetate in amounts from 0.1 to 25.0 ppm. Both the antibacterial and antifungal activity are illustrated by the experimental results included. (Sinha-OEIS)
W72-13524

METHOD FOR SEPARATING LIQUID FROM SOLID SUBSTANCES AND STORING THE SOLID SUBSTANCES,
Brown, Boveri and Co. Ltd., Baden (Switzerland).
G. Baumann, and G. Hentschel.
U. S. Patent No. 3,658,179, 3 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 897, No 4, p 1251, April 25, 1972.

Descriptors: *Patents, *Filtration, *Radioactive waste disposal, *Ion exchange, *Resins, *Waste water treatment.

The apparatus consists of a container whose top side is at least partly open but can be sealed tightly and which is equipped for filtering and storage. There is also a filter for separating the liquid from the solids. The filter is arranged in the vessel so that the bottom of the vessel remains partly free for collecting the liquid and removing it. In use in connection with a nuclear power plant, the retained solids remain within the vessel which is subsequently sealed for storage. (Sinha-OEIS)
W72-13525

METHOD AND APPARATUS FOR RETAINING AND DISLODGING FILTER CAKE,
Sparkler Mfg. Co., Conroe Tex. (assignee).
A. C. Kracklauer.
U. S. Patent No. 3,655,049, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 897, No 2, p 499, April 11, 1972.

Descriptors: *Patents, *Filtration, Equipment, *Waste water treatment, Treatment, Pollution abatement, Separation techniques, Filters.
Identifiers: *Filter cake.

In a filtration apparatus, the filter cake may be retained on a vertical filter plate having flexible filtering media for filtering fluids until it becomes necessary to dislodge the cake. The method of dislodging includes oscillation of a screen located adjacent to the filter plate while at the same time expanding the filtering media toward the screen and washing the filtering media with water. (Sinha-OEIS)
W72-13526

REVERSE OSMOSIS SEPARATIONS USING A TREATED POLYAMIDE MEMBRANE,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
For primary bibliographic entry see Field 03A.
W72-13527

LIQUID TRANSFER MEANS FOR SETTLING TANKS,
Carborundum Co., Niagara Fall, N.Y. (assignee).
D. E. Holloway.
U. S. Patent No. 3,550,783, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 5, p 1903, December 29, 1970.

Descriptors: *Patents, Water purification, *Equipment, *Settling basins, *Waste water treatment, Pollution abatement, Water pollution, Separation techniques.
Identifiers: *Settling tanks.

The removal of a large quantity of fluid at low velocity from a settling tank is described. A boxlike receiver is supported and suspended within the tank so that the sidewalls thereof extend above and below the top level of the liquid. There are several open ended tubes within the receiver and extending through the bottom of the receiver. The liquid rising in the settling tank flows to overflow at the top edges of the tubes into the receiver where it is released through its outlet. (Sinha-OEIS)
W72-13529

WASTE WATER RECLAMATION SYSTEM,
For primary bibliographic entry see Field 03D.
W72-13530

METHODS AND APPARATUS FOR DISPOSING OF WASTE MATERIALS,
Black Clawson Co., Hamilton, Ohio. (assignee).
J. W. Wiseman.
U. S. Patent No. 3,549,529, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1558, Dec 22, 1970.

Descriptors: *Patents, Waste treatment, *Municipal wastes, *Organic wastes, *Oxidation, Sewage sludge, Sewage treatment, Separation techniques, Waste water treatment, Pollution abatement, Water pollution, *Chlorination.
Identifiers: *Wet oxidation.

Two disposal systems, one for sewage sludge and one for municipal refuse, are combined by transforming the solid constituents of each waste material into a mutually disposable form. The mechanical and hydraulic shearing actions of the pulper significantly retard decomposition and enhance wet oxidation by disintegrating the unstable cell walls of organic molecules under aeration conditions within an aqueous medium, consisting chiefly of water. The mixed slurry may be moved to the disposal device prior to the onset of organic decomposition. A final chlorination treatment is provided for. (Sinha-OEIS)
W72-13531

SEWAGE TREATMENT PROCESS AND SYSTEM,
Nayadic Sciences Inc., West Chester, Pa. (assignee).
J. I. Stevens.
U. S. Patent No. 3,549,521, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1556, December 22, 1970.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aeration, *Activated sludge, *Flow rates.

Raw sewage is fed to and passed serially through first stage and second stage treating units. Each unit has an aeration zone in which the sewage is mixed with air or oxygen to form an activated sludge and a clarification zone. The settled activated sludge from the first stage clarifying zone is collected, recirculated, and mixed with raw sewage being fed to the first stage aeration zone. The supernatant liquor from the first stage is fed into the second stage aeration zone. The supernatant liquor from the second stage clarification zone is discharged from the system. The flow rate analyzer is claimed as a special improvement in this invention. (Sinha-OEIS)
W72-13532

METHOD FOR THE TREATMENT OF GARBAGE AND OTHER WASTES,
Black Clawson Co., Hamilton, Ohio. (assignee).
J. Baxter, Jr.
U. S. Patent No. 3,549,092, 5 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1463, December 22, 1970.

Descriptors: *Patents, *Solid waste treatment, *Sewage treatment, *Municipal wastes, Pollution abatement, Equipment, Waste treatment, *Waste water treatment.
Identifiers: Pulpers, *Pulping.

Miscellaneous and unsorted municipal wastes are subjected to a pulping operation in an aqueous medium under conditions of mechanical and hydraulic action. When sewage is used as the pulping medium, it is possible to deliver the pulped and extracted waste slurry into the existing sewage system of the municipality for treatment with other sewage by conventional methods. (Sinha-OEIS)
W72-13533

APPARATUS FOR USE IN SLUDGE TREATMENT,
Passavant Werke (Germany). (assignee).
K. Theidel, and W. Weber.
U. S. Patent No. 3,549,017, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1445, December 22, 1970.

Descriptors: *Patents, *Sludge treatment, Sewage sludge, *Sewage treatment, Equipment, Pollution abatement, Separation techniques, *Waste water treatment.

This sewage treatment apparatus comprises equipment for lifting and lowering sludge scraping or removal gear in a sludge thickener basin. The raising of the apparatus will be responsive to an increase in the resistive force offered by the accumulating sludge counteracting the force intended to turn the shaft. The motor is mounted on roller bearings to permit rotational movement. The outermost scraping blades and scraping rods are lifted out of contact with the solids while the full driving force is applied to the innermost blades. After time for clearing at the central area of the basin, a switch turns the motor in the opposite direction to lower the poles. This causes the sludge to be scraped from top to bottom and conveyed to the discharge hopper. (Sinha-OEIS)
W72-13534

PERMEABLE MEMBRANE AND METHOD OF MAKING AND USING THE SAME,
Amicon Corp., Cambridge, Mass. (assignee).
P. N. Rigopulos.
U. S. Patent No. 3,549,016, 6 p, 2 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1445, December 22, 1970.

Descriptors: *Patents, *Membranes, Permeability, *Water purification, Separation techniques, Water quality, Equipment.

An anisotropic permeable membrane consists of a gel structure having a lattice formed of two ionically associated synthetic organic linear polymers. Each polymer has sufficient dissociable groups to render it water-soluble in the absence of the other. The membrane has a zone adjacent one face of less permeability than the remainder of the membrane. By proper control of the composition of the casting solution and of the washing and annealing conditions, membranes may be produced having flow rates of the order of 50 to 175 gallons of distilled water per 24 hours square foot of membrane area at a pressure differential of 100 pounds per square inch across the membrane. (Sinha-OEIS)
W72-13535

METHODS AND APPARATUS FOR DISPOSING OF WASTE MATERIALS,
Black Clawson Co., Hamilton, Ohio. (assignee).
P. G. Marsh, and E. T. Blakley.
U. S. Patent No. 3,549,010, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1444, December 22, 1970.

Descriptors: *Patents, *Aeration, *Flocculation, Sedimentation, *Sludge treatment, Activated sludge, *Industrial wastes, Municipal wastes, Pollution abatement, Waste treatment, *Waste water treatment, Sewage treatment, Separation techniques, Equipment, *Pulp wastes, *Waste disposal.

Waste sludges, particularly sludges resulting from the treatment of municipal sewage, but including industrial waste sludges, are mixed with the residue obtained by the pulping of garbage, trash and other municipal refuse. A pulper receives the solid waste and a continuous supply of fresh water for wash-up purposes. Waste is reduced to a slurry form. A primary sedimentation tank, an aeration tank, and a final sedimentation tank are provided. A line supplies compressed air to the liquid in the aeration tank to suppress anaerobic decomposition and to remove dissolved or suspended solids. The liquid is delivered to a final sedimentation tank where a flocculent precipitate (activated sludge) settles out to leave a clear, odorless effluent. Fibers are removed from the solid waste and are disposed separately. The sludge and slurry are processed for ultimate disposal. (Sinha-OEIS)
W72-13536

ADJUSTABLE PONTOONS FOR AERATOR PLATFORM,
R. D. Boutros.
U. S. Patent No. 3,548,770, 2 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 881, No 4, p 1390, December 22, 1970.

Descriptors: *Patents, *Pontoons, *Aeration, Equipment, *Waste water treatment, Water pollution treatment, Water purification, Aerobic treatment, Pollution abatement.

The pontoon includes a hollow, oblong flotation shell filled with foamed resin material. A shaft is fixed to the shell and extends vertically upward. A horizontal support plate is carried by the shaft and a bearing plate is arranged on the platform to rest on the support plate. Slots in one of the plates follow a circle concentric with the shaft. Pins on the other plate extend through the slots to permit turning between the two plates concentric with the shaft. (Sinha-OEIS)
W72-13537

BIO-OXIDATION WITH LOW SLUDGE YIELD,
Union Carbide Corp., New York. (assignee).
J. R. McWhirter.
U. S. Patent No. 3,547,814, 8 p, 4 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 881, No 3, p 1126, December 15, 1970.

Descriptors: *Patents, *Biochemical oxygen demand, *Activated sludge, Sludges, *Chemical wastes, *Municipal wastes, *Oxygenation, Separation techniques, Pollution abatement, Waste treatment plants, *Waste water treatment, Water pollution treatment, Water pollution.
Identifiers: Petrochemical plants, Paper plants.

Sufficient recycling sludge is introduced to the BOD containing water aeration zone to provide volatile suspended solids content of at least 3000 ppm. Oxygen- 50% by volume, is mixed in the aeration for a liquid solid contact time of at least 5 minutes. The DO content is maintained above 0.5 ppm and suspended activated sludge is formed. The activated sludge is then transferred to a stabilization zone where it is held for 20-90 minutes. Again gas, containing oxygen at least 35% by volume, is introduced. Finally at least part of the sludge derived from the oxygen gas mixing is withdrawn and returned to the BOD containing water aeration zone. (Sinha-OEIS)
W72-13538

APPARATUS AND METHOD FOR PURIFYING WASTE WATERS,
Aairbanks, Morse and Co., Chicago, Ill.
Pei Tai Pan.
U. S. Patent No. 3,547,800, 3 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p 1123, December 15, 1970.

Descriptors: *Patents, *Waste water treatment, Sewage treatment, Sea water, *Chlorination, *Coagulation, *Permselective membranes, Electrolysis, Ion exchange.
Identifiers: Sodium hydroxide.

An apparatus is provided for simultaneously separating suspended and dissolved solids, in a raw sewage mixture, from the liquid fraction. The separated liquid effluent is treated in a flotation chamber by electrolytic coagulation and disinfection by chlorination. Ion exchange takes place in a pretreatment unit. A cation permselective membrane is used and NaOH solution is used for coagulation. Seawater may be used as the initial liquid fraction. (Sinha-OEIS)
W72-13540

APPARATUS FOR TREATING WASTE WATER ASSOCIATED WITH HYDROCARBON PRODUCTION,
Shell Oil Co., New York. (assignee)
L. L. Wilkerson.
U. S. Patent No. 3,547,190, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p 989, December 15, 1970.

Descriptors: *Patents, *Waste water treatment, *Hydrogen sulfide, Industrial wastes, Separation techniques, Pollution abatement, *Aeration, Water pollution, Water pollution treatment.
Identifiers: Hydrocarbon production.

An apparatus is provided for treatment of waste waters from hydrocarbon production. Concentration of hydrogen sulfide is reduced at the same time as the temperature of the water is reduced. The waste water is pumped under pressure to spray nozzles directed vertically into the atmosphere. The hydrogen sulfide escapes and the water is collected in a basin where skimming of any remaining oil may be accomplished. (Sinha-OEIS)
W72-13541

WASTE TREATMENT,
Ethyl Corp., New York. (assignee)
A. W. Busch.
U. S. Patent No. 3,546,111, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p 704, December 8, 1970.

Descriptors: *Patents, Waste treatment, *Waste water treatment, *Domestic wastes, *Organic wastes, *Trickling filters, Filters, Filtration, *Aeration, Lime, Phosphates, Carbon dioxide, Treatment, *Municipal wastes, *Biological treatment, Biochemical oxygen demand, Hydrogen ion concentration.

After comminution, the waste stream flows into the top of a chamber containing a biological trickling filter. Large voids in the plastic packing filter media provide a high flow of air to perpetuate the growth of the biological material. The treated fluid is collected in a basin underneath the plastic material. After secondary aeration if necessary, the treated fluid flows into a lime treatment vessel. The lime will precipitate inorganic salts, such as phosphates, magnesium, or calcium. Mechanical

devices are used to remove the precipitate as the cleaned fluid leaves. Carbon dioxide from the calciner stack gas is used to adjust the pH of the effluent before release. (Sinha-OEIS)
W72-13542

METHOD AND APPARATUS FOR TREATING SEWAGE WATER BY MEANS OF FLOCCULATION AND AERATION,
Stenberg-Flygt A.B., Solna (Sweden). (assignee)
S. Englesson, and S. G. Gamer.
U. S. Patent No. 3,546,110, 5 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p 704, December 8, 1970.

Descriptors: *Patents, *Liquid wastes, *Sewage, *Flocculation, *Sedimentation, *Aeration, Separation techniques, Pollution abatement, Waste water, *Waste water treatment, Water pollution, Water pollution treatment, Treatment facilities, Water purification, *Phosphorus.

Sewage water is fed into a flocculation and sedimentation apparatus. As much as 20% by volume of regenerated sludge is added to the sewage. From 20 to 100 cubic m/hr of air is supplied from the bottom so that a laminar vertical flow of air bubbles rises upward through the sludge. Carbon dioxide and nitrogen are formed and expelled. Provisions are also made for precipitating phosphorus where necessary. This is done by adjusting the Fe (OH)3 concentration and maintaining a neutral pH. Details are given on the special equipment used. (Sinha-OEIS)
W72-13543

APPARATUS FOR PURIFYING LIQUIDS CARRYING SUSPENDED SOLID PARTICLES, CHIEFLY PULP FOR PAPER MILLS,
Etablissement d'Etudes et de Recherches Meteorologiques, Paris (France). (assignee)
J. P. Lamort.
U. S. Patent No. 3,545,621, 4 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 2, p 594, December 8, 1970.

Descriptors: *Patents, *Pulp wastes, *Water purification, *Waste water treatment, Separation techniques, *Equipment, *Rotors.

The apparatus includes a vat enclosing a cylindrical sieve and a bladed rotor. A second sieve is arranged in series with the first sieve coaxially with it. The bladed rotor produces pressure pulses on the upstream side of the first sieve and on the downstream side of the second sieve. The suspension is fed into the annular gap between the two coaxial sieves so as to flow both outward through the outer sieve and inward through the inner sieve. (Sinha-OEIS)
W72-13544

FILTER MEDIA,
J. M. Choun.
U. S. Patent No. 3,543,937, 4 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 1, p 178, December 1, 1970.

Descriptors: *Patents, *Liquid wastes, Sewage, *Organic wastes, Industrial wastes, *Filters, Filtration, Equipment, Pollution abatement, Waste water, *Waste water treatment, Water pollution, Water pollution treatment, Separation techniques.

Thin-walled shells, preferably spherical in form and made of selected synthetic resin are placed within a filter tank. The individual shells are perforated to permit percolation of water and air ventilation. As the waste water is sprayed onto the media, it percolates downward. It is exposed to the oxidizing action of aerobic microorganisms. The water collects in drains at the bottom of the tank and is removed through the main drainpipe. (Sinha-OEIS)
W72-13545

APPARATUS FOR EFFLUENT TREATMENT,
Simon-Carves Ltd., Stockport (England). (assignee)
J. W. Abson, and E. I. Clark.
U. S. Patent No. 3,543,936, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 1, p 178, December 1, 1970.

Descriptors: *Patents, Effluents, Municipal wastes, *Industrial wastes, *Waste water treatment, *Electrodes, Equipment, Pollution abatement, Water pollution, Water pollution treatment.

Electrodes are immersed in the sludge. A potential difference is applied across the electrodes at a low current density sufficient to cause gassing. A thickened layer of sludge is formed and the remainder of the liquor is removed. Examples of successful use are presented. This apparatus comprises a tank in which is mounted along a base a horizontal planar aluminum cathode. In addition several vertical, parallel, planar, evenly-spaced, shallow, mild steel anodes are mounted in the tank. The anodes are suspended above the cathode by electrically conductive rods which are mounted in two spaced insulated supports. (Sinha-OEIS)
W72-13546

5E. Ultimate Disposal of Wastes

SANITARY LANDFILLS--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-13043

MICROBIOLOGICAL UTILIZATION OF SULPHITE LIQUOR,
British Columbia Research Council Vancouver.
For primary bibliographic entry see Field 05D.
W72-13098

FERMENTATIVE UTILIZATION OF SPENT SULPHITE LIQUOR, A REVIEW AND PROPOSAL,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05D.
W72-13107

RESIDUAL TAR DISPOSAL.
For primary bibliographic entry see Field 05D.
W72-13499

5F. Water Treatment and Quality Alteration

WATER SYSTEM AND TREATMENT HANDBOOK.
For primary bibliographic entry see Field 08B.
W72-13147

BACTERIA CAUSE MANY PROBLEMS.

Johnson Drillers' Journal, Vol 39, No 4, p 1-3, 13. Jul-Aug 1967.

Descriptors: *Water quality, Water pollution, *Coliforms, Bacteria, E. Coli, Chlorination, Water wells, *Water sampling, *Water treatment.
Identifiers: *Presumptive test, Dysentery, Oxyacetylene torch, Sodium hypochlorite.

Bacteria in water can present a health hazard, in that they can cause typhoid, dysentery, and other intestinal upsets. Disease-causing bacteria, testing and identification of these bacteria in water samples, disinfection of drilling water and equipment by means of chlorination, and screening of samples are described. The 'presumptive' test for coliform bacteria is outlined, and sampling methods are demonstrated. (Campbell-NWWA)
W72-13156

A BLISTER SHEET AND POUCH OVERWRAPPER PACKAGE FOR THE IODINE WATER PURIFICATION TABLET,
Columbia Research Corp., Gaithersburg, Md.
D. F. Brown, and C. T. Derick.
Available from the National Technical Information Service as AD-733 921, $3.00 in paper copy, $0.95 in microfiche. Army Land Warfare Laboratory, Technical Report No LWL-CR-05S69, Oct. 1971. 49 p, 26 fig, 3 tab, 11 ref, append. DAADO3-70-C-0089.

Descriptors: *Water treatment, *Public health, Sanitary engineering, *Iodine, *Disinfection, *Water purification.
Identifiers: Packaging, Iodine tablets.

Iodine tablets for use in disinfection of water contain a minimum of 7.6 mg of titratable iodine. They are packaged in glass bottles which provide little protection from moisture, once the bottle is opened. Often large percentages of the tablets are rendered impotent. Blister sheets for 12 tablets, and pouch overwrappers that contain two sheets were developed; each tablet is individually isolated in vacuum by heat sealing. The sheets are fluorohalocarbon, the overwrappers are Mylar-aluminum foil polyolefin. The background color matches the normal tablet color, therefore, deterioration of tablets is evident by color changes from normal gray through olive-drab and finally to yellow and orange. The yellow tablets contain 7.6 mg of titratable iodine but they take longer to dissolve, and they can be eliminated. Test exposure to humidity demonstrated the ability of the package to protect the tablets to the objective of two-year shelf life when sealed in the overwrappers, and six months when the overwrapper is opened. Sheets, overwrappers, methods and test procedures are described. It is predicted that in mass production costs could be comparable to the present cost in bottles. (Bean-AWWARF)
W72-13257

DRINKING WATER STANDARDS, 1961, US PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-13258

ADSORPTION OF INORGANIC COMPOUNDS BY ACTIVATED CARBON,
Westvaco Corp. Covington, Va.
For primary bibliographic entry see Field 05D.
W72-13260

EFFECT OF FOREIGN COMPONENTS ON THE PRECIPITATION OF PHOSPHATE BY ALUMINUM,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 05D.
W72-13290

EFFICACY OF UNDERGROUND FILTRATION INSTALLATIONS WITH RESPECT TO SALMONELLA,
Meditsinskii Institut, Kiev (USSR).
B. M. Duchinskii.
Gig Sanit. Vol 35, No 10, p 93-94. 1970.
Identifiers: *Water treatment, *Water pollution treatment, Filtration, Installations, *Salmonella, Springs.

Spring water containing Salmonella at concentrations up to 10 to the 9th power/l may be effectively decontaminated by filtration through 1 m of medium-grade sand at a filtration rate not exceeding 15

l/day per running meter of irrigation network. After biological aging of the filter system the filtration rate may be safely increased to 30 l/day per running meter.--Copyright 1972, Biological Abstracts, Inc.
W72-13423

APPLICATION OF SILVER TO DRINKING WATER IN SMALL AGRICULTURAL COMMUNITIES (IN GERMAN),
Water Hygiene Inst., Gelsenkirchen (West Germany).
H. Althaus.
Arch Hyg Bakteriol. Vol 154, No 6, p 574-576. 1971. Illus. English summary.
Identifiers: *Water treatment, Chlorination, Potable water, Disinfection, *Silver, Tolidine.

Under certain circumstances the electrical application of silver to drinking water may act as a means of degermination. The number of failures is so high with this method that it cannot be recommended for reasons of hygiene. Chlorination involving lower costs, more likely success, and being simple to check with o-tolidine should be given preference.--Copyright 1972, Biological Abstracts, Inc.
W72-13435

TURBULENCE IN ORTHOKINETIC FLOCCULATION,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05D.
W72-13506

INTERACTION OF A FLOCCULANT SOL AND GRANULAR FILTER MEDIA,
Rensselaer Polytechnic Inst., Blacksburg, Va.
J. J. Cochrane.
Available from University Microfilms, Ann Arbor, Mich, Order No. 67-4161, Microfilm $3.00, Xerox $9.25. Ph. D. Dissertation, 1966. 202 p.

Descriptors: *Filtration, *Deposition, *Flow rates, *Mathematical models, *Water treatment, Flocculant, Hydraulic gradient, Waste water treatment.
Identifiers: *Alum, *Sand filters, Floc concentration, Deposit profiles, Differential equations.

The interaction of a flocculant sol and granular filter media was investigated by examination of the physical characteristics of deposits within a filter. The floc was produced from the common coagulant, aluminum sulfate. Removal from solution was by a uniformily graded, almost perfect spherical type of silica sand. Operating variables such as alum floc concentration, flow rate and anions were employed to study the interactions. A method was developed which relates the change in hydraulic gradient due to deposition to the volume of deposited material. Deposit profiles through the filters indicated that there were 3 different classifications possible when filtering a flocculant sol. It was concluded that filters should be operated under the conditions required for controlled penetration in conjunction with a continuous recording turbidimeter to insure a high quality effluent. Results indicated that the initial deposition of the floc was in a highly hydrous state and subsequent removal was by a floc to floc interaction with an accompanying dehydration. (Galwardi-Texas)
W72-13513

APPARATUS FOR IRRADIATING A LIQUID,
Controlex Corp. of America, Croton Falls, N.Y.
For primary bibliographic entry see Field 05D.
W72-13523

TREATMENT OF WATER,
H. B. H. Cooper.
U. S. Patent No. 3,547,810, 3 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 881, No. 3, p 1125, December 15, 1970.

Descriptors: *Patents, *Water treatment, Demineralization, Resins, Ion exchange, *Chlorination, Electrolysis, Sodium chloride.
Identifiers: Sterilization.

The water treatment system is based on a sodium chloride electrolytic cell which is operated to provide an aqueous caustic soda stream (free of salt), chlorine gas, and hydrogen gas. Both gases are combined in the hydrogen chloride generating cell and absorbed in water. The aqueous caustic soda regenerant stream and the hydrochloric acid regenerant stream are available for regeneration of the anionic and cationic exchange resins. A portion of the chlorine produced in the electrolysis cell is used for sterilizing the water being processed. (Sinha-OEIS)
W72-13539

CONTROL OF TASTE AND ODOR IN MISSOURI RIVER WATER,
Omaha Metropolitan Utilities District, Neb.
J. F. Erdei.
Journal of the American Water Works Association, Vol 55, No 12, p 1506-1522, December 1963. 7 fig, 9 tab, 12 ref.

Descriptors: *Water treatment, Water quality, *Actimycetes, *Taste, *Odor, *Organic matter, *Activated carbon, *Chlorine, Gas chromatography, Spectroscopy, *Missouri River, Pollutant identification, Nebraska.
Identifiers: Permanganate.

Problems on the Missouri River are discussed. Activated carbon filters and CCE studies, odor potentials of organic pollutants and actimoycetes are described. Studies of actinomycetes should be continued and expanded along the main stem of the river; silt particles bearing organic pollutants can produce odors in finished water if they are not completely removed the carbon filter (CCE) is a good tool for study of organic chemicals in the river; the significant odor-producing materials are concentrated in the neutral and weak-acid groups, as defined by the USPHS.; further evaluation of the use of chlorine and potassium permanganate in removing the tastes and odors from Missouri River water must be undertaken. Studies are being made of organic materials of taste and odor significance extracted from raw and finished waters from the Missouri River. Also, use of gas chromatography techniques and infrared spectroscopy are being investigated for determining chemical characteristics of natural decomposition products which can or may cause taste and odor problems. (Bean-AWWARF)
W72-13598

INTERNATIONAL SIGNIFICANCE OF WATER PURIFICATION,
Stanford Univ., Calif. Dept. of Civil Engineering.
R. Eliassen.
Journal American Water Works Association, Vol 55, No 7, p 831-844, July 1963. 7 fig, 9 ref.

Descriptors: *Water purification, *Public health, *Diseases, *Economics, *Training, Potable water.

Typhoid fever has virtually disappeared from those countries blessed with adequate water purification facilities. In the USA the rate is 1 per 100,000 population; in So. America it averages 50 per 100,000. In two countries the death of children under 5 exceed 1,000 per 100,000 population. Disinfected water can prevent most of these deaths. Prevention of waterborne disease has only succeeded in the developed countries through excellence in management, design, construction, and operation of water supply systems. The international significance of water treatment can well be considered in terms of economics-the improvement in health to make individuals more productive and thus serve to enhance the economy of their country. WHO has responded to requests by sending teams of consultants in the field of engineering, finance and public administration to study problems in developing countries and submit recommendations for action. The developing countries would like to receive grants for the complete design and construction of water supply systems. This is impossible as hundreds of billions of dollars would be required. Assistance is given by AID of the U.S. Dept. of State, the World Bank, the International Development Assoc., The inter-American Development Bank, and Export-Import Bank and Development Loan Fund of the U.S. One of the principal objectives of the Community Water Supply Development Program of AID is the training of water utility personnel. (Bean-AWWARF)
W72-13599

THE NEXT FIFTY YEARS IN WATER PURIFICATION,
Hazen and Sawyer, New York.
R. Hazen.
Journal American Water Works Association, Vol 55, No 7, p 825-830, July 1963. 1 tab.

Descriptors: *Water purification, Sanitary engineering, *Public health, *Standards, *Electrolytes, Filtration, Disinfection, Clarification, Desalinization, Taste, Odor, Water softening, *Water quality standards.
Identifiers: *Coagulant aids.

The next 50 years will reflect concern for maintaining existing standards in the face of declining raw-water quality. Discoveries demonstrating the need for removal of natural substances long considered harmless and discoveries demonstrating the desirability of adding things to water should not be ruled out. Predictions include reduction of coagulant quantities by use of aids, the 'burning' of color by chlorine or other oxidizing agents, a continuance of the importance of filtration since good sterilization is dependent on good clarification, much greater reuse of water in some parts of the country, and an increase in desalinization. People have demonstrated a willingness to pay for soft water and taste and odor free water. (Bean-AWWARF)
W72-13600

ADVANCES IN WATER TREATMENT,
Omaha Metropolitan Utilities District, Nebr.
J. F. Erdei.
Journal American Water Works Association, Vol 55, No 7, p 845-856, July 1963. 1 tab, 16 ref.

Descriptors: *Water treatment, Sanitary engineering, *Pathogenic bacteria, Algae, Organic matter, Radioactivity, Pesticides, Taste, Odor, Coagulation, Electrolytes, Potable water.

Reviews were conducted of the status of increasing water pollution problems. Use of chemicals, new scientific tools, analytical techniques, treatment processes, polyelectrolyte usage, coagulation, jar test, pathogenic organisms, algae, trace elements, pesticides, radiosotopes, and tastes and odors, are discussed. More study is needed on methods of treating drinking water, a good share of which should involve organic contaminants. There is no assurance that such harmful substances in solution will signify their presence by producing taste or odor, and many interesting opportunities for research exist in these areas. (Bean-AWWARF)
W72-13601

EFFECT OF FILTRATION RATE CHANGES ON QUALITY,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. L. Cleasby, M. M. Williamson, and E. Baumann.

Journal American Water Works Association, Vol 55, No 7, p 869-880, July 1963. 4 fig, 3 tab.

Descriptors: *Water treatment, Water quality, *Filtration, *Turbidity, Iron compounds, Copper, Flow rates, Head loss, *Filters, *Suspension, Effluents.

An investigation was conducted with three types of influent suspensions and two filtering facilities. The filters were operated in a normal manner and at constant rate to head loss of 3.5-5.0 ft. The rate was then increased to a predetermined amount at a predetermined rate of increase, and the effluent was monitored for turbidity and iron content. Hydrous ferric oxide floc suspension was filtered in 12 runs and a similar floc, prepared with 0.5 ppm of copper ($CuSO_4$ solution) added, in 24 runs. The influent iron concentration was in all runs 10 ppm. The iron floc without the copper catalyst was the stronger. It was found that iron concentration in the effluent builds up rapidly after the disturbance of rate change, reaching a peak, then decreasing to very nearly the previous concentration within one hour, after some of the dislodged material has redeposited in lower layers of the filter and equilibrium has been reestablished between the shear forces and depositing forces. The amount flushed through the filter was dependent on the magnitude of the rate disturbance, on the rapidity with which the rate is disturbed, and on the type of material being filtered. (Bean-AWWARF)
W72-13602

CHEMICAL CHARACTERISTICS OF FULVIC ACID,
Florida Univ., Gainesville. Dept. of Chemistry.
A. P. Black, and R. F. Christman.
Journal of the American Water Works Association, Vol 55, No 7, p 897-912, July 1963. 10 fig, 8 tab, 4 ref.

Descriptors: *Water treatment, *Fulvic acids, *Color, *Organic matter, *Chlorine, Infrared radiation, Analytical techniques, Pollutant identification.
Identifiers: Ozone, Chlorine dioxide.

Experimental evidence of the chemical properties and structural characteristics of the organic materials responsible for the coloration of water is presented. Infrared spectra of the fulvic acid fraction of each colored water were very similar, and confirmed the assumption that these materials are hydroxy carboxylic acids, and gave strong indications of unsaturation and aromacity. The effects of ozone, chlorine dioxide, and chlorine on the color values of the waters studied were evaluated. Effects of oxidants on color removal is generally assumed to be oxidation of the organic matter to carbon dioxide and water. That this is not true is shown by the results. Chlorine oxidation was found to produce ether-soluble oxidation products. The infrared spectra of the substances suggested that they are polyhydroxy carboxylic acids containing disubstituted phenyl rings. (Bean-AWWARF)
W72-13603

USE OF SUBMERGED FILTERS,
Saint Louis County Water Co., University City, Mo.
H. O. Hartung, and J. L. Tuepker.
Journal of the American Water Works Association, Vol 55, No 9, p 1165-1173, Sept. 1963. 3 fig, 3 tab, 2 ref.

Descriptors: *Water treatment, *Filters, *Filtration, *Design, Water softening, *Missouri.
Identifiers: *Submerged filters, Backwashing, *St. Louis.

The submerged filters at the South County Plant of the St. Louis County Water Co. are contained within a basin providing softening, coagulation, sedimentation; the water then passes downward through the filters at the effluent end of the basin. The filters have Wheeler bottoms, 12 in. of gravel and 27 in. of sand. The filters are some 3600 sq. ft. in area, divided in two sections to allow backwashing. The wash water rises above the surrounding walls and carries the wastes into the settling areas of the basin, where they resettle. More wash water is required than with conventional filters, but none is wasted or lost. The added wash water pumping costs are minor compared to the saving of the wash water. Surrounding filter walls rise about 2 ft. above the sand. No surface wash equipment is required. During backwashing all the filters and basins are completely out of service, but this is accomplished at off-peak during the night. Filter beds are skimmed semi-annually as preventive maintenance. Filtering to waste after backwashing has not been found necessary. Compared to conventional filters the annual saving on construction costs is considerable. (Bean-AWWARF)
W72-13604

CHEMICAL ASPECTS OF ACTINOMYCETE METABOLITES AS CONTRIBUTORS OF TASTE AND ODOR,
Iowa Univ., Iowa City. State Hygienic Lab.
R. L. Morris, J. D. Dougherty, and G. W. Ronald.
Journal of the American Water Works Association, Vol 55, No 10, p 1380-1390, October 1963. 7 fig, 1 tab, 8 ref.

Descriptors: *Water treatment, *Actinomycetes, *Algae, *Taste, *Odor, Water quality control, Pollutant identification, Iowa.
Identifiers: *Metabolites, *Cedar River (Iowa).

The extremely severe musty tastes and odors that occurred in the Cedar River were due to certain metabolites of the actinomycetes, particularly a 'neutral fraction'. No correlation existed between the intensity of taste problems and threshold odor values, as the burning, musty taste of critical fractions of actimycete cultures were far more persistent than the associated odor phenomena. Metabolites were extracted, purified and determination made as to which produced the typical tastes and odors. These were purified by elutriation with various solvents. When the remaining ether solution was dried with sodium sulfate a pale yellow oil called the 'neutral fraction' was reclaimed; it had a decidedly musty taste and odor. Various 'neutral fractions' in spectrograms, showed correlations of bound hydroxyl and carbonyl groups at wavelengths 2.9-2.95 and 5.8-5.85 microns respectively. (Bean-AWWARF)
W72-13605

REVIEW OF THE BACTERICIDAL EFFECTIVENESS OF SILVER,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. L. Woodward.
Journal of the American Water Works Association, Vol 55, No 7, p 881-886, July 1963. 1 tab, 7 ref.

Descriptors: *Water treatment, *Public health, *Disinfection, *Silver iodide, Water quality standards, Phosphates, Chlorides, Sulfides, Hardness (Water), Reviews, *Bactericides.

Silver has never been used extensively in water disinfection and the literature is notable for its contradictions. Evidently some significant factor affecting the performance of silver is not being adequately controlled, but the identity of this factor is unknown. One problem is the development of a sensitive and precise analytical method for silver in the parts per billion range. Information on the interfering substances is needed. The fact that silver does not impart taste, odor or color makes it attractive for use. Its slow bactericidal action is in some situations a disadvantage. Its effect on viruses is not known. Until some of the uncertainties are resolved it should be used in drinking water only where substantial factors of safety can be provided and where the bacterial effectiveness can be monitored. The USPHS Drinking Water Standards contain a limit of 50 ppb for silver, based not upon toxicity but upon deposition of silver possibly causing argyria, which is cosmetically objectionable. The bactericidal effects of silver are known to be subject to interference by phosphates, hardness, chlorides, sulfides and other sulfur compounds. (Bean-AWWARF)
W72-13606

REVIEW OF THE RELATION OF WATER QUALITY AND SIMPLE GOITER,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. L. Woodward.
Journal of the American Water Works Association, Vol 55, No 7, p 887-896, July 1963. 1 tab, 26 ref.

Descriptors: *Water treatment, *Public health, *Iodine, Calcium, Fluoride, Hardness (Water), Organic matter, Nitrate, Reviews, Potable water.
Identifiers: *Goiter.

Goitrogenic materials are present in some waters. This is not to deny the major role of iodine deficiency as a cause of goiter, but to emphasize that other factors may contribute. Around the turn of the century the importance of iodine in thyroid metabolism was well established. Calcium and fluorine have been implicated as causing goiter, also hard water, but descriptions of the waters involved suggest other pollutants such as high organic matter and nitrates. Boiling of the water was found to eliminate the goitrogen. On one river, goiter incidence in the farthest upstream village was 11.8% and increased to 45.6% in the village farthest downstream; a nearby village that obtained drinking water from a spring was goiter free. Of 35 volunteers who drank some suspended matter from the downstream water supply, but otherwise used only water from the spring, 10 developed marked goiter enlargements in two weeks and five others developed swellings. Water from certain wells is known to have produced goiter. Hettche found a compound (urochrome) in water which produced goiter in rats. The effect on thyroid functions of organic contaminants of water, other than urochrome has not been investigated. (Bean-AWWARF)
W72-13607

STATUS OF FLUORIDATION IN THE UNITED STATES AND CANADA, 1961.
American Waterworks Association, New York. Task Group 2620P.

Journal of the American Water Works Association, Vol 55, No 5, p 571-580, May 1963. 3 fig, 10 tab, 4 ref.

Descriptors: *Water treatment, *Fluoridation, *Fluorides, United States, Canada, Public health, Texas, Water supply.
Identifiers: Bartlett (Tex).

97 SYSTEMS SERVING 106 COMMUNITIES IN THE U.S. and Canada started fluoridation in 1961 (80 in U.S. and 20 in Can.). Total is now 1,329 systems serving 43,700,000 people, plus 7,300,000 using naturally fluoridated water with more than 0.7 ppm. There are also 84 military installations in the U.S. which fluoridate and serve 776,980 persons. Also 56 military installations receive fluoridated water from civilian systems. Only 6% of communities with population less than 2,500 have so far adopted fluoridation. Maryland leads the States with 91% of the population using fluoridated water. There were no shortages of fluoride compounds in 1961. A dental examination of children living in Bartlett, Texas, was repeated after 8 years of using partially defluoridated water which had previously contained 8.0 ppm fluoride.

Fluorosis had practically disappeared as a result of this water treatment. (Bean-AWWARF)
W72-13608

5G. Water Quality Control

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS OF THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington. Water Quality Control Div.

Federal Water Pollution Control Administration--District of Columbia Department of Health Cooperative Report, July 1, 1970. 16 p, 1 fig, 2 plate, 2 tab, append.

Descriptors: *Water quality standards, *Water Quality Act, *Interstate rivers, *Water quality control, *District of Columbia, Water pollution control, Sampling, Networks, Water analysis, Chemical analysis, Documentation, Reviews.

In the Water Quality Act of 1965, Congress authorized the establishment of water quality standards for interstate (including coastal) waters. The standards for interstate waters which the District of Columbia adopted on June 29, 1967 were submitted to the Department of the Interior. The standards became fully approved as both the District of Columbia and Federal standards, enforceable under the District's water pollution control statutes and the Federal Water Pollution Control Act, as amended (Section 10). The standards consist of three major components: (1) designation of the uses which interstate waters are to serve, (2) specification of narrative and numerical criteria to protect and enhance water quality, and (3) specification of a plan of implementation and enforcement, including treatment and control requirements for municipal, industrial, and other wastes discharged to or affecting interstate waters. The District collects samples from approximately 50 locations in the general area of the District of Columbia. Although the sampling frequency may vary from station to station, each individual station has been scheduled a frequency which conforms to the overall program. (Woodard-USGS)
W72-13049

EFFECTS OF NONIONIC SURFACTANTS ON MONOCOTS,
California Univ., Riverside. Dept. of Plant Pathology; and California Univ., Riverside. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 05C.
W72-13050

CONSUMER WILLINGNESS TO PAY FOR POLLUTION ABATEMENT,
Guelph Univ. (Ontario).
D. A. L. Auld.
August, 1971. 19 p, 4 tab.

Descriptors: *Pollution abatement, *Cost allocation, Taxes, Regression analysis, Income, Education, Age, *Canada.
Identifiers: *Consumers, *Charges, *Hamilton (Canada).

To obtain information about consumers' willingness to pay for pollution abatement a short questionnaire was mailed to approximately 1900 residential households in the city of Hamilton, Canada early in 1971. There were 395 respondents. The data were used to estimate the parameters of two regression models. The first model posits the willingness to pay for 'primary' environmental improvement as a linear function of income, education, and age. These variables accounted for only about 10 percent of the variance in the willingness to pay for 'primary' improvement. The second model employed the same explanatory variables as the first, but replaced the willingness to pay for 'primary' improvement with the willingness to pay for 'secondary' environmental improvement. This model explained only about 14 percent of the variation in the dependent variable. Thus, it is clear that additional factors, other than level of income, age, and education, must substantially explain consumer willingness to pay for pollution abatement. While many of these additional factors may be difficult to quantify in a statistical sense, it seems that further useful information might be obtained through in-depth, personal interviews. (Settle-Wisconsin)
W72-13085

TOWARD AN ECONOMICS OF ECOLOGY,
For primary bibliographic entry see Field 06G.
W72-13087

EXTERNALITIES AND THE RACE FOR ECONOMIC GROWTH IN THE USSR: WILL THE ENVIRONMENT EVER WIN,
Wellesley Coll., Mass.
M. I. Goldman.
Journal of Political Economy, Vol 80, No 2, p 314-327, 1972. 12 ref.

Descriptors: *Pollution abatement, *Cost-benefit analysis, *Real costs, Economic efficiency, Prices, Environmental effects.
Identifiers: *Socialism, *Incentives, *Externalities, Social costs, Private costs, USSR.

Theoretically there should be no divergence between private and social costs in a socialist state like the USSR. Furthermore, it would seem to be in the interest of the USSR to make each factory pay for the social costs it generates. If each factory were accountable for both private and social costs there would presumably be considerably less pollution of the air, water, and land. Yet, in practice almost no effort is made in the USSR to assign social costs. Consequently, the Russian factory manager has no economic incentive to clean up his plant's pollution himself. There are several factors contributing to this failure to account for social costs. Marxist ideology makes it difficult to justify a charge on such free goods as air and water. Setting prices is such an immense undertaking that in many instances the State Committee on Prices does a poor job, and thus misallocates resources. Cost-benefit ratios are subject to manipulation by project-oriented planners and engineers. Also, the emphasis placed on high national growth rates assures that few incentives will be provided for pollution control. However, due to the scarcity of consumer goods, the USSR's solid-waste problem is reduced. (Settle-Wisconsin)
W72-13088

ENVIRONMENTAL REPERCUSSIONS AND TRADE THEORY,
Michigan State Univ., East Lansing.
A. Y. C. Koo.
Michigan State University, Econometrics Workshop Paper No 7102, October, 1971. 29 p, 4 fig, 10 ref.

Descriptors: Pollutants, *Pollution abatement, *Economic impact, Theoretical analysis, Comparative productivity, *Mathematical models, *Linear programming, Input-output analysis, *Model studies.
Identifiers: *International trade theory, Comparative advantage.

Pollution, or environmental repercussions, are incorporated into a linear trade model in order to study the impact of pollution on volume, terms, and direction of trade. The model assumes that environmental disruptions create a problem only to the extent that additional resources will be consumed to remove them. The model suggests that the impact of pollution on the pattern, volume, and terms of trade depends largely on preferences toward the environment and the technology of pollution abatement. This result implies that such natural resources as clear water, open space, and fresh air can be included in the determination of a country's comparative advantage. These natural resources can be traded off for material well-being if a country so chooses. Consequently, two countries could find trade profitable despite identical transformation surfaces if their environmental preferences differ. An interesting hypothesis suggested by the model is that nations will tend to specialize in and export goods whose production will generate pollutants with which they are better equipped or more able to handle and to import those goods which would generate pollution which they are less able or ill-equipped to handle. (Settle-Wisconsin)
W72-13093

SOCIO-ECONOMIC ACCOUNTING AND EXTERNAL DISECONOMIES,
Texas Univ., Arlington. Dept. of Accounting.
R. W. Estes.
The Accounting Review, Vol 47, No 2, p 284-290, April, 1972. 19 ref, append.

Descriptors: *Pollution abatement, *Pollution taxes (Charges), *Real costs, Pollutants, Research priorities.
Identifiers: *Socio-economic accounting, *Accounting, *Social costs, Externalities, External diseconomies.

External diseconomies can be defined as the damages, or negative effects, inflicted on outsiders by activities of an entity which are not recognized explicitly as costs by that entity, and for which the outsiders are not adequately compensated. The most obvious forms of external diseconomies are the various forms of poliution such as air and water pollution. While several solutions to the pollution problem are possible, recent developments suggest that the most feasible solution will involve forcing firms to internalize their external diseconomies by taxing them according to some monetary measure of social costs. The assessment of these charges will involve accountants at several levels, from the estimation of social costs through the ultimate inclusion of such costs in financial reports. Unfortunately, accountants have tended to avoid monetizing external diseconomies. Yet there are many questions that must eventually be investigated, and they should be investigated now rather than after pollution charges have become widespread. Foremost among the needed study projects would appear to be one aimed at developing and field-testing techniques for measuring social costs. Other projects might involve studying such problems as the potential effects on firms of assessments for social costs. (Settle-Wisconsin)
W72-13094

A CO-OPERATIVE RESEARCH PROGRAM ON KRAFT PULP MILL EFFLUENT QUALITY,
British Columbia Research Council Vancouver.
For primary bibliographic entry see Field 05C.
W72-13106

WATER POLLUTION AND THE KRAFT PULP MILL INDUSTRY,
British Columbia Research Council Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 05C.
W72-13109

NEW DEVELOPMENTS IN AERATION SYSTEMS FOR LARGE RIVERS,
Rutgers - The State Univ., New Brunswick, N.J.; and Princeton Univ., N.J.
W. Whipple, Jr., L. Yu Shaw, and G. E. Mattingly.
Water Resources Bulletin, Vol 8, No 1, p 3-14, Feb. 1972. 7 fig, 22 ref.

Descriptors: *Water quality control, *Aeration, *Dissolved oxygen, *Oxygenation, *Pollution control, Navigable rivers, Costs, Biochemical oxygen demand, Dispersion, Diffusion, Stream pollution, Bibliographies, Equipment, Rivers, Estuaries.
Identifiers: *Delaware River.

The practicability and economy of artificial aeration of small rivers has been established, but the more important problem areas are concerned with large navigable polluted rivers, such as the Potomac, the Delaware, and the Houston Ship Canal. The use of supplemental or induced oxygen on large tidal rivers has been approached theoretically. The problems involved in applying such techniques to the Delaware Estuary are discussed. The basic oxygen regimen problems of large navigable estuaries, although similar in principle to those of small rivers, require a different approach. Wind and wave action modify air-water interface transfers, and require sturdy construction and mooring of surface equipment. Navigation requirements also pose definite constraints on design. The mere size of the river makes measurement of oxygenation effects of aerators difficult. The most challenging set of problems concerns the dispersion of oxygenated water throughout the great mass moved by the tidal cycle, and the effects of dispersion characteristics of individual aerators upon system design. These aspects must be incorporated into systems approaches to determine an optimum water quality control plan. (USBR)
W72-13132

MATHEMATICAL MODEL FOR RATE STUDIES,
Camp, Dresser and McKee, Boston, Mass.
K. M. Yao.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA4, Paper 9146, p 635-645, August, 1972. 5 fig, 5 ref, 2 append.

Descriptors: *Water supply, *Sewage disposal, *Project planning, *Estimating, *Cost analysis, Mathematical models, Computer programs, Digital computers, Operating costs, Inflation (Economic), Sanitary engineering, Long-term planning, Alternative planning, Operation and maintenance.
Identifiers: Revenues, Financial planning.

A mathematical model is developed for estimating the total annual cost of a public water supply or waste water disposal system to provide cost information for rate studies. The model is also a good tool for comparing alternative projects in water resources planning. The estimated annual costs are in the form of a time series useful for long-range planning. The model is adaptable to digital computer programming, an ideal tool for thorough investigation of a water system where the nature of the total annual costs are time-dependent or dynamic. The model reflects the effects of parameter changes such as the interest rate, the rate of inflation, and construction cost increases, on the estimated annual costs. A numerical example illustrates the application of the model. Results of the example indicate that inflation has significant influence on the financial requirements of the system for its proper operation. Ignoring inflation in cost estimates may result in inadequate revenue and the need of frequent adjustments of the rate schedule. A sample computer program is presented to show the programming technique required to obtain correct results. (Bell-Cornell)
W72-13135

DIMENSIONS OF THE ENVIRONMENTAL CRISIS,
For primary bibliographic entry see Field 06G.
W72-13145

ROCK SALT AS AN URBAN TRACER,
Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
For primary bibliographic entry see Field 05B.
W72-13164

SHORELINE STUDY-PHASE III, WATER USE DEVELOPMENT PLAN.
Titusville Planning Dept., Fla.

June 1971. 62 p, 7 fig, 4 tab. HUD, Florida P-121E.

Descriptors: *River regulation, *Shores, *Urbanization, *Water quality control, *River basin development, Land management, Water resources development, Comprehensive planning, Rivers, Florida.
Identifiers: *Indian River, *Titusville (Florida), *Shoreline development, Intracoastal Waterway.

Existing conditions and potentials were studied for utilization of the Indian River at Titusville. Policy recommendations were studied that can be used by the City of Titusville to avoid some of the problems of intensive urbanization now being faced by so many Florida communities. Because of the focus on future water use policies and plants, an additional emphasis has been placed on unique problems directly and indirectly related to the water area that result from interaction among man-made and natural factors. Previous studies, Phase I and Phase II, identified existing conditions and problems, presented and evaluated alternative plans for use of the shoreline, and summarized background information. The deposition of solid wastes and derelict vehicles should be prohibited within the River or along the shoreline. Surface drainage of stormwater is recommended to be directed inland to groundwater recharge areas, rather than permitted to flow to the River's edge. Sanitary sewage effluent should be prohibited from discharge into the Indian River, or, at least, deposited far out from the shoreline to enhance dispersion of contaminants throughout the receiving waters. Other recommendations include control of boating activities, dredging, aesthetically objectionable structures, utility lines, and the construction of bulkheads to retain fills along the shoreline. (Poertner)
W72-13167

FACTORS PERTINENT TO WATER QUALITY IN THE ALBUQUERQUE METROPOLITAN AREA,
Albuquerque Urban Observatory, N. Mex.
For primary bibliographic entry see Field 06D.
W72-13168

ENGINEERING CONCEPT EVALUATION PROGRAM FOR HIGH SEAS OIL SPILL RECOVERY,
Lockheed Missiles and Space Co., Sunnyvale, Calif. Ocean Systems Div.
B. Bruch, K. R. Maxwell, and H. G. Ulbrich.
Available from the National Technical Information Service as AD-725 883, $3.00 in paper copy, $0.95 in microfiche. U. S. Coast Guard, Office of Research and Development, Washington, D.C., December 1970. 194 p, 66 fig, 15 tab. DOT-CG-00595-A.

Descriptors: *Oil spills, *Model studies, *Oil pollution, *Water pollution control, Oceans, Ships, Harbors, Coasts, Coast Guard regulations, Transportation, Water pollution, Performance, Measurement, Testing.
Identifiers: *Oil recovery, *Tankers, Shipping.

Model tests and engineering studies were made of a proprietary Lockheed oil spill recovery device. The principal objective of the U. S. Coast Guard was to obtain parametric engineering evaluation information, performance characteristics, and scaling ratios for the oil recovery device. Oil recovery tests were conducted with four different size models in four test facilities, with four different oils and with emulsions of these oils, under forward way with and without waves. A method was established for estimating oil recovery. The primary factors affecting performance were: forward way or current, oil film thickness, support vessel response to waves, and oil viscosity and emulsification. Oil paraffin or asphalt content, oil specific gravity, and surface tension yielded small second-order effects. Sizing of the oil recovery device and extrapolation of oil recovery rates from existing test data can be accomplished using an idealized theory developed for static operation. The static theory was verified by 13 test results with 4 different size devices. It indicates that the oil recovery rate varies with the 5/2 power of the disc radius and with the 3/2 power of the disc rotational speed up to a maximum of 12 rpm. Oil recovery can be maximized by concentrating the slick to 1/3 in. The rate varies linearly with ingested slick thickness to below 0.005 in. Tests established that the device will recover 70 percent of any oil thickness encountered on a single pass. This can be increased by successive passes to 90 and 97 percent. However, if oversupplied, it will bypass the excess. (Poertner)
W72-13172

REGION NINE POLLUTION CONTINGENCY PLAN.

Available from the National Technical Information Service as PB-200 490, $3.00 in paper copy, $0.95 in microfiche. Commander, Twelfth Coast Guard District, San Francisco, California, December 1970. 384 p, 32 fig, 56 tab.

Descriptors: *Oil spills, *Oceans, *Oil pollution, *Water pollution control, *Hazards, *Planning, Ships, Harbors, Coast Guard regulations, Water pollution.
Identifiers: *Shipping, Emergency plan, Hazardous spills.

The Region Nine Contingency Plan, prepared within the framework of the National Multi-agency Oil and Hazardous Materials Pollution Contingency Plan, provides a mechanism for coordinating response to a spill of oil or other hazardous substances. This plan covers all the coastal waters of California, Hawaii, Guam, American Samoa, and the U. S. Trust Territories of the Pacific Islands. It supplements the National Oil and Hazardous Materials Polution Contingency Plan and provides for coordinated response by Federal agencies to polluting spills of oil and hazardous materials to minimize damages. It assigns responsibilities to the concerned Federal agencies; establishes a system of surveillance and notification; prescribes pollution cleanup and control procedures; designates regional response centers and on-scene commanders to coordinate and direct response operations; lists available response equipment and supplies; establishes a regional response team and other trained pollution response forces; and describes restrictions on use of dispersants and other chemicals. It also provides for coordination among Federal, state, local, and non-governmental response systems. Agencies and organizations participating in this plan include the following: departments of Defense, Interior, Transportation, and Health, Education and Welfare; Office of Emergency Preparedness; state governments of California and Hawaii; territories of Guam, American Samoa, and Trust Territories of the Pacific Islands; local governments and agencies; affiliate organizations of the American Petroleum Institute; and the Marine Oil and Hazardous Materials Spill Cleanup Contractors. (Poertner)
W72-13173

POTENTIAL FOR CONTROLLING QUALITY OF IRRIGATION RETURN FLOWS,
Robert S. Kerr Water Research Center, Ada, Okla.
J. P. Law, Jr., and G. V. Skogerboe.
Journal of Environmental Quality, Vol 1, No 2, p 140-145, April-June, 1972. 1 fig, 23 ref.

Descriptors: *Water quality control, *Irrigation efficiency, *Pollution abatement, Water conservation, Salinity, Nutrients, Pesticides, Soil erosion, *Return flow, Sediment transport.

Water quality problems associated with irrigation return flows are difficult to assess accurately and to control effectively. They include salinity increase, nutrient loss, sediment transport, and pesticide residue. The effects of these on the quality of receiving waters are discussed. Potential control measures that may prove effective in alleviating the detrimental effects of irrigation return flows are suggested. These may involve physical changes in the system, improvements in present management and cultural practices, or changes in the institutional influences upon the system. The potentials for improving the quality of return flows through changes in the water delivery system, farm water management practices, and water removal system are outlined and discussed. Research investigations will be required to further evaluate the effectiveness of many of the controls suggested. (EPA abstract)
W72-13179

WATER AND AIR QUALITY REPORTING ACT.
For primary bibliographic entry see Field 06E.
W72-13204

DEPARTMENT OF WATER AND AIR RESOURCES. ORGANIZATION AND POWERS; CONTROL OF POLLUTION. RIGHT OF WITHDRAWAL OF IMPOUNDED WATERS,
For primary bibliographic entry see Field 06E.
W72-13207

OFFSHORE DRILLING--THE COMING BATTLE,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-13209

LET STATES KEEP NO-DISCHARGE REGULATIONS FOR BOATS,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-13210

BOATING--WATER SANITATION.
For primary bibliographic entry see Field 06E.
W72-13212

POTOMAC RIVER-WASHINGTON METROPOLITAN REGION ENFORCEMENT CONFERENCE.

Potomac Basin Reporter, Vol. 28, Jul 1972. 4 p, 1 map, 1 tab.

Descriptors: *Potomac River, *Basins, *Projects, *Water quality control, Economics, Flow measurement, Federal government, State governments, Sediment control, Water management (Applied), Regional development, Interstate rivers, Information exchange projects, Project post-evaluation.

The Potomac Basin Reporter is published to interest citizens in the cause of a cleaner and more useful Potomac River and to provide for a public informed on problems and plans for development in the Basin. This special issue examines each of the topics the Environmental Protection Agency agendized for the June 20-21, 1972 meeting. It provides interpretation and background information on each item along with official conference recommendations. These topics include funding of the Blue Plains project, the Blue Plains Interim Treatment Program, the Piscataway problem, the Montgomery County facility, building bans, measurement of flows to the Blue Plains, allocation of waste loads, expansion of the conference area, Virginia waste water facilities, federal installations, the Metropolitan regional plan, and sediment control. (Widman-Florida)
W72-13213

RAT CONTROL IN THE SEWER NETWORK OF THE CITY OF MAGDEBURG,
Medizinische Akademie Magdeburg (East Germany).
W. Schuster, and R. Roeder.
Z Gesamte Hyg Grenzgeb. Vol 17, No 8, p 592-594. 1971. Illus.
Identifiers: *Pest control, City, Germany, Magdeburg (East Germany), *Rats, Sewerage, *Public health.

An experimental rat control method that permitted the formulation of recommendations for effective rat control is described. It is applicable to cities and villages with interconnecting sewer pipes, laid at an angle to collect water and having end shafts accessible through a sewer cover from the streets. The bait was specially manufactured in blocks with a hole through which the baits could be attached to an accessible place on the sewer stairs. Evidence of chewing on the bait was looked for. The bait blocks were protected from mold by incorporation of a fungicide. This made the blocks attractive to rats for longer periods. The main point was that the baits should be placed in high locations, where rats would tend to congregate to escape sudden rises in water levels during rainfalls, which would otherwise drown them.--Copyright 1972, Biological Abstracts, Inc.
W72-13216

UNITED STATES V. CROW, POPE AND LAND ENTERPRISES, INC. (DEFINITION OF NAVIGABILITY UNDER THE REFUSE ACT).
For primary bibliographic entry see Field 06E.
W72-13218

ENVIRONMENTAL PROTECTION AGENCY--GENERAL GRANT REGULATIONS AND PROCEDURES; STATE AND LOCAL ASSISTANCE.
For primary bibliographic entry see Field 06E.
W72-13219

MARINE SANITATION DEVICE STANDARD.
For primary bibliographic entry see Field 06E.
W72-13220

AN ACT...IN RELATION TO PROHIBITING INSURANCE COVERAGE AGAINST ENVIRONMENTAL POLLUTION.
For primary bibliographic entry see Field 06E.
W72-13221

AN ACT...IN RELATION TO REMOVAL OF ILLEGAL FILL IN PROTECTED WATERS.
For primary bibliographic entry see Field 06E.
W72-13222

PROPOSED BIG CYPRESS NATIONAL FRESH WATER RESERVE, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
National Park Service, Richmond, Va. Southeast Region.
For primary bibliographic entry see Field 06G.
W72-13224

ON BUYING CLEAN WATER--REFLECTIONS ON THE GEORGIA WATER POLLUTION CONTROLS,
K. L. Hirsch.
Mercer Law Review, Vol 23, No 2, p 603-631, 1972. 73 ref.

Descriptors: *Georgia, *Water quality control, *Pollutants, *Regulation, *Abatement, Standards, Administrative agencies, Adoption of practices, Legal aspects, Political aspects, Decision making, Water management (Applied), Water pollution control, Alternate planning, Water pollution sources, State governments.

The approach to water pollution control established by the Georgia Water Quality Control Act and the regulations promulgated by the Georgia Water Control Board are examined in the light of other available approaches. The factors which determine water quality, the interaction among the various types of pollutants, and the complexity of assessing and regulating point discharges in a waterway with many discharges are considered. The calculation of the impact of projected changes in effluent discharges on water quality can only be accomplished by sophisticated computer techniques. The various legal, political, and technical factors involved, and Georgia's water classification system are discussed. Of the many abatement measures available, Georgia adopted a uniform secondary treatment requirement, which was not the most efficient or equitable choice possible. (Widman-Florida)
W72-13226

GEORGIA'S ENVIRONMENTAL LAW: A SURVEY,
E. B. Benson, Jr.
Mercer Law Review, Vol 23, No 2, p 633-662, 1972. 169 ref.

Descriptors: *Georgia, *Legislation, *Environmental control, *Legal aspects, Air pollution, Water quality control, Marsh management, Mining, Waste disposal, Administrative agencies, Permits, Standards, Regulation, Interstate compacts, State governments, Groundwater, Solid wastes, Water resources development.

The Georgia General Assembly has established four general areas within which state agencies can operate to protect the environment: air quality, water quality, surface mining, and marshlands. The 1964 Air Quality Control Act was amended and broadened in 1971 and now contains specific civil sanctions, reasonable means of imposing these sanctions, and vehicular emission control. The Water Quality Control Act, enforced by the Water Quality Control Board, prohibits the utilization of any state waters for the disposal of any type waste. The Coastal Marshlands Protection Act of 1970 created the Coastal Marshlands Protection Agency and requires a permit for alteration of these lowlands. The surface Mining Act of 1968 provides for regulation of surface mining operations and facilitates reclamation of lands affected by such mining. The Interstate Environmental Compact and legislation considered during the 1972 General Assembly are discussed, including a governmental reorganization bill, the Ground Water Use Act of 1972, the Solid Waste Management Act, legislation for the protection of the Chattahoochee River, and various proposed amendments to existing legislation. (Widman-Florida)
W72-13227

WATER POLLUTION CONTROL LEGISLATION--1971 (H.R. 11896, H.R. 11895).
Hearings on H.R. 11896, H.R. 11895--Comm. on Public Works, House of Representatives, Ninety-second Congress, First Session, December 7, 8, 9, and 10, 1971. 972 p.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Water quality control, *Water pollution control, Water law, Water pollution, Legal aspects, Watercourses (Legal aspects), Navigable waters, Pollution abatement, Waste disposal, Industrial wastes, Municipal wastes, Administrative agencies, Federal government, State governments, Governmental interrelations, Regulation, Administration, Government finance, Costs, Cost sharing, Permits, Sewage disposal, Effluents, Rivers and Harbors Act.
Identifiers: Refuse Act.

Proposed amendments to the Federal Water Pollution Control Act would require no discharges of pollutants into navigable waters or best available technology by 1981, with a goal of no discharges by 1985. The zero discharge provision is the most contentious issue involved in the amendments. Witnesses for the administration contend that this would be too costly, that such a requirement demands too much of the Nation's productivity and capacities. Another criticism of the bill is that it fails to strike the proper balance between federal and state responsibilities. It is averred by some that the bill will provide a program so dominated by the federal government that the state role will be reduced to performing meaningless ministerial acts. A panel of environmentalists testified in favor of the bill on those two aspects. Other issues discussed include: the permit program, which would in effect continue the program initiated under the Refuse Act; the sufficiency of federal financial assistance to implement the goals of the bill; provisions for citizens suits; and water quality standards and their enforcement. Testimony is included from public officials, environmentalists and representatives of industry. (Brackins-Florida)
W72-13228

A CITIZEN'S ACTION HANDBOOK: THE REFUSE ACT PERMIT PROGRAM,
Natural Resources Defense Council, New York.
J. Tauber, R. Stover, and R. M. Hall.
Natural Resources Defense Council Project On Clean Water, January 1972. 190 p, 2 maps, 7 append.

Descriptors: *Rivers and Harbors Act, *Water pollution control, *Permits, *Administrative agencies, *Federal government, Water law, Legal aspects, Water pollution, Pollution abatement, Water quality control, Regulation, Administration, Waste disposal, Industrial wastes, Water quality standards, Federal Water Pollution Control Act, municipal wastes, Law enforcement, State governments, Navigable waters, Legislation, Control.
Identifiers: *Refuse Act.

The past record of the federal government in water pollution control indicates that the Refuse Act permit program will fall short of its potential unless citizen groups make sure government officials administer the program in the public interest. Hopefully new water pollution controls will be enacted shortly to replace the Refuse Act. There are opportunities for public comment and public hearings of both state and federal levels of the permit application process. This handbook details opportunities for citizen input during all stages of the application process. Initial federal process of permit applications is handled by the permit sections of the Corps of Engineers' district offices and the Environmental Protection Agency's regional offices. The Corps' role is largely administrative, while the EPA's role is to evaluate applications in regard to water quality impact. The state reviews the application to determine whether the discharge will violate its water quality standards. The Corps has full responsibility for the processing and final issuance of all permits; but it is required to recognize the EPA's expertise in water quality matters and to follow the EPA's recommendation to deny a permit. (Brackins-Florida)
W72-13229

OIL/WATER SEPARATION SYSTEM WITH SEA SKIMMER.
AiResearch Mfg. Co., Los Angeles, Calif.

Copy available from GPO Sup Doc EP2.10:15080DJP-10/70, $1.50; microfiche from NTIS as PB-211 604, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, October 1970. 187 p, 93 fig, 16 tab, 4 ref. EPA Program 15080 DJP 10/70.

Descriptors: *Centrifugation, *Oil wastes, *Oily water, *Secondary recovery (Oil), Oil water interfaces, Water pollution treatment, Pollution abatement, Performance, Skimming, Weirs, *Separation techniques.
Identifiers: *Sea skimmer, *Oil-water separation, Oil slicks, Oil spills.

An oil skimming and separation system capable of processing 30,000 gallons per hour, and operating on the open ocean under Sea State 3 conditions, was designed, constructed, and tested by the AiResearch Manufacturing Company. A 45 x 26-foot twin-hulled barge, which contained an entrance paddle wheel and self-adjusting skimming weirs, was built to support the skimming and separation equipment. A 500-gpm centrifuge developed during the program was used to reduce the oil content of the discharge water to less than 100 ppm. The recovered oil contained less than 5 percent water. The oil content of the discharge water could be reduced to less than 20 ppm by recycling it through the centrifuge a second time. The equipment was tested in natural and simulated oil slicks off the coast of Southern California under environmental conditons up to and including Sea State 3. Intentionally spilled oils of API 15, 26, and 35 gravities were recovered and separated, as were weathered oil slicks that resulted from natural under water seeps in the test area. The centrifuge was particularly useful in separating the mixtures of water and the higher API gravity oils. (Galwardi-Texas)
W72-13253

DESIGN OF PVC WATER-DISTRIBUTION PIPE,
Johns-Manville Research and Engineering Center, Manville, N.J. Fluids Handling Dept.
For primary bibliographic entry see Field 08A.
W72-13255

ON MARYLAND'S ENVIRONMENTAL SERVICE,
For primary bibliographic entry see Field 06E.
W72-13256

DRINKING WATER STANDARDS, 1961, US PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C.

Journal of the American Water Works Association, Vol 53, No 8, p 935-945, August 1961. 1 fig, 4 tab.

Descriptors: *Standards, Water properties, *Water quality control, *Potable water, Water management, Water analysis, Water supply systems, *Water treatment.
Identifiers: *Drinking water standards.

Guidelines for revising the USPHS 1946 Drinking Water Standards are described. Radioactivity, occurrence of chemical and toxic substances, the bacteriological quality, the physical characteristics, and the methods of analysis of the water supply were considered. Other guidelines were that the standards shall be generally acceptable and be applicable to all public water supplies in the United States. Also, limits shall be grounds for rejection of the supply and shall apply to the water at the free-flowing outlet of the consumer. The revised standards approved by the Secretary of Health, Education and Welfare are included. Approval of water supplies shall be dependent upon enforcement of rules and regulations, adequate protection of water quality, proper operation of the water supply system, adequate capacity to meet peak demands, and records of laboratory examinations. (Britton-AWWARF)
W72-13258

SAVE WATER: AIR CONDENSE STEAM,
Lummus Co., Bloomfield, N. J.
G. M. Black, and W. Schoonman.
Hydrocarbon Processing, p 101-103, October 1970. 3 fig, 2 tab.

Descriptors: *Heated water, *Condensers, *Cooling, Design criteria, Recycling, Industrial water.
Identifiers: Air cooling.

Aircoolers can be used effectively to combat the increasing shortage of cooling water. As competition for the available water increases, aircoolers will then be more widely used for the recovery of steam from power plants and turbine drives as well as for process cooling. The mechanical-draft, direct-condensing system is the most economical and best suited for steam capacities required by HPI plants. Turbine exhaust is distributed to the air-cooler condensing surface, the condensate drains through a manifold to the hotwell tank, then the water is pumped back into the boiler circuit. The vacuum obtained is a function of condenser duty, ambient air conditions and fan power. A figure is included to facilitate determination of performance at other than design conditions. Optimization of the plant steam cycle and operating economics in large part depends on sizing the condenser. Accurate design and performance predictions of air-cooled vacuum steam condensers can be made in a practical sense only by computer since the calculations are complicated and iterative. Freezing protection must be incorporated into the air-cooler design for installations in colder climates. (Eagle-Vanderbilt)
W72-13311

COOLING TOWER SITE CONSIDERATIONS,
Stone and Webster Engineering Corp., Boston, Mass.
D. R. DeHarpporte.
Power Engineering, Vol. 74, No. 8, p 49-51, August 1970. 3 fig.

Descriptors: *Cooling towers, *Sites, *Meteorology, Heated water, *Thermal pollution, Cooling, Winds, Topography, Humidity, On-site data collections.
Identifiers: Inversions.

Power plants cool heated water by exposure to a large amount of air per unit time (cooling towers), a large amount of air per unit volume of heated water by diluting it with a moderate sized body of water (cooling ponds), or an extremely large amount of air per volume of heated water (large lake or ocean site). With most methods heat is transferred through evaporation, resulting in a layer of fog. An especially dense fog is associated with cooling towers. Site selection is based on hydrometeorological criteria. The prevailing wind direction, topography, surrounding roads and cities and frequency of inversion are considered. A description of the method of inversion formation is included. A two phase meteorological site study is recommended. The first is an evaluation of available meteorological data with, possibly, a limited field study to rank the sites considered according to the effects of fogging on the environment. The second is a fully instrumented on-site study lasting at least one year. Wind, temperature and humidity data are measured and continuously recorded on a high tower and predictive estimates of the induced fog are made. (Eagle-Vanderbilt)
W72-13314

COLUMBIA RIVER THERMAL EFFECTS STUDY - VOLUME 2 - TEMPERATURE PREDICTION.
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 05B.
W72-13316

SHAPE FACTORS FOR COOLING LAKES,
Towne School of Civil and Mechanical Engineering, Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W72-13318

THE CONTROL OF RIVER HEATING BY ACCURATE DIGITAL SIMULATION,
Motor-Columbus Engineering Co., Baden (Switzerland).
P. Bogh, and H. Zund.
In: Proceedings of the Symposium on Environmental Aspects of Nuclear Power Stations, New York, New York, International Atomic Energy Agency, Vienna, ST1/PVB/261, p 615-624, January 1971. 4 fig, 4 ref.

Descriptors: *Computer models, *Rivers, *Water resources development, *Thermal pollution, Thermodynamics, Nuclear powerplants, Heated water.
Identifiers: *Aare River.

Swiss nuclear power plants depend heavily on river cooling. Thermal discharges from these plants cannot cause the undisturbed river temperature to rise above 3C at any place or time along the river after full discharge and river mixing. A Swiss computer program called THEDY was developed to simulate the thermodynamic behavior of rivers so that optimum siting and minimum cost determinations could be made for nuclear plants within the 3C limit. A description of the THEDY program is given. THEDY was applied to the Aare River and figures show how model predictions compare with actual data for the summer of 1969. Reasons are given for present model inadequacies and the need for further parameter corrections is stated. THEDY is believed to show that good digital simulation of thermodynamic river behavior is possible. (Bass-Vanderbilt)
W72-13322

ENERGY-ENVIRONMENT DILEMMA: SOLUTIONS SOUGHT.

Chemical and Engineering News, Vol 50, No 3, p 15, January 17, 1972. 1 photo.

Descriptors: *Electric powerplants, *Environment, Thermal pollution, Electric power, Locating.
Identifiers: Certification.

A report by the Committee on Power Plant Siting of the National Academy of Engineering is reviewed. It calls for major changes in society's handling of the power plant siting process, including better public understanding of the problems and a new certification system for power plants that takes into account all interests. The report recommends a substantially large, well-planned and coordinated R and D program covering the whole range of knowledge used in setting standards and in making engineering decisions to minimize impact on the environment. Relief of the conflict between the requirement for more electric power and the desire to preserve the environment will be costly and will not completely avoid damage to the environment. (Eagle-Vanderbilt)
W72-13323

UP COOLING TOWER CAPACITY WITHOUT ADDING NEW CELLS,
Phelps Engineering Co., Kentfield, Calif.
For primary bibliographic entry see Field 05D.
W72-13325

CONSERVATIONISTS WIN LAKE COOLING TOWER BATTLE.

Engineering News Record, p 11, March 25, 1971. 1 photo.

Descriptors: *Cooling towers, *Thermal pollution, *Nuclear powerplants, *Conservation, Permits, *Michigan, *Lake Michigan, Costs.

A country-wide thermal pollution standard may be planned as a result of a battle between conservationists and Consumers Power Co., owner of the 700,000 Kw Palisades nuclear powerplant at South Haven, Michigan. The battle started when the power company applied to the Federal Atomic Safety Licensing Board for a license to operate the plant. A group of Michigan conservation organizations, led by the Steelhead Fisherman's Association, intervened in the ASLB hearings and demanded that the plant be equipped with cooling equipment. Although they contend that the heated discharges are not damaging, the company has agreed to build cooling towers. The towers will cost more than $10 million initially plus about $3 million a year in operating expenses. (Eagle-Vanderbilt)
W72-13326

GUIDELINES FOR DISCHARGE WATERS ARE BEING STUDIED.
Electrical World, p 25, January 1, 1972.

Descriptors: *Florida, *Illinois, *Water quality standards, *Thermal pollution, Heated water, Temperature, Freshwater, Oceans, Nuclear powerplants, Utilities.

Two states have set up standards for the discharge of heated cooling water in the hope they will be made into guidelines by federal agencies. The intent of Illinois temperature regulations is to determine the natural 'highs' by month and to permit, in general, 5 F above these highs except when the resulting temperature would adversely affect aquatic life. The 1618 Mw Quad Cities nuclear plant under construction (jointly owned by Commonwealth Edison Co. and Iowa-Illinois Gas and Electric Co.) is greatly affected. Its license to operate even at 20-50% capacity is in jeopardy. The Florida standards would set specific limits on heated discharge depending on what type water it would be discharged into. There is a 90 F maximum limit and no allowance for a mixing zone, these standards are questioned by the state's utilities. (Eagle-Vanderbilt)
W72-13328

WASTE HEAT DISPOSAL IN POWER PLANTS,
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-13330

MANAGING THE POWER SUPPLY AND THE ENVIRONMENT.
For primary bibliographic entry see Field 06G.
W72-13332

THE EFFECT OF OIL SLICK DISPERSANT, ESSO COREXIT 7664 AND THE JOINT EFFECT WITH CRUDE OIL ON THE SURVIVAL OF MARINE GLASS FISH, AMBASSIS SP. AND PALAEMONID SHRIMPS
Ministry of Agriculture and Lands, Kuala Lumpur (Malaysia). Fisheries Div.
For primary bibliographic entry see Field 05C.
W72-13343

URBAN WASTES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Coll. of Agriculture and Environmental Science.
H. E. Besley, and C. H. Reed.
J Environ Qual. Vol 1, No 1, p 78-81. 1972. Illus.
Identifiers: *Municipal wastes, Waste disposal, *Agriculture.

A role for agriculture in the management of urban wastes is presented. The point of view is that of agricultural engineers who would endeavor to gainfully utilize all wastes as a conservation measure, giving particular attention to utilizing biodegradable solid wastes in the soil. Methods or techniques now widely used for the disposal of urban wastes are ocean dumping, land filling, incineration, composting, and reclamation and salvage. However, some restriction or even outright prohibition is being applied to several of these techniques. Therefore, in order to effectively manage urban solid wastes with the ultimate objective of maximum recovery of resources, it is considered essential that land utilization be added to the techniques presently used. Incorporation of wastes directly into the soil, and the equipment necessary to do this successfully are described.--Copyright 1972, Biological Abstracts, Inc.
W72-13396

ANIMAL WASTE MANAGEMENT: PROBLEMS AND GUIDELINES FOR SOLUTIONS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
R. C. Loehr.
J Environ Qual. Vol 1, No 1, p 71-78. 1972.
Identifiers: *Farm wastes, *Waste treatment, Water pollution control, Water pollution sources, Waste disposal.

Changes in animal production have occurred in response to the need for greater production efficiency and to the changes in per capita consumption. These changes include confinement feeding of livestock and increased animals per production unit. The accumulated wastes at these confined feeding operations have become point sources of potential pollution more amenable to both environmental complaints and regulation, and to better waste management and control. Solutions for satisfactory animal waste treatment and disposal will not be direct extensions of approaches that have been successful for industries and municipalities. Although no one treatment or disposal system will be the solution for all operations, there are a number of approaches that can minimize flagrant pollution problems. The most satisfactory solutions for animal wastes include some type of initial treatment followed by disposal on the land. Possible initial treatment methods include aerated liquid systems, natural drying systems, runoff control measures, and waste holding units. For over-all animal waste management, all aspects of the production scheme should be evaluated for interactions and tradeoffs so that an acceptable environment for the public and an adequate profit for the producers can be obtained. Interdisciplinary approaches are required for successful methods of animal waste management. Feasible technical and interdisciplinary approaches that may be desirable are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-13424

CHEMICAL CONTROL OF CATTAIL, TYPHA LATIFOLIA,
Alberta Univ., Edmonton. Dept. of Plant Science.
For primary bibliographic entry see Field 04A.
W72-13431

FORECASTING THE EFFECTS OF POLLUTING DISCHARGES ON NATURAL WATERS - II, ESTUARIES AND COASTAL WATERS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-13437

THE ROLE PLAYED BY THE FISHERIES RESEARCH BOARD OF CANADA IN THE 'RED' HERRING PHOSPHORUS POLLUTION CRISIS IN PLACENTIA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05C.
W72-13439

EFFECT OF PESTICIDE CHEMICALS ON MARINE ORGANISMS,
Stanford Univ., Pacific Grove. Hopkins Marine Station.
For primary bibliographic entry see Field 05C.
W72-13441

HAWAII'S SUGAR INDUSTRY FACES TOUGH PROBLEMS.
For primary bibliographic entry see Field 05B.
W72-13451

THERMAL POLLUTION IN UNCHARTED WATERS.
For primary bibliographic entry see Field 05C.
W72-13452

OIL POLLUTION - CAUSES AND CURES,
International Tanker Owners Pollution Federation Ltd., London (England).
For primary bibliographic entry see Field 05B.
W72-13484

METERING SYSTEM TAKES THE WASTE OUT OF SEWAGE COSTS,
Westinghouse Electric Corp., Pittsburgh, Pa.
E. C. Tanner.
Plant Engineering, Vol 25, p 100-101, June 10, 1971. 1 fig.

Descriptors: *Sewage effluents, *Costs, *Flow measurement, Water costs, Pennsylvania, Water pollution control.
Identifiers: *Metering system, *Sewer charges, *Pittsburgh.

The metering system installed at the Westinghouse Research and Development Center in Pittsburgh, Pennsylvania which provided an accurate measure of sewage flow was described. The system involved metering incoming water and all water usage which did not go to sewer lines. In less than 2 years of operation, savings in sewer charges of over 30 percent per year have been realized. (Galwardi-Texas)
W72-13496

POLLUTION IN AREAS NEAR THE POMPANO BEACH SEWAGE OUTFALL,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W72-13504

APPARATUS FOR CONFINING FLOATING MATERIALS,
E. E. Headrick.
U. S. Patent No. 3,662,891, 3 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 898, No 3, p 871, May 16, 1972.

Descriptors: *Patents, *Oil pollution, *Oil spills, Pollution abatement, Equipment, Water pollution, Water pollution treatment, Flotsom, Liquid wastes.
Identifiers: *Booms.

A V-shaped boom is formed from a cluster of parallel elongated air and water tubes. They are flexible and insensitive to wave action. The arms lock the boom to the surface of the water preventing oil from being spilled over. A harness arrangement between the two arms has an intersecting pattern of cables crisscrossed between the arms. Wave attenuators at the apex of the V are disposed parallel to a line bisecting the boom angle to reduce the trochoidal velocity of waves. A controllable gate serves as a link between the boom and an oil collection container. The gate skims the oil and moves it into the container. (Sinha-OEIS)
W72-13522

ADJUSTABLE PONTOONS FOR AERATOR PLATFORM,
For primary bibliographic entry see Field 05D.
W72-13537

WORLD AND WATER IMPERATIVES: WORLD CITY OF THE FUTURE,
Doxiadis Associates, Athens (Greece).
C. A. Doxiadis.
Journal of the American Water Works Association, Vol. 62, No. 12, p 740-747, December 1970. 11 ref.

Descriptors: *City planning, *Water quality, *Water supply, *Water conservation, Pollution abatement, Research and development, Technology, Economics.
Identifiers: *Policy making, Water cycle.

To the many traditional problems which exist in the relationship between man and water should be added the new problems of pollution on a large scale. The most probable future for human settlements is one of a larger increase of population and energy per capita in the urban areas. In order to provide the quantity and quality of water needed for development, man must change his policies and programs. The quantity of water which is needed in relation to that which is possible to control and make available through the annual water cycle must be ascertained. A new conception of the water cycle is necessary, based not only on precipitation but on additional water which will be kept outside of the system of precipitation to be used for human purposes only. Water consciousness is a first need. A type of city design will emerge from this consciousness which will be oriented towards the preservation of water. Research is needed to increase knowledge, to predict the future, and to develop simulation models for the reestablishment of a better economic balance in the system of man, water and land. The creation of technologies on a simplified pattern is demanded. Many areas of the world can be saved by the use of the knowledge and the technologies which exist. Man should develop an attitude with which to look at the urgent problems of water resource development that will account for the overall problem of the evolution of man as a part of the biological system developed by nature on earth. (Strachan-Chicago)
W72-13549

WATER-CAPACITY PLANNING FOR METROPOLITAN AREAS - THE CASE OF MONROE COUNTY, N.Y.,
Rochester Univ., N.Y. Center for Naval Analyses.
For primary bibliographic entry see Field 03D.
W72-13550

THE TRUE COST OF WATER,
For primary bibliographic entry see Field 06C.
W72-13552

CRISIS IN MUNICIPAL WATER SUPPLIES,
Taylor and Smith, San Bernardino, Calif.
For primary bibliographic entry see Field 03D.
W72-13553

COMMITTEE REPORT: JOINT ADMINISTRATION WATER/WASTEWATER WORKS.
American Waterworks Association, New York. Committee for Water and Wastewater Operations.

Journal of the American Water Works Association, Vol. 63, No. 4, April 1971, p 199-202. 3 photo, 2 tab.

Descriptors: *Administration, *Water works, Waste water treatment, Rates, Political aspects, Financing, Decision making, Planning, Water treatment.
Identifiers: *Joint administration.

The joint administration of water and sewage facilities is discussed. The report is compared to a similar study made in June 1959. A questionnaire was mailed to 2,472 cities and water districts with a population of more than 10,000 with a 44% response. Trends and general opinions that may be a guide to avenues of investigation are presented. The feelings for some sort of joint administration, as expressed in 1959, prevail today. Difficulties within this system were identified as: maintenance of the separate identity of each service with particular concern that each service identify its own costs and respectively set its charges; and political hinderance of appreciable organizational changes. The most significant trends are: (1) the number and percentage of water and sewerage systems under joint administration are increasing, (2) the number and percentage of complete sewerage systems under joint administration are increasing, and (3) the number and percentage of cities utilizing the service charge for financing operations is increasing. The results are recommended as a basis on which to make the decision to choose joint or separate administration. (Strachan-Chicago)
W72-13554

POPULATION GROWTH AND NONINDUSTRIAL WATER POLLUTION,
C. H. Weidner.
In: Environmental Side Effects of Rising Industrial Output, Chapter 4, p 85-110, Heath Lexington Books, D.C. Heath and Co., Lexington, Massachusetts. 1970. 1 fig, 5 tab, 34 ref.

Descriptors: *Municipal wastes, Domestic wastes, *Sewage, Population, Technology, Sewage treatment, Demand, Feasibility, Cost-benefit analysis, Water utilization, *Water pollution control.
Identifiers: *Nonindustrial water pollution.

The principal component of nonindustrial water pollution is mass sanitary sewage disposal. Since the amount of sanitary sewage created is directly proportional to the urban population, the amount of potential water pollution should increase substantially in future years. Projections indicate that the 1980 urban population will be 47 percent greater than the 1960 urban population, while the 2000 urban population will be 114 percent greater than that of 1960. However, treatment technology is now more than adequate to treat sewage to whatever degree is desired. Unfortunately, high levels of treatment are very costly. Consequently, the future purity of our water will depend on the amount of concern the nation has for the pollution problem. If the present high level of public concern continues, our waterways should, in the future, be superior to their present condition, regardless of population increases. One reason public concern may remain at a high level is that water pollution has deleterious effects on many of water's uses, including recreation, agricultural reuse, industrial reuse, public water supply, and fishing. Consequently, the high costs of treatment may be more than offset by the benefits accruing to the users of clean water. (Settle-Wisconsin)
W72-13558

PRICING POLLUTION AND OTHER NEGATIVE EXTERNALITIES,
Ohio State Univ., Columbus. Dept. of Economics.
R. A. Tybout.
The Bell Journal of Economics and Management Science, Vol 3, No 1, p 252-266, Spring, 1972. 3 fig, 2 tab, 15 ref.

Descriptors: *Pollutants, *Compensation, *Legal aspects, Water pollution, Mathematical models, Optimization.
Identifiers: *Externalities, *Coase Theorem, Bribery, Legal responsibility.

The 'Coase Theorem' asserts that legal responsibility can be assigned to either the pollution originators or to those damaged without affecting the allocation of resources. Either way, it is held, the parties could negotiate a monetary settlement that would lead to identical waste output in the absence of transactions costs. However, the Coase Theorem breaks down in many circumstances. Consequently, the transaction for internalizing a negative externality such as upstream water pollution cannot, in general, run either way. Viable market operation requires that an internalizing payment must in general take the form of compensation running from the polluter to the damaged party. The model used in the analysis is the conventional one with two goods, two factors, two firms, and linearly homogeneous production functions. Prices are viewed parametricllly by all parties, and the second-order conditions are those required for quasi-concavity. Under the constant returns to scale assumption, compensation leads to exhaustion of product whereas bribery does not. Only certain selected production functions can lead to positive aggregate profits in a bribe-paying industry. Related issues of the blackmail problem, third-party pricing, and public goods aspects are also analyzed. (Settle-Wisconsin)
W72-13559

COSTS AND QUALITY OF WATER IN OHIO CITIES,
Ohio State Univ., Columbus; Ohio Agricultural Research and Development Center, Columbus; and Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
M. H. Cosgrove, and L. J. Hushak.
Ohio Agricultural Experiment Station, Research Bulletin No 1052, April 1972. 16 p, 10 tab, 10 ref.

Descriptors: *Water supply, *Costs, *Regression analysis, *Municipal water, Estimated costs, Economies of scale, Operating costs, Fixed costs, Average costs, *Ohio, Water Pollution Control.
Identifiers: *Water systems, Cost functions, Cost parameters.

Cost functions for public water systems in Ohio cities are estimated. The general cost function used in the analysis posits total costs (capital and/or operating and maintenance costs) as a function of (1) output variables including quantity and quality characteristics, (2) water input variables, (3) treatment variables, and (4) input prices and other factors affecting costs. The cost parameters were estimated by ordinary least squares with operating and maintenance cost data from 79 Ohio cities. The estimates suggest that the marginal costs of water flow decline with increasing system size. However, the rate of decline is probably too small to make consolidation of water systems attractive unless the size of the consolidated system is several times as large as the individual systems. Furthermore, the estimated average cost equations indicate a large fixed component of operating expenses, thus making consolidation even more attractive for small systems. When the data is separated by source of water, a difference arises between the surface and ground water cost equations. However, this difference may be due either to specification problems from the data or to differences in the cost structures. (Settle-Wisconsin)
W72-13561

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Developmen t Advisory Service.
For primary bibliographic entry see Field 06B.
W72-13562

INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS, UNITED STATES.
National Air Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 06B.
W72-13563

PROBLEMS AND INSTRUMENTS RELATING TO THE ALLOCATION OF ENVIRONMENTAL COSTS.
Organization for Economic Co-operation and Development, Paris (France).

Organization for Economic Co-operation and Development, Paris, June, 1972. 33 p, 2 fig.

Descriptors: *Pollutants, *Environmental effects, *Costs, Pollution taxes (Charges), Taxes, Standards.
Identifiers: *Externalities, *Internalization, Subsidies, Economic theory, Applications.

The analysis of the principal methods of allocating environmental costs is divided into two main parts: (1) an overall analysis of the general problem of cost allocation, and (2) actual applications. THE FIRST SECTION IS SUBDIVIDED INTO (1) a statement of the problem, and (2) an economic analysis of the problem of cost allocation. The basic problem is one of internalizing environmental affects in economic mechanisms in order to ensure a rational allocation of costs. The basic instruments for solving this problem are compulsory standards, taxes, and subsidies. Concrete examples of how these instruments may be used are given in the second major section. The following three examples are discussed: (1) the French experience with allocating water resources by levying charges, (2) the Japanese experience with controlling air pollution through standards and tax abatements, and (3) the German experience with controlling the disposal of used oils through a tax-subsidy scheme. Pollution charges appear to satisfy the two-fold criteria of efficiency and equity in allocating water resources. Tax abatements, while probably helpful as a temporary measure, appear less efficient and equitable than pollution charges. (Settle-Wisconsin)
W72-13564

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

AN ALGORITHM FOR OBTAINING OPTIMAL LOOPED PIPE DISTRIBUTION NETWORKS,
Parsons, Brinckerhoff, Quade and Douglas, New York. Water Resources Systems Group.
For primary bibliographic entry see Field 08A.
W72-13042

THE OAP REGIONAL ECONOMIC MODEL UTILIZATION. PHASE I. VOLUME I. SIMULATION AND ANALYSIS,
Consad Research Corp., Pittsburgh, Pa.
T. R. Lakshmanan, F. Lo, and R. Byrne.
Available from the National Technical Information Service as PB-207 319, $3.00 in paper copy, $0.95 in microfiche. Environmental Protection Agency, Research Triangle Park, North Carolina, Office of Air Programs, APTD-0946, January, 1972. 142 p, 17 fig, 30 tab, 4 append.

Descriptors: *Economic prediction, *Economics, *Air pollution, *Abatement, *Model studies, Regional economics, Economic impact, Estimated costs, Industries, Regressive taxes, Cost sharing, Benefits, Legislation, Computer programs, Bibliographies, Cost sharing, Water pollution control, Costs, Waste disposal, Solid wastes, Income, Industrial wastes, Administration, Water quality.
Identifiers: *Regional economic model, *Air pollution control, Incentives, Implemental strategies.

A regional economic model for assessment of the effects of air pollution abatement was demonstrated; it describes the economic system-wide effects of specific air pollution strategies in 91 regional metropolitan areas of the U.S. by encompassing (1) implementation strategies, (2) control costs and economic projections, (3) economic effects of selected strategies, (4) application to water pollution and solid waste disposal. A regional labor market block specifies employment, unemployment, and labor force equations, and describes the regional electricity and fuel demand patterns. The regional economics of different Air Quality Control Regions (AQCRs) respond to alternative implementation strategies with considerable sensitivity, as seen from five variables selected for analysis: manufacturing production (value-added), manufacturing investment, regional personal income, regional unemployment ratio, and regional government revenue. For example, increment in unemployment aggregated over the 91 AQCRs varies from 0.51% to 0.18%. Cost-sharing by the government is more effective than a two-year extension to the regional economy, e.g., the number of AQCRs which will face 0.5% or more increment in unemployment rate will drop from 32 to 20 AQCRs with a two-year extension from 1975 to 1977 while with 59% additional government financial assistance to the control cost the number will drop to 6 AQCRs. (Auen-Wisconsin)
W72-13072

IMPACT OF THE DECLINING WATER SUPPLY ON THE ECONOMY OF CURRY AND ROOSEVELT COUNTIES,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 04B.
W72-13078

A MODEL FOR OPTIMAL SALMON MANAGEMENT,
Washington Univ., Seattle. Fisheries Research Inst.
D. E. Booth.
Fishery Bulletin, Vol 70, No 2, p 497-506, April, 1972. 1 fig, 4 ref, 1 append.

Descriptors: *Salmon, *Fisheries, *Fish management, Profit, Sustained yield, Mathematical models, Theoretical analysis, Optimization.
Identifiers: *Discrete time model.

A discrete time profit maximizing model based on currently accepted views of biological spawner-return relationships for salmon is developed. The model's assumptions include (1) a linear homogeneous aggregate production function, (2) a spawner-return relationship exhibiting the usual properties of fishery recruitment functions, and (3) constant prices in all time periods. The objective function is the present worth of industry profits. First-order conditions indicate that the level of escapement should be selected in time period zero such that the incremental profitability of an additional fish caught today is just equal to the present value of the profitability of the future return resulting from an incremental spawner. There is no reason to anticipate in this model that

he initial run size will be at the desired level for a profit-maximizing equilibrium solution, and to each the desired level may be costly. This analysis, however, ignores the question of optimal policy for reaching the equilibrium solution. Also, here is no reason to anticipate that the equilibrium olution will correspond to maximum sustained ield. (Settle-Wisconsin)
W72-13080

A GENERAL MODEL FOR EVALUATING AGRICULTURAL FLOOD PLAINS,
Texas A and M Univ., College Station; and Oklahoma State Univ., Stillwater.
R. D. Lacewell, and V. R. Eidman.
American Journal of Agricultural Economics, Vol 54, No 1, p 92-101, February, 1972. 4 tab, 13 ref.

Descriptors: *Floods, *Flood plains, *Mathematical models, *Evaluation, Optimization, Land use, Agriculture, Flood plain insurance.
Identifiers: *Flood damage estimating.

A model is developed that can be used to estimate flood damages by small tract for flood plains devoted to agricultural uses. The model uses the basic mechanics of the frequency method of flood damage estimation. However, computation of flood damages is based on a point sample method rather than the commonly used composite acre technique. The computational procedure uses data presently available in flood damage studies. An application of the model to the Nuyaka Creek flood plain in eastern Oklahoma illustrates that the disaggregated damage estimates, which the model employs, can be used to establish (1) more equitable assessments of the local costs of flood protection, (2) annual premiums for flood insurance, and (3) cropping patterns having the greatest return. Furthermore, this application indicates that the increase in expected net returns for appropriate land use changes exceeds the benefits of flood protection. Two criticisms of this model are evident. First, it considers only agricultural production; flood damages to buildings, fences, roads, and other improvements are not included. Second, land is the only resource constraint considered by the model in selecting optimum land use. (Settle-Wisconsin)
W72-13081

EXTERNALITIES AND THE BASIC THEOREMS OF WELFARE ECONOMICS,
Keio Univ., Tokyo (Japan). Dept. of Economics.
H. Osana.
Journal of Economic Theory, Vol 5, No 3, p 401-414, June, 1972. 7 ref.

Descriptors: *Theoretical analysis, *Welfare Economics), *Mathematical models, Economics, Optimization.
Identifiers: *Competitive equilibrium, *Pareto optimum, *Externalities, Microeconomic theory.

The two basic theorems of welfare economics are shown to be valid under conditions characterized by a certain set of externalities. The first theorem, which asserts that a competitive equilibrium is Pareto optimal, requires strong conditions excluding almost completely the external effects in preference relations. This requirement suggests that the externalities in preference relations are great obstacles for a competitive process to achieve an optimal resource allocation. Technological externalities have less serious implications. If each economic agent thinks he can always do whatever is actually possible for him in attainable states, then a competitive equilibrium without externalities in preference relations is an optimum. The second theorem, which asserts that an optimum can be supported by a competitive price system with the appropriate redistribution of purchasing power, does not necessitate the absence of externalities in preference relations. It requires only the convexity of agents' judgments and the fair limitedness of information. This latter requirement says that the set of initial resources which agents think necessary to achieve a unanimously better state is included in the set of those which are actually necessary for such achievement. (Settle-Wisconsin)
W72-13082

ENVIRONMENTAL REPERCUSSIONS AND TRADE THEORY,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05G.
W72-13093

OPTIMIZATION MODEL FOR CHURCHILL RIVER DIVERSION,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 04A.
W72-13134

MATHEMATICAL MODEL FOR RATE STUDIES,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-13135

AN APPLICATION OF NETWORK THEORY TO WATER MANAGEMENT IN POULTRY PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W72-13137

AN 'OPTIMIZED MODULE' APPROACH TO WASTE WATER RECLAMATION DESIGN,
Kennedy Engineers, San Francisco, Calif.
For primary bibliographic entry see Field 05D.
W72-13138

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 04A.
W72-13139

THE CHESAPEAKE BAY, REPORT OF A RESEARCH PLANNING STUDY,
Johns Hopkins Univ., Baltimore, Md.; Maryland Univ., College Park; and Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 06G.
W72-13165

SHIFTING LAND AND WATER USE IN THE BITTERROOT VALLEY, MONTANA,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W72-13307

STREAMFLOW REGULATION BY ARTIFICIAL RECHARGE FED FROM UPSTREAM SURFACE STORAGE: DERIVATION OF CONTROL RULES,
Water Research Association, Marlow (England).
T. Wyatt, D. G. Thorn, and P. A. Mawer.
AIHS--IASH (International Association of Scientific Hydrology) International Symposium on Mathematical Models in Hydrology, Warsaw, Poland, July, 1971. 16 p, 7 fig, 4 ref.

Descriptors: *Dynamic programming, *Artificial recharge, *Streamflow, Regulation, Storage, Surface water, Groundwater, Aquifers, Constraints, Systems analysis, Mathematical models, Optimization, Simulation.
Identifiers: *Direct search methods, *Upstream surface storage, *Control rules.

Presented are two alternative methods of finding control rules for regulating streamflow using an on-channel surface store conjunctively with abstraction from and artificial recharge to an aquifer. The methodologies are based on dynamic programming and direct search methods. This study presents an example of the special case of regulation of a common streamflow by combined surface storage and artificial groundwater recharge, where the surface storage (on-channel) is upstream of the point of recharge abstractions. Upstream surface/downstream aquifer storage implies the need for operating rules to determine under what conditions it is necessary to abstract water from the aquifer to avoid excessive depletion of the surface store, and under what conditions it is necessary to recharge water to the aquifer to avoid its excessive depletion. Subject to these constraints, the objective is to minimize use of the aquifer, given that the operating costs of recharge/abstraction are higher than the costs of direct releases from the surface store. (Bell-Cornell)
W72-13356

INTERACTIVE COMPUTING IN WATER QUALITY MANAGEMENT,
Wisconsin Univ., Madison. Water Resources Center.
A. G. Merten, and C. H. Falkner.
Journal Water Pollution Control Federation, Vol 44, No 8, August, 1972. 11 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Water quality, *Waste water (Pollution), *Waste water treatment, *Computer programs, Optimization, Algorithms, Mathematical models, Systems analysis, River flow, Temperature, Dissolved oxygen.
Identifiers: *Waste reduction.

An interactive computer program is described that is designed to generate solutions to the problem of determining the reduction in organic discharges to a river required at specified waste sources so that minimum dissolved oxygen levels are maintained. This interactive approach provides a method for investigating the stochastic nature of the problem, yields the problem solver much flexibility in performing sensitivity analyses on the solutions, and helps him gain insight into the role played by the individual waste sources and control points at which the quality of the river is measured. The program consists of over 20 commands which the problem solver can execute from a teletype to generate, test, compare, and store waste reduction solutions. The algorithm commands are used to find and modify solutions to specific constrained optimization problems which are described herein. (Bell-Cornell)
W72-13357

A STORAGE MODEL IN WHICH THE NET GROWTH-RATE IS A MARKOV CHAIN,
Michigan State Univ., East Lansing. Dept. of Statistics, and Probability.
P. J. Brockwell.
Journal of Applied Probability, Vol 9, No 1, p 129-139, March, 1972. 11 p, 14 ref.

Descriptors: *Markov processes, *Water storage, *Growth rates, Dams, Systems analysis, Mathematical models, Algorithms, Equations.

The distribution of the times to first emptiness and first overflow, together with the limiting distribution of content are determined for a dam of finite capacity. It is assumed that the rate of change of the level of the dam is a continuous-time Markov chain with finite state-space (suitably modified when the dam is full or empty). These methods used herein can also be applied to the case where the input data minus the demand rate takes constant values over time intervals which are indepen-

dently distributed with gamma distributions, provided the transitions from one rate to the next are governed by a Markov transition matrix. (Bell-Cornell)
W72-13358

A LINEAR PROGRAMMING FORMULATION OF A WATER SUPPLY PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
K. E. Case, and J. A. White.
American Institute of Industrial Engineers, Vol. 4, No. 2, p 85-91, June 1972. 2 fig, 3 tab, 12 ref.

Descriptors: *Linear programming, *Water distribution, *Planning, Water supply, Water demand, Flow rates, Pressure, Pipes, Size, Head loss, Systems analysis, Mathematical models, Valves.
Identifiers: *Friction losses.

Presented is the problem of determining the minimum cost distribution system for supplying water to several demand centers having demand patterns which change over time. The objective is to minimize the present worth cost of the system, while maintaining flow rates at specified pressure and static heads at each demand center. The costs of the system are taken to be functions of the lengths of alternative pipe sizes used, as well as the friction losses produced by the flow of water. Linear programming is employed to determine the optimal lengths of each of the available pipe diameters and the magnitude of optimally inserted head loss required for equilibrium, using valves. The example problem is solved. (Bell-Cornell)
W72-13359

SOLUTION OF A WATER RESOURCES PROBLEM WITH ECONOMIES OF SCALE BY LINEAR PROGRAMMING,
Texas Water Development Board, Austin. Systems Engineering Div.
D. Salcedo, and A. O. Weiss.
Water Resources Bulletin, American Water Resources Association, Vol. 8, No. 3, p 546-552, June 1972. 9 fig, 2 tab, 2 ref.

Descriptors: *Linear programming, *Economies of scale, Optimization, Water resources, Planning, Computers, Algorithms, Mathematical models, Systems analysis, Water supply, Water demand.

Linear programming has gained wide acceptance with water resource planners because of its effectiveness and ease in use. While in certain cases integer or nonlinear techniques may appear better in terms of the final answer, linear programming generally proves to give accurate solutions while definitely being more workable. A method of using linear programming is presented for solving problems involving significant economies of scale. The specific problem, to which the method is applied, is structured to maximize net benefits derived from providing a water supply to a demand area, by building and operating a system of facilities where: (1) inflow can occur to each of the reservoirs; (2) there is a single import source; (3) operating costs are a linear function of quantity pumped; (4) returns are represented as negative operating costs in the final supply canal; (5) construction costs are a linear function of size except for a single canal facility; and (6) operating costs, as well as returns, are discounted and accumulated over the economic life of the project. (Bell-Cornell)
W72-13360

COMPUTER TECHNIQUES FOR WATER-DISTRIBUTION ANALYSIS,
Becher-Hoppe Engineers, Inc., Schofield, Wis.
A. E. Becher, Jr., G. J. Bizjak, and J. W. Schulz.
Journal American Water Works Association, Vol. 64, No. 7, p 410-417, July 1972. 1 fig, 4 tab, 15 ref.

Descriptors: *Water distribution (Applied), *Computer programs, *Analog computers, *Digital computers, Pipes, Networks, Systems analysis, Mathematical models.
Identifiers: *Distribution networks.

The state of the art in computing network performance is reviewed. Economic and technical comparisons are made of digital and analog computers, and detailed descriptions of their operational characteristics are given, in relation to the application of modern techniques and equipment to the analysis of pipe networks for water distribution systems. The problem of accurately analyzing the behavior of distribution networks is common to both the design of new water systems and the operation and rehabilitation of old ones. With today's high construction costs and the long-lasting character of available materials, it behooves designers to make accurate determination of required component sizes. It is concluded that use of the digital computer appears usually to be the most preferable from cost standpoint. Regardless of the selection of specific equipment or program, however, it is apparent that computer techniques offer the designer an essential tool in the planning of efficient, economical distribution systems. (Bell-Cornell)
W72-13361

6B. Evaluation Process

WATER RESOURCES MANAGEMENT: A CRITIQUE,
Ohio Dept. of Public Health and Welfare, Cleveland. Div. of Environmental Health.
B. Walker, Jr.
Am J Public Health. Vol 61, No 12, p 2354-2361. 1971.
Identifiers: Critique, *Management, *Water resources, Reviews, Federal government, State governments, Local governments.

A review of developments in the management of water resources in terms of administration, technical methods and financing is given. Federal, state and local levels are considered.--Copyright 1972, Biological Abstracts, Inc.
W72-13066

THE OAP REGIONAL ECONOMIC MODEL UTILIZATION. PHASE I. VOLUME I. SIMULATION AND ANALYSIS,
Consad Research Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 06A.
W72-13072

ECONOMICS OF WATER RESOURCES PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James, and R. R. Lee.
McGraw-Hill Book Company, New York, N.Y., 1971. 615 p, 3 append.

Descriptors: *Water resources, *Planning, *Economics, Resource allocation, Optimization.
Identifiers: *Project purposes, *Project feasibility, Multiple-purpose projects, Financial analysis.

Six major aspects of water resource economics are considered: (1) engineering economy, (2) microeconomics and efficient resource allocation, (3) planning in a real world setting, (4) economic planning by project purpose, (5) multipurpose water resources development, and (6) financial analysis. Under these general headings many particular topics are discussed. The principles of engineering economics and the basic mathematics of economic analysis are developed in the engineering economy section. In the microeconomics section, the simple analytics of microeconomics is developed and applied to the question of project optimality in particular and welfare economics in general. Various aspects of discounting are also considered. Benefit-cost analysis and the dynamics of project analysis are developed as part of the general planning problem. Particular planning problems considered are those associated with project purposes such as flood control, drainage, water supply, hydroelectric power, navigation, water quality control, recreation, and fish and wildlife enhancement. Various optimization techniques for solving the problems posed by multipurpose projects are outlined, and their implementation in a planning framework discussed. Finally, methods for assessing a project's financial feasibility, allocating costs among various project purposes, and pricing water resources are discussed. (Settle-Wisconsin)
W72-13073

FLOOD DAMAGE PREVENTION POLICIES,
Chicago Univ., Ill. Dept. of Geography.
For primary bibliographic entry see Field 04A.
W72-13074

AGRISYSTEMS AND ECOCULTURES, OR: CAN ECONOMICS INTERNALIZE AGRICULTURE'S ENVIRONMENTAL EXTERNALITIES,
Population Reference Bureau, Inc., Washington, D.C.
M. F. Brewer.
American Journal of Agricultural Economics, Vol 53, No 5, p 848-865, December, 1971. 1 tab, 4 ref.

Descriptors: Agriculture, Environmental effects, Forecasting, Demand, Supply, Prices, Management, Economic efficiency.
Identifiers: *Environmental quality.

The agricultural sector will face several problems in the coming decade. Trends evident in the production of food and fiber are (1) a movement to more extensive agriculture in an effort to reduce environmentally damaging capital inputs, (2) a continuing growth in agricultural export demand, (3) a possible shift toward a more vegetarian diet, and (4) increases in the number and importance of suburban area 'pick-it-yourself' farms. In a more general setting, there will be continued growth in several competing industries for what traditionally have been agricultural resources. For instance, increases in population, per capita income, mobility, and leisure time will significantly increase the land needed for recreational uses. Problems with which agricultural economists will have to contend include (1) how agricultural activities affect environmental quality, (2) determining the nature of demand functions for rural amenities, (3) developing production and cost functions for various types of agriculturally-related public services and their distribution, and (4) assessing agriculture's future needs for capital. Nine discussants analyze the paper's contributions. They point out, for example, that we also need more social knowledge concerning pollution problems and that more attention needs to be given to selection of correct policies. (Settle-Wisconsin)
W72-13075

THE PROFIT IN POLLUTION,
D. Thomas.
Management Today, p 70-78, 132, May, 1972. 5 fig.

Descriptors: *Pollution abatement, *Industrial wastes, *Profit, Legislation, Environmental effects.
Identifiers: England.

The experience of several British firms suggests that the prospects for the pollution control industry, while good, do not appear to be highly profitable. While recent legislation has no doubt increased the demand for pollution abatement services, rising costs will keep profits from increasing considerably. The pollution abatement industry is rapidly becoming capital-intensive, particularly in

the treatment and disposal of industrial effluent. Thus, it is unlikely that new entrants into the industry will succeed without the backing of larger, financially powerful firms. Even the scrap industry is tending toward capital-intensive operations, thus making it more difficult for new firms to profitably enter the industry. The rising costs of pollution control will be met by the larger businesses. However, it is the legions of medium-sized and small companies with their characteristically smaller profit margins that will be most affected by these cost increases. The capital costs of installing adequate control equipment may be punitive for them. Yet, the fines and prospects of imprisonment offer no better alternative. Some British industrialists are hopeful, nonetheless, that the pollution abatement industry can avoid pricing itself out of the range of the smaller firms. (Settle-Wisconsin)
W72-13076

PROJECT SELECTION AND MACROECONOMIC OBJECTIVES: A METHODOLOGY APPLIED TO PERUVIAN IRRIGATION PROJECTS,
Georgetown Univ., Washington, D.C. Dept. of Economics; and Iowa State Univ., Ames. Dept. of Economics.
S. E. McGaughey, and E. Thorbecke.
American Journal of Agricultural Economics, Vol 54, No 1, p 32-40, February, 1972. 1 fig, 6 tab, 15 ref.

Descriptors: *Irrigation programs, *Decision making, *Investment, Cost-benefit analysis.
Identifiers: *Goals, *Decision rule, *Objectives, Weights, Peru.

Development planning requires explicit specification of the major macroeconomic targets such as output, income distribution, employment, and balance of payments equilibrium. To achieve this specification, a method of obtaining investment priorities is formulated and applied to eleven Peruvian irrigation projects. The benefit-cost ratio and the social marginal productivity of investment were the investment criteria used to assess a project's contribution to the income objective. The effect on the balance of payments may be measured by either the ratio of the present value of the total balance of payments effects to the present value of project investment costs, or the foreign exchange-investment ratio. The employment goal may be assessed with the employment-investment ratio. Based on these criteria, a ranking function is formulated in ordinal and cardinal terms. This weighted linear function of the macro objectives can be used as a decision rule in the selection of projects according to their weighted contributions to the macro goals. This function appears to be a general device which can include as many objectives as there are suitable investment criteria. (Settle-Wisconsin)
W72-13077

A MODEL FOR OPTIMAL SALMON MANAGEMENT,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 06A.
W72-13080

A GENERAL MODEL FOR EVALUATING AGRICULTURAL FLOOD PLAINS,
Texas A and M Univ., College Station; and Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 06A.
W72-13081

WATER QUALITY CRITERIA FOR SELECTED RECREATIONAL USES-SITE COMPARISONS,
Illinois Univ., Urbana. Dept. of Physical Education.
R. Aukerman.
Ph.D. Thesis, 1971. 326 p, 35 fig, 36 tab, 30 ref, 3 append. OWRR B-034-ILL (2).

Descriptors: *Recreation facilities, *Water users, *Water quality, *Attitudes, Behavior, Recreation, Illinois.
Identifiers: Recreation sites, Beliefs, Criteria.

The study's major objective was to test the hypothesis that there are no differences among the selected study sites on respondent's attitudes, beliefs, and behavior concerning water characteristics. The study's methodology involved interviewing 606 adult users of nine Central Illinois water recreation sites. Analysis of the data suggests that there was indeed very little difference between the nine sites. Consequently, it appears to be unnecessary to develop water quality criteria for each lake in a region. Once the criteria are developed for one lake, they can be generalized to the other lakes in the region. Several secondary conclusions were also suggested by the study. First, while water quality is an important component of overall site perception, attractiveness of the site or a combination of other factors are more important. Second, the beliefs and attitudes of large numbers of people are being detrimentally affected by the quality of water at the site. Third, behavior of most site users is not strongly affected by water quality. Fourth, people can identify those variables which affect their beliefs, attitudes, and behavior. (Settle-Wisconsin)
W72-13084

ENGINEERING AND ECONOMIC IMPLICATIONS OF ICEBERGS IN THE NORTH ATLANTIC,
Memorial Univ. of Newfoundland, St. John's. Dept. of Engineering.
A. A. Bruneau, and R. T. Dempster.
In: Oceanology International 1972, Conference Papers, March 19-24, 1972, Brighton, England, The Society for Underwater Technology, p 176-180. 1972. 6 fig, 11 ref.

Descriptors: *Oil, *Icebergs, *Economic impact, Engineering, Exploration, Drilling, Operations, *Canada.
Identifiers: *North Atlantic.

The presence of moving and grounded or bottom dragging icebergs off the east coast of Canada poses serious problems in the development of offshore resources. As the cost of energy rises, the development of petroleum resources off the Canadian coast will become more and more profitable. Yet, any development project must cope with the icebertgs. These massive bodies of ice pose a clear threat to any operation lying in their paths, and if the safety of men and equipment involved is to be assured, some means must be developed to remove the risk of collision. Four alternative actions seem open to project operators. They might (1) develop a method for predictably deflecting icebergs from collision courses, (2) design the installation so that it can be readily moved out of the path of an iceberg, (3) strength the installation to ensure that it could withstand any conceivable collision, or (4) locate the operation in a place safe from the icebergs, such as on the sea bottom in a hardened site or depression. Each of these potential solutions has serious drawbacks which must be solved if they are to become practicable. (Settle-Wisconsin)
W72-13086

TOWARD AN ECONOMICS OF ECOLOGY,
For primary bibliographic entry see Field 06G.
W72-13087

EXTERNALITIES AND THE RACE FOR ECONOMIC GROWTH IN THE USSR: WILL THE ENVIRONMENT EVER WIN,
Wellesley Coll., Mass.
For primary bibliographic entry see Field 05G.
W72-13088

DELAYS RAISE COSTS OF WATER PROJECTS,
Texas Water Development Board, Austin. Operations Div.
For primary bibliographic entry see Field 06C.
W72-13089

ESTIMATION OF NET SOCIAL BENEFITS FROM OUTDOOR RECREATION,
Montana State Univ., Bozeman; and Missouri Univ., Columbia.
O. R. Burt, and D. Brewer.
Econometrica, Vol 39, No 5, p 813-827, September, 1971. 2 tab, 15 ref, append.

Descriptors: *Recreation demand, *Recreation facilities, *Real benefits, Recreation, Regression analysis, Estimating, Water resources development, *Missouri.
Identifiers: *Outdoor recreation demand, *Social benefits, Demand equations, Equation systems, Generalized least squares.

An economic framework is presented for measuring the net social benefits that can be attributed to development of a new outdoor recreation site, taking into consideration the influence that existing recreation developments have on the demand for services from the newly developed site. Initially, a model for measuring social benefits associated with a newly developed recreation site is presented, under the assumption that the system of demand equations for interrelated outdoor recreation sites is known. This method for estimating the social value of investments in outdoor recreation is shown to be commensurable with market value measures utilized in traditional cost-benefit analysis. The critical information required for the estimation of these demand equations is (1) the number of days the household spent at each category of recreation sites, including travel time, (2) expenditures incurred that were specific to each trip, (3) mileage driven on each trip, and (4) the family's income. Given this information, generalized least squares may be used to estimate the relevant parameters. The model is applied to six water recreation site groupings in Missouri. (Settle-Wisconsin)
W72-13091

SOCIO-ECONOMIC ACCOUNTING AND EXTERNAL DISECONOMIES,
Texas Univ., Arlington. Dept. of Accounting.
For primary bibliographic entry see Field 05G.
W72-13094

THE CHESAPEAKE BAY, REPORT OF A RESEARCH PLANNING STUDY,
Johns Hopkins Univ., Baltimore, Md.; Maryland Univ., College Park; and Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 06G.
W72-13165

PROPOSED BIG CYPRESS NATIONAL FRESH WATER RESERVE, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
National Park Service, Richmond, Va. Southeast Region.
For primary bibliographic entry see Field 06G.
W72-13224

THE INTERGRATION OF MULTIPLE OBJECTIVES IN URBANIZING WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
R. R. Wilkinson, Wayne Maynard, D. M. Mitchell, and J. W. Ranney.
Available from the National Technical Information Service as PB-211 615, $3.00 in paper copy, $0.95 in microfiche. UNC-WRRI North Carolina Water Resources Research Institute, Raleigh, Report No. 62, May 1972, UNC-WRRI-62-72, 65 p, 18 fig, 8 tab, 54 ref. OWRR-A-051-NC (1).

Descriptors: *Planning, Water resources development, *Urbanization, *Land development, *Land management, Land use, Small watersheds, *North Carolina, Decision making.
Identifiers: *Crabtree Creek Watershed, *Neuse River Basin, *North Carolina, Small watershed program, *Urban watersheds.

A generalized effort is used to describe and apply a development guidance system to an urbanizing watershed. Presently, the participants in the process operate within different spheres of interest and varying time frames. An essential objective is to identify a natural unit of the watershed as a focus for development that will permit the realization of objectives in a simultaneously integrated manner. The participants are real estate developers, public interest groups, a parks department and general city management concerned with public works and investment priorities. A development guidance system that will admit public interest groups to the decision process and adjust private developer's interests through granting premiums for environmental conservation is recommended.
W72-13303

SHIFTING LAND AND WATER USE IN THE BITTERROOT VALLEY, MONTANA,
Montana State Univ., Bozeman. Water Resources Research Center.
C. Hash, and H. Holje.
Available from the National Technical Information Service as PB-211 619, $3.00 in paper copy, $0.95 in microfiche. Montana Water Resources Research Center, Bozeman, Completion Report No. 3, (1972), 139 p, 4 fig, 19 tab, 70 ref, 3 append. OWRR-A-033-MONT (1).

Descriptors: Evaluation, *Economic impact, Third party effects, Economic feasibility, *Regression analysis, *Linear programming, *Institutional constraints, Montana, Model studies, *Land use, *Water utilization, Water distribution (Applied), Irrigation systems.
Identifiers: *Bitterroot Valley (Mont).

The rapid movement of land and water resources from agricultural to recreation-residential use in Montana's mountain valleys present both opportunities and problems to the residents to those areas--opportunities in the form of increased return to the resources of the area--problems in providing for a growing population without substantial increases in local tax rates and without creating the kinds of urban problems that so many come here to avoid. A multivariate regression model was used to analyze data on sales of unimproved tracts of land in the Bitterroot Valley area to determine the contribution to value of various amenities and detriments. A linear programming model of the resource economy of the Bitterroot Valley was used to evaluate the impact on local community well-being of certain policies to internalize some of the external costs of recreation-residential development. The present institutions and works for the distribution of irrigation water do not allow the waters available to Bitterroot Valley lands to be fully utilized in agriculture. The same linear programming model was used to estimate the impact of the agricultural economy of improvements in the irrigation water distribution system.
W72-13307

THE UTILIZATION OF ECONOMIC CRITERIA FOR THE EVALUATION OF ANGLING (VYUZITI EKONOMICKYCH KRITERII K HODNOCENI SPORTOVNIHO RYBOLOVU),
Prague Agricultural Univ. (Czechoslovakia). Dept. of Agricultural Economics.
J. Vacek, and J. Havelka.
Buletin VUR Vodnany, No 3, p 10-15, 1971. 2 fig, 5 ref. English summary.

Descriptors: *Fishing, *Recreation, *Evaluation, Fisheries, Sport fishing, Water utilization, Economics, Social needs, Social participation, Cost analysis.
Identifiers: *Czechoslovakia.

An introduction is presented to the prepared economic evaluation of angling and to the formation of a basis for the prospective evaluation of this 'hobby' activity by means of value categories. Only economic evaluation allows for the measurement and quantification of the importance of angling to society. The economic research of angling in Czechoslovakia should be focused on three interrelated fields: social aspects, hobbies and the psychological motivation of the spare-time activities; costs incurred in angling; and intensity of angling. The quatification of the dependencies existing among the different parts of angling is not only an important instrument for economic evaluation but it is also immediately connected with the method of the economic utilization of the fishing and angling districts. (Svensson-Washington)
W72-13349

SOLUTION OF A WATER RESOURCES PROBLEM WITH ECONOMIES OF SCALE BY LINEAR PROGRAMMING,
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 06A.
W72-13360

WATER-CAPACITY PLANNING FOR METROPOLITAN AREAS - THE CASE OF MONROE COUNTY, N.Y.,
Rochester Univ., N.Y. Center for Naval Analyses.
For primary bibliographic entry see Field 03D.
W72-13550

INDUSTRIAL WATER FORECASTS,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 03E.
W72-13551

POPULATION GROWTH AND NONINDUSTRIAL WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W72-13558

THE IMPACT OF PUBLIC WORKS SCHEMES ON FARMING: A CASE STUDY RELATING TO A RESERVOIR AND POWER STATION IN NORTH WALES,
University Coll. of Wales, Aberystwyth.
For primary bibliographic entry see Field 03F.
W72-13560

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Development Advisory Service.
C. J. Ciccetti, R. K. Davis, S. H. Hanke, R. H. Haveman, and J. L. Knetsch.
Johns Hopkins University, Baltimore, Maryland, Dept of Geography and Environmental Engineering, March, 1972. 18 p.

Descriptors: *Water resources development, *Cost-benefit analysis, *Evaluation, *Regional development, Economic efficiency, Cost sharing, Cost allocation, Discount rates, Standards, Regional analysis, Benefits, Costs.
Identifiers: *Water Resources Council, Double counting.

While the intent of the Water Resources Council's proposed 'Principles and Standards for Planning Water and Related Land Resources' is to improve benefit-cost practices, several of their proposals will facilitate the misuse of economic methods and result in a systematic bias toward overestimating benefits and underestimating costs of water resource projects. The shortcomings of several of the Council's proposed standards are discussed, and alternative standards are recommended. The discussion and recommendations are divided into six topics: (1) accounting concepts, (2) benefit measures, (3) cost allocation, reimbursement, and cost-sharing, (4) development versus preservation, (5) regional development, and (6) public participation. The Council's new multiple account framework is found to be unsound, and a unified national accounting framework should be adopted. The beneficiaries of water resource projects should normally be charged the full cost of the goods and services provided tham. The preservation of environmental resources should be recognized as a goal, and the irretrievable loss of such resources should be appropriately costed. An interest rate between nine and eleven percent should be applied to all new expenditures. Several other standards are also recommended. (Settle-Wisconsin)
W72-13562

INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS, UNITED STATES.
National Air Pollution Control Administration, Washington, D.C.

Organization for Economic Co-operation and Development, Paris, June, 1972. 60 p.

Descriptors: *Water pollution, *Air pollution, *Cost-benefit analysis, *Bibliographies, Pollutants, Environment, Evaluation.

This bibliography organizes publications in which cost-benefit analysis is applied to environmental problems in the United States. The bibliography is divided into the following two main topics: (1) the economics of air pollution, and (2) water pollution control. The air pollution section is organized according to (1) periodicals dealing with air pollution and other problems of environmental management (43 entries), (2) bibliographies and other sources of information (18 entries), (3) literature relating to benefit-cost analysis and economic theory (167 entries), and (4) recent literature relating to problems of environmental management (165 entries). The water pollution control bibliography is divided into the following five sections: (1) definition (19 entries), (2) benefit measurement or cost determination (12 entries), (3) evaluation techniques (15 entries), (4) decision criteria (6 entries), and (5) Federal Water Pollution Control Administration studies (4 entries). The water pollution control bibliography is annotated. (Settle-Wisconsin)
W72-13563

PUBLIC WATER RESOURCE PROJECT PLANNING AND EVALUATION: IMPACTS, INCIDENCE, AND INSTITUTIONS,
Wisconsin Univ., Madison. Dept. of Agricultural Economics; and Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
D. W. Bromley, A. A. Schmid, and W. B. Lord.
Center for Resource Policy Studies and Programs, School of Natural Resources, Wisconsin University, Madison, Working Paper No 1, September, 1971. 1 fig, 3 tab, 41 ref, 1 append.

Descriptors: *Water resources development, *Evaluation, *Cost-benefit analysis, *Multiple-purpose projects, Institutions, *Planning, Benefits, Costs, Economics.
Identifiers: *Project impact.

The role of economic logic and method in analyzing the consequences of water resource investments is examined. The bargaining context within which federal water resource decisions are made is

found to be inadequate in three respects. First, the range of interests participating at the local level is too limited and tends to favor development-oriented groups. Second, the present system militates against a local realization that all federally-financed projects are mutually competitive with respect to the budget. Third, the present system does not facilitate the expression of nonlocal reaction to local programs. These shortcomings could be overcome to some extent with the adoption of an improved information display designed to (1) reveal the positive and negative impacts of proposed projects on all local and nonlocal interests, and (2) facilitate a national consideration and comparison of entire programs in terms of truly national objectives. The nature and incidence of project impacts are thoroughly discussed, and an accounting framework designed to reflect these project impacts is proposed. An appendix briefly discusses twelve issues of relevance to the evaluation of water resource projects, including effective demand, consumers' and producers' surplus, recreation benefits, flood control, project costs, and direct and indirect pecuniary effects. (Settle-Wisconsin)
W72-13565

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMICS OF WATER RESOURCES PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 06B.
W72-13073

FLOOD DAMAGE PREVENTION POLICIES,
Chicago Univ., Ill. Dept. of Geography.
For primary bibliographic entry see Field 04A.
W72-13074

THE PROFIT IN POLLUTION,
For primary bibliographic entry see Field 06B.
W72-13076

THE COST OF CLEAR WATER, VOLS I AND II.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-13079

A GENERAL MODEL FOR EVALUATING AGRICULTURAL FLOOD PLAINS,
Texas A and M Univ., College Station; and Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 06A.
W72-13081

TREATMENT-COST RELATIONSHIP FOR INDUSTRIAL WASTES,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 05D.
W72-13083

CONSUMER WILLINGNESS TO PAY FOR POLLUTION ABATEMENT,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05G.
W72-13085

DELAYS RAISE COSTS OF WATER PROJECTS,
Texas Water Development Board, Austin. Operations Div.
A. Eatman.
Water For Texas, Vol 2, No 3, p 4-7, March, 1972. 2 fig.

Descriptors: *Water resources development, *Costs, *Inflation (Economic), Dams, Spillways, Land, Relocation, *Texas.
Identifiers: Delays, *Palmetto Bend Reservoir (Tex).

The cost of anything bought by anyone is going to be more in the future than it is now. Consequently, delays in the construction of water resources development projects can be very costly. The United States Bureau of Reclamation estimates that between 1950 and 1972 the cost of canals increased by approximately 56 percent, the cost of dams rose by roughly 60 percent, and the cost of pumping stations increased by over 110 percent. The Palmetto Bend Reservoir project in Texas offers an example of the cost of waiting. In 1963 the estimated total cost of the project was $29,565,000. The component costs were estimated to be $3,470,000 for land, $8,040,000 for relocations, $12,000,000 for the dam and spillway, and $6,055,000 for other expenditures. Due to delays, the project was not undertaken, and by 1971 the estimated total cost had risen 76 percent to $52,085,000. The cost of land had risen 105 percent to $7,100,000; relocation expenses had increased 102 percent to $16,213,000; the cost of the dam and spillway had risen 46 percent to $17,464,000; and the cost of other items had risen 87 percent to $11,298,000. (Settle-Wisconsin)
W72-13089

FINANCING IRRIGATION,
For primary bibliographic entry see Field 03F.
W72-13090

THE ECONOMICS OF GEOTHERMAL POWER,
J. J. C. Bradbury.
In: Natural Resources Forum, United Nations, Dept. of Economic and Social Affairs, Vol I, p 46-54, 1971.

Descriptors: *Geothermal studies, *Steam, *Variable costs, *Fixed costs, *Operating costs, Exploration, Drilling, Pipelines, Operations.
Identifiers: *Geothermal power, *International cost comparisons.

In order to be a viable energy source, geothermal power must compete successfully with alternative energy sources such as natural gas, solid fuels, hydroelectric power, and nuclear energy. Consequently, before undertaking a geothermal power project, it is necessary to have the best possible estimates of not only probable exploration expenses, but also the costs of developing both well fields and power plants. The cost of exploration depends on such factors as geological structure, hydrology, and the depth and temperature of the production zone. Production-drilling costs are a function of several factors, including regional geological conditions, rock properties, drilling techniques, well design, and well depth. The cost of a fluid collection system in a geothermal field depends upon such factors as the mass flow, the steam-water ratio, and interference between adjacent wells. The variable costs associated with steam supply are very small and consist mainly of well and pipeline maintenance, which to a certain extent is a function of the corrosive nature of the geothermal fluid. Thus, the economics of geothermal power plants are dominated by comparatively high fixed charges and low variable costs. The costs associated with exploration, drilling, and operating in many parts of the world are quoted. (Settle-Wisconsin)
W72-13092

SOCIO-ECONOMIC ACCOUNTING AND EXTERNAL DISECONOMIES,
Texas Univ., Arlington. Dept. of Accounting.
For primary bibliographic entry see Field 05G.
W72-13094

MATHEMATICAL MODEL FOR RATE STUDIES,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-13135

AN APPLICATION OF NETWORK THEORY TO WATER MANAGEMENT IN POULTRY PROCESSING,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W72-13137

OPTIMAL SEASONAL AND SHORT-TERM OPERATION OF A RESERVOIR USED FOR FLOOD CONTROL AND WATER SUPPLY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 04A.
W72-13139

REGIONAL ADMINISTRATION AND FINANCING OF THE BALTIMORE WATER SYSTEM.
Booz, Allen and Hamilton, Inc., Washington, D.C.
For primary bibliographic entry see Field 06D.
W72-13166

ON MARYLAND'S ENVIRONMENTAL SERVICE,
For primary bibliographic entry see Field 06E.
W72-13256

AN ANALYSIS OF THE DEMANDS FOR WATER FROM THE PRIVATE SECTOR IN A SUB-ARCTIC URBAN AREA,
Alaska Univ., College. Inst. of Water Resources.
R. C. Haring.
Available from the National Technical Information Service as PB-211 610, $3.00 in paper copy, $0.95 in microfiche. Institute of Water Resources Report No. IWR-22, April 1972. 71 p, 1 fig, 9 tab, 131 ref. OWRR B-003-ALAS (1). 14-01-0001-872.

Descriptors: Water costs, Alternative costs, Water distribution (applied), Economic feasibility, Groundwater, Management, Pricing, Cold regions, *Alaska, *Water utilization, Water wells, Water supply, *Cities.
Identifiers: *Fairbanks (Alas), *Sub-arctic urban areas.

Problems of water use in the Fairbanks North Star Borough of Alaska, a typical urban-rural area in a sub-arctic climate, are described. Water use characteristics of various segments of the local economy, water policy practice and the pricing and costs associated with various types of water use are discussed. The research indicated a gradual expansion of water consumption and requirements for an increased rate of public and private investment in facilities. The water supply system of this sub-arctic city appears to be unusually complicated compared to those of other U.S. cities. These complications seem to stem from a naturally poor condition of the water supply and associated distribution problems caused by the cold climate. Additional complications result from a rather ambiguous utility and water regulation and use policy. The research work concludes that there will be a small water consumption growth in the future but increased demand for production and distribution facilities; the risks of health and financial loss due to well drilling uncertainty are indirectly borne by individual households; public and private investments in water production and distribution facilities overlap in some areas and do not exist in others this fact represents an unfortunate void in urban planning of the area; and, finally, quality of water supply is a very real and significant development problem for sub-arctic urban areas. The costs of water for human consumption and industrial use are substantial both in initial capital costs

and in continuing high maintenance costs. (Carlson-Alaska)
W72-13298

METERING SYSTEM TAKES THE WASTE OUT OF SEWAGE COSTS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05G.
W72-13496

PULLING EFFLUENTS INTO LINE.
For primary bibliographic entry see Field 05D.
W72-13498

THE TRUE COST OF WATER,
E. F. Spitzer.
Journal of the American Water Works Association, Vol. 63, No. 6, June 1971, p 325-328. 2 photo.

Descriptors: *Water costs, *Water rates, *Water supply, Utilities, Pricing, Water pollution, Economics, Planning.
Identifiers: *Water study, Questionnaries, High rate area, Economic development, Rate increase.

The questions asked and conclusions made in a study of water-rating procedures of water utilities in the US are discussed. The objective of the study, which was made for the Office of Saline Water by The American City, was to identify water supplies serving 1,000 or more people, whose prices exceeded the study criterion of $7.50 for 10,000 gal in one month. Questionnaires were originally sent to 10,466 utilities, with a 55% return. Rates were found to be higher than expected. No section of the country was found to be immune to high rates. It is not the semiarid states which have the largest number of high rate areas. The three highest states are Kentucky, Tennessee, and West Virginia. It is suggested that the high water rates have retarded the economic development of these states. Most of the high rate areas are located in water-plentiful states, not in areas of relative water scarcity. High rate areas are those with small populations served. There is little rate variation between metropolitan and nonmetropolitan areas. Half of the high rates are four years old or less; about one third of the high rates date between 1960 and 1965; and the oldest high rate dates back to 1930. 47% of the utilities said that their rates would increase within the next five to ten years. Only 1.4% of these utilities expecting increases stated additional water treatment for water pollution as a cause for the increase. A number of the utilities stated that they would need an additional supply of water within the next five to ten years. (Strachan-Chicago)
W72-13552

COMMITTEE REPORT: JOINT ADMINISTRATION WATER/WASTEWATER WORKS.
American Waterworks Association, New York. Committee for Water and Wastewater Operations.
For primary bibliographic entry see Field 05G.
W72-13554

PRICING POLLUTION AND OTHER NEGATIVE EXTERNALITIES,
Ohio State Univ., Columbus. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-13559

COSTS AND QUALITY OF WATER IN OHIO CITIES,
Ohio State Univ., Columbus; Ohio Agricultural Research and Development Center, Columbus; and Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 05G.
W72-13561

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Developmen t Advisory Service.
For primary bibliographic entry see Field 06B.
W72-13562

PROBLEMS AND INSTRUMENTS RELATING TO THE ALLOCATION OF ENVIRONMENTAL COSTS.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 05G.
W72-13564

ECONOMICS OF PUMPED STORAGE IN NEW ENGLAND,
Alexander Kusko, Inc., Needham Heights, Mass.; and Massachusetts Ins. of Tech., Cambridge, Mass.
For primary bibliographic entry see Field 04A.
W72-13567

ECONOMIC ANALYSIS OF SWISS PUMPED STORAGE SCHEMES FOR VARIOUS PARAMETERS OF OPERATION AND ENERGY COSTS,
Maggia, Locarno (Switzerland).
For primary bibliographic entry see Field 04A.
W72-13568

6D. Water Demand

A WIDE-AREA INVESTIGATION OF WATER UTILIZATION--PRIMARY REPORT.
Ministry of Construction, Tokyo (Japan). River Bureau.

Japan Ministry of Construction Publication, April 1971. 30 p, 13 fig, 1 map, 8 tab.

Descriptors: *Water resources development, *Water supply, *Water demand, *Projections, Foreign countries, Hydrologic data, Data collections, Streamflow, Water yield, Dams, Costs, Social aspects, Economics, Flood control, Reservoirs, Water storage, Water utilization.
Identifiers: *Japan.

Results of water resources investigations in Japan are presented, including a projection for water demand and supply in 1985. In estimating the balance between the supply and the demand, changes in economic and social factors are considered. According to the estimations, approximately 46 cu km of water consumption anticipated from 1966 to 1985 will depend on river surface waters. The construction of approximately 480 dams and other similar facilities will be required for this purpose, and the amount of funds required, including expenditure for flood control, will be approximately 7 trillion yen. The utilization rate of major rivers in the country in 1985 will reach a level of 50% to 60%. (Woodard-USGS)
W72-13054

WATER QUALITY CRITERIA FOR SELECTED RECREATIONAL USES-SITE COMPARISONS,
Illinois Univ., Urbana. Dept. of Physical Education.
For primary bibliographic entry see Field 06B.
W72-13084

ESTIMATION OF NET SOCIAL BENEFITS FROM OUTDOOR RECREATION,
Montana State Univ., Bozeman; and Missouri Univ., Columbia.
For primary bibliographic entry see Field 06B.
W72-13091

GENERAL PLAN 2020, LAND USE GUIDE FOR WATER, WASTE WATER AND DRAINAGE ENGINEERING STUDIES, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10367, $3.00 in paper copy, $0.95 in microfiche. Humboldt County Planning Commission, Eureka, California, April 1971. 214 p, 46 fig, 83 tab, 5 ref. HUD Contract LPO-P/360-CAS-1.

Descriptors: *Planning, *Comprehensive planning, *Land use, *Water resources development, *Water supply development, *Drainage systems, Land development, Water supply, Drainage, Water conveyance, Long-term planning, Urbanization, Community development, Regional analysis, California.
Identifiers: *Humboldt County (California).

A general land use guide is presented which serves as a basis for subsequent water, wastewater and drainage studies. It is not a precise document for detailed plans. The study area is the western portion of mid-Humboldt County, extending 34 miles along the Pacific Coast and about 15 miles inland. The population of the area is expected to change from the present 79,590 persons to 321,000 by 2020. This expected increase is attributed to new jobs in the tourist and manufacturing industries, migration from metropolitan centers, and adoption of 'second' homes by many people. About 71,000 housing units must be added by 2020 in urban areas and about 20,000 in rural areas. Major transportation in the future emphasizes full construction of Highways 101 and 299, and a freight railway connection to the Valley. Airport development is encouraged with lands around airports to be planned and zoned with the noise factor being given full consideration. Gas and electricity supply will meet expected needs. A policy framework is needed to shape the short-range and long-range land use development around Humboldt Bay. (See also W72-13161 and W72-13162) (Poertner)
W72-13160

WATER SUPPLY, TREATMENT AND DISTRIBUTION, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM.
Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10375, $3.00 in paper copy, $0.95 in microfiche. Humboldt County Planning Commission, Eureka, California. 166 p, 30 fig, 72 tab, 25 ref. 1971. HUD LPO-P/360-CAS-1.

Descriptors: *Water supply development, *Planning, *Regional analysis, *Municipal water, *Water conveyance, Financing, Urbanization, Water resources development, Water treatment, Water supply, Water management (Applied), Administration, Water requirements, Water demand, California, Comprehensive planning, Water reuse.
Identifiers: *Humboldt County (California), Long-term planning.

Results are reported of a study aimed at developing long-range plans for water supply, treatment and distribution for the western mid-portion of Humboldt County, extending 34 miles along the northern California coast. A dominant feature of the area is Humboldt Bay, which is 14 miles long and up to 5 miles wide. Another striking geographical feature is the Mad River, whose drainage basin stretches almost 100 miles inland and whose discharge enters the ocean 5 miles north of the bay. The possible alternative sources of water in the area include surface waters, groundwater and reclaimed wastewater. Based on the expected

yield from each of these sources, it is apparent that surface waters will continue to be the prime supply source for the area. Based upon previous investigations and upon the information developed in this study, it is recommended that the Butler Valley Project be relied upon as the primary source of supply for municipal and industrial purposes for the entire Study Area. It is recommended also that groundwater continue to be used for agricultural purposes and that treated waste water be investigated as a supplement for the industrial water needs on the Samoa Peninsula. Also, the Humboldt Bay Municipal Water District should become the water purveyor for the entire Study Area. Plans for water distribution and storage facilities were developed using the electronic network analyzer for each of the major communities within the Service Areas. In many cases, alternative systems were evaluated and recommendations as to the best alternative were made. Financing is also discussed. (See also W72-13160) (Poertner)
W72-13161

REGIONAL ADMINISTRATION AND FINANCING OF THE BALTIMORE WATER SYSTEM.
Booz, Allen and Hamilton, Inc., Washington, D.C.

Regional Planning Council, Baltimore, Maryland, June 15, 1969. 106 p, 4 tab.

Descriptors: *Administration, *Financing, *Cities, *Water supply, *Planning, Water demand, Water distribution, Water management, Water conveyance, Maryland, Urbanization.
Identifiers: *Baltimore (Maryland), *Regional planning.

With the present Baltimore Water distribution system already inadequate, future demand estimated at three times the present demand promises to pose serious problems. Alternative solutions are presented to the administrative and financial problems of satisfying this future demand. Recognizing that a regional approach must be used to satisfy all communities involved, alternate methods are described. These are (1) an improvement to the present agreement process between local units of government, (2) a regional water authority, (3) a public corporation, (4) a city-county water authority, selling water to counties outside Baltimore County, (5) a state administration and/or financing of the water system, (6) a quasi-judicial regulatory body and (7) miscellaneous, complex arrangements. It is recommended that a plan embodying a regional approach be adopted and implemented quickly. (Poertner)
W72-13166

FACTORS PERTINENT TO WATER QUALITY IN THE ALBUQUERQUE METROPOLITAN AREA,
Albuquerque Urban Observatory, N. Mex.
C. L. Beckel.
Available from the National Technical Information Service as PB-208 122, $3.00 in paper copy, $0.95 in microfiche. November 1970. 77 p, 4 fig, 3 tab, 11 ref. HUD H-987.

Descriptors: *Municipal water, *Water quality, *Water supply, *Planning, *Decision making, *Water supply development, Potential water supply, Dependable supply, Groundwater potential, Groundwater availability, Groundwater resources, Cities, Urbanization, Local governments, New Mexico.
Identifiers: *Albuquerque (N.M.).

This manual contains facts pertinent to water quality in the Albuquerque area that may be useful to administrators in making decisions affecting water quality. The focus is on the problems associated with the Albuquerque metropolitan area's water supply and waste water, and additional problems such as flood control, as they relate to these two primary areas of focus. The report contains: a detailed tabulation of pertinent legislative authority; a description of some actual administrative procedures; a review of geological and geograph factors; a summarization of current master plans; a description of equipment, personnel, and personnel training; and a listing of funding and advisory sources. Over 50 governmental agencies have jurisdiction over water quality in the metropolitan area, although the authority and responsibilities of the departments of the City of Albuquerque are not spelled out in City ordinances. There appears to be no problem with regard to the quantity of available water for municipal use; however, the quality characteristics of the available water supply at depths appreciably below present pumping levels is virtually unknown. Many private water supply and waste disposal systems in the area pose a current health threat to their users. Effluent from Albuquerque waste treatment plants presently meets Stream Standards but not Effluent Standards. (Poertner)
W72-13168

AN APPROACH TO THE REGULATION OF WATER USE IN MANUFACTURING: A STUDY OF NORTH GEORGIA INDUSTRIES,
Indiana State Univ., Terre Haute.
J. R. McGregor.
In: Indiana Academy of the Social Sciences Proceedings, 1971, Third Series, Vol VI, p 64-78, Indiana State University, Terre Haute. 9 tab, 12 ref. OWRR A-014-GA (3).

Descriptors: *Industrial water, *Water utilization, *Water allocation (Policy), *Georgia, Water policy, Water supply development, Water requirements, Water conservation, Water demand, Administration, Regional analysis, Planning, Decision making, Industrial production, Competing uses, Equitable apportionment.
Identifiers: *Regulating water use.

A survey was made of water usage by various manufacturing companies representative of forty-four manufacturing industry types in northern Georgia. Information was obtained by personnel contact with Company representatives in 107 interviews and completed questionnaires returned by 322 of the 805 companies contacted by mail. Five distinct categories of the area's industries were established based upon the 'per employee annual intake' water requirements by four-digit S.I.C. industries. These varied from 9,000 gallons/year to 300,000 + gallons/year per employee. On the basis of these results it would seem that manufacturing industries logically could be classified in terms of their overall water requirements. The quantity of intake water clearly relates to the pattern of water use and to requirements for on-site intake and waste water treatment in the sample of industries considered. Three groupings of industries were found to differ substantially in their water requirements. These were Category I (1 to 10 thousand gallons/day), Category II (10 to 100 tg/d) and Categories III-V (more than 100 tg/d). Recognition of such differences in industrial water requirement characteristics would seem to be fundamental to rational area planning for industrial water use and therefore the groupings should have practical value. The group including Category I required relatively small volumes of intake water and could normally utilize existing municipal supply and treatment facilities without creating or adding to local water resource difficulties. The group of industries of Category II, while not usually problem industries, could create additional difficulties in areas presently having water problems. (Poertner)
W72-13171

CALIFORNIA WATER PROJECT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 04A.
W72-13259

DESALTING,
National Water Commission, Arlington, Va. Engineering and Environmental Div.
For primary bibliographic entry see Field 03A.
W72-13354

6E. Water Law and Institutions

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS OF THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington. Water Quality Control Div.
For primary bibliographic entry see Field 05G.
W72-13049

WATER RESOURCES MANAGEMENT: A CRITIQUE,
Ohio Dept. of Public Health and Welfare, Cleveland. Div. of Environmental Health.
For primary bibliographic entry see Field 06B.
W72-13066

AWWA STANDARD FOR DEEP WELLS.
American Water Works Association, New York.
For primary bibliographic entry see Field 08B.
W72-13150

INSTITUTIONAL CHARACTERISTICS OF WATER MANAGEMENT IN MEDIUM-SIZED METROPOLITAN AREAS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
G. E. Willeke, and F. W. Kroeck.
Paper presented at the Annual Water Resources Meeting of the American Society of Civil Engineers, January 24, 1972. 12 p. OWRR B-38-GA (1).

Descriptors: *Administration, *Administrative agencies, *Local governments, *Cities, *Legislation, *Zoning, Institutional constraints, Political aspects, Organizations, Water policy, Urbanization, Governments, Institutions, Water resources development.
Identifiers: Subdivision regulations.

Research in progress is reported on the management of water resources in medium-sized metropolitan areas. Included are the functions of water supply, provision of storm and sanitary sewers, waste water treatment, flood damage reduction, and water-oriented recreation. The purpose is to determine what is happening, what the problems are, what are the good aspects of water management, and what could be done to improve the situation. Two issues are covered: (1) land development control ordinances (zoning and subdivision regulations) and (2) government reorganization. Attention was given particularly to those characteristics that are distinctive, or that local officials believe are distinctive, in each jurisdiction and entity. It is hypothesized that major improvements in water management won't be made unless these distinctive features are given explicit attention. Institutional characteristics considered include: the participants; the kinds of problems faced in water management; the values and priorities of water managers and general influentials that shape water management; and the organization and administration of local governments. People seem to presume that the objectives of water management are well known and the solutions are not, whereas the opposite is more likely the case. The apparent removal of water management functions from the political arena has also inhibited the responsiveness of water managers to changing needs of society. Economic efficiency is not a high priority goal of water management, as compared to the goals of fiscal soundness, organizational viability, and equity in water rates and provision of service. (Poertner)
W72-13169

WATER AND AIR QUALITY REPORTING ACT.

N.C. Gen. Stat. secs. 143-215.63 thru 143-215.69 (Supp. 1971).

Descriptors: *North Carolina, *Legislation, *Monitoring, *Control systems, *Water quality control, State governments, Air pollution, Penalties (Legal), Regulation, Legal aspects, Water pollution, Water management (Applied), Data transmission, Measurement, Operations.

The Water and Air Quality Reporting Act of 1971 requires specified persons to file reports with the Board of Water and Air Resources detailing the discharge of waste and air contaminants into the waters and outdoor atmosphere and to establish and maintain approved systems for monitoring the quantity and quality of such discharges and their effects. The Act details the method to be used in monitoring and filing reports. No person subject to these provisions shall willfully cause or allow the discharge of any wastes or air contaminants into a waste disposal system or air cleaning device in excess of the capacity of the disposal system or device or any wastes or air contaminants which the disposal system or cleaning device cannot adequately treat. The Board is authorized to adopt report forms and such rules and regulations as are deemed necessary. Violation of the Act on implementing regulations shall constitute a misdemeanor subject to a fine of $100-$1000 for each violation and each day such person shall fail to comply after having been officially notified by the Board shall constitute a separate offense subject to the foregoing penalty. (Widman-Florida)
W72-13204

FLOODWAY REGULATION.
N.C. Gen. Stat. secs. 143-215.51 thru 143-215.61 (Supp. 1971).

Descriptors: *North Carolina, *Legislation, *State governments, *Floodways, *Regulation, Adoption of practices, Flood routing, Water management (Applied), Penalties (Legal), Obstruction to flow, Administrative agencies, Flood plains, Legal aspects, Comprehensive planning, Permits, Water law.

The purpose of this Part is to specify a means for regulation of artificial obstructions in floodways by responsible local governments. It defines relevant terms, prohibits artificial obstruction in delineated floodways, and enumerates uses of the floodway which may be made as a matter of right without a permit. Existing artificial obstructions shall not be considered in violation of this Part. Provisions are made for delineation of floodways, powers of the Board of Water and Air Resources, powers of local governments, and procedures to be followed in issuing permits. Any violation of this Part shall constitute a misdemeanor or result in appropriate civil actions. The granting of a permit under the provisions of this Part shall be construed as an added requirement if other approvals are required. No action for damages sustained because of injury caused by an obstruction for which a permit has been granted under this Part shall be brought against the State or any of its political subdivisions, or their employees or agents. This Part shall not preclude other regulations in the interest of flood plain management by responsible local governments. (Widman-Florida)
W72-13205

NATURAL AND SCENIC RIVERS ACT.
N.C. Gen. Stat. secs. 113A-30 thru 113A-43 (Supp. 1971).

Descriptors: *North Carolina, *Legislation, *State governments, *River systems, Administrative agencies, Governmental interrelations, Regulation, Easements, Water management (Applied), Conservation, Adoption of practices, Law enforcement, Land use, Rivers, Comprehensive planning, Penalties (Legal).

The Natural and Scenic Rivers Act of 1971 initially provides a declaration of policy, declaration of purpose, and definitions of terms used, then enumerates the types of rivers eligible for inclusion in the North Carolina natural and scenic rivers system and the criteria for inclusion. The Act: (1) delegates responsibility for administration and control of the system, acceptance of federal grants, additions to the system, and the promulgation of regulations for carrying out the provisions of the Act; (2) provides a method for raising the status of an area or of acquiring land; (3) determines the effect of contributions or gifts of easements on claims and allowances for charitable deductions; and (4) provides for integration of this system into any state park, wildlife refuge, state-owned area, or the national wild and scenic river system. Both civil actions and criminal penalties are available to enforce the provisions of the Act. The Department of Administration is authorized to advance from land-purchase appropriations necessary amounts for the purchase of lands in those cases where reimbursement will be later effected by the Bureau of Outdoor Recreation of the United States Department of the Interior. (Widman-Florida)
W72-13206

DEPARTMENT OF WATER AND AIR RESOURCES. ORGANIZATION AND POWERS; CONTROL OF POLLUTION. RIGHT OF WITHDRAWAL OF IMPOUNDED WATERS,
N.C. Gen. Stat. secs. 143-215.8, 143-215.44 thru 143-215.50 (Supp. 1971).

Descriptors: *State governments, *IMmpounded waters, *North Carolina, *Legislation, *Withdrawal, Legal aspects, Penalties (Legal), Water management (Applied), Consumptive use, Water utilization, Adoption of practices, Exploitation, Law enforcement, Public rights, Regulation, Water law.

Injunctive relief may be sought to restrain violation of this Article and for such other relief as the court deems proper. A person who lawfully impounds water for the purpose of withdrawal shall have a right of withdrawal of the excess volume of water attributable to the impoundment. A person with a right of withdrawal may assign or transfer it in whole or in part. The assignee or transferee has an interest in water superior to other interests only to the extent that his withdrawal is in accordance with the terms of the assignment or transfer. A person may exercise his right of withdrawal directly from the impoundment, from a watercourse below the impoundment, or both provided this does not require any other person to incur additional capital expenditures. Neither a right of withdrawal nor any assignment or transfer of said right may be asserted in defense against certain enumerated claims. A determination by the Board as to rate of flow based on either statutory method shall be prima facie correct. A person may assert his right of withdrawal when its use is specified by statute as well as in other circumstances. (Widman-Florida)
W72-13207

VERDUN V. SCALLON BROS. CONTRACTORS, INC. (APPROPRIATION AUTHORITY OF LEVEE DISTRICT).
255 So.2d 808-816 (La. Ct. App. 1971).

Descriptors: *Louisiana, *Riparian land, *Judicial decisions, *Eminent domain, Legal aspects, Levees, Administrative decisions, Administration, Administrative agencies, Riparian rights, Levee districts, Easements, Prior appropriation, Navigable waters, Appropriation.

Plaintiff riparian owners sued to enjoin defendant corporation and intervenor levee district from expropriating its encumbered land for the purpose of repairing a break in a nearby levee. The land in question, bordering a navigable water, was encumbered by a servitude because of its riparian nature when the levee was built in 1934. Compensation was duly made at that time. Plaintiffs contended that the instant attempt to expropriate the land was beyond the authority of the intervenor; that prior appropriation did not vest title in the intervenor; and, in the alternative, that plaintiffs should be paid for the expropriation. Defendants argued that the land was still encumbered with the servitude. The Louisiana Appellate Court held that a servitude created by law remained in effect as long as the land was riparian. Where plaintiffs' land was farther away than other lands within the servitude, the failure to appropriate lands closer to the levee was not deemed an abuse of intervenor's authority. The court further held where there is other available land the burden rested on the plaintiffs to establish the economic and technological necessity for appropriating the other land. In dissolving the lower court injunction granted plaintiffs, the appellate court declared that the authority to exercise the right of appropriation is bound by the reasonable necessities of the situation and that the Levee Board had not abused such reasonableness. (Ilkson-Florida)
W72-13208

OFFSHORE DRILLING--THE COMING BATTLE,
House, Washington, D.C.
M. Harrington.
Congressional Record, Vol. 118, p E5781-E5782 (daily ed.) May 25, 1972.

Descriptors: *Oil industry, *Well drilling, *Oceans, *Environmental effects, Offshore platforms, Exploration, Power marketing, Economics, Electric power demand, Water pollution sources, Oil spills, Oil pollution, Disasters, Energy, Technology, Research and development, Projects, Political aspects.
Identifiers: *Oil import quotas.

The proposed plan by the Nixon administration to initiate offshore oil development on the Atlantic-New England coast is criticized. An article from Friends of the Earth is included which makes a five-point proposal that should be undertaken before any development is permitted: (1) elimination of the oil import quota system and the tax incentives so as to force oil companies to freely compete; (2) development of a rational energy policy and program of research for discovery of new energy sources; (3) proof that the proposed oil drilling will not be counter to the public interest; (4) imposition on oil companies of liability for cleanup and damages from oil spills; and (5) improvement of clean-up and tanker technology. The importance of making a realistic assessment of the severity of the energy crisis and the need for removing oil import quotas are stressed. The serious threat to the marine ecology which an oil spill off New England poses is discussed. (Grant-Florida)
W72-13209

LET STATES KEEP NO-DISCHARGE REGULATIONS FOR BOATS,
House, Washington, D.C.
D. M. Fraser.
Congressional Record, Vol. 118, p E5803 (daily ed.) May 25, 1972.

Descriptors: *Boating regulations, *Federal Water Pollution Control Act, *Federal-state water rights conflicts, *Water pollution sources, Boats, Boating, Minnesota, Wisconsin, Federal jurisdiction, State jurisdiction, Legislation, Water pollution, Treatment facilities, Waste storage, Waste treatment, Waste disposal, Sewage treatment, Public health.
Identifiers: *Marine toilets, *Holding tanks.

The joint House-Senate Conference Committee on the Water Pollution Control Act Amendments o

972 is urged to include and retain an amendment ermitting states to regulate and prohibit the ischarge of sewage from vessels into their rivers nd lakes. Without this amendment the bill reempts the entire area to the federal govern- ıent, which through the Environmental Protec- on Agency has specifically not prohibited such ischarges. A resolution from the Minnesota-Visconsin Boundary Area Commission to the .PA recommending that vessels with marine ›ilets be required to carry holding tanks is in- luded. The resolution considers that the proposed .PA regulations are unsound since they do not equire holding tanks and only require that marine ›ilets installed after 1973 be capable of providing econdary treatment. The Commission contends ıat: The required tanks would be consistent with ederal regulations, no device currently on the ıarket will perform secondary sewage treatment, ıe proposed EPA regulation will allow continued ollution, and serious doubts exist that recrea- onal vessel treatment plants will be properly ıaintained. (Grant-Florida)
/72-13210

OATING--WATER SANITATION.

ederal Register, Vol. 37, No. 132, p 13480, 1972.

)escriptors: *Boating, *Water quality control, Waste disposal, *National parks, *Great Lakes,)rainage practices, Water resources development, /ater law, Federal government, Federal jurisdic- on, Freshwater, Low water mark, Regulation, /ater management (Applied), Water pollution ontrol, Parks.

lotice is given herein of a proposal to amend sec- on 3.17 of Title 36 of the Code of Federal Regula- ons. The purpose of these amendments is to rohibit the dumping or discharge from vessels of /aste and refuse within park boundaries, where uch park boundaries extend into Great Lakes /ater areas beyond 1 mile from shore. Additional ontrols have become necessary to combat water ollution and maintain water quality in areas of the lational Park System which include Great Lakes /ater areas. The notice gives the specific changes ıade and the address to which interested persons ıay submit comments, suggestions, or objections. t is proposed that paragraphs (a) and (b) of Sec- on 3.17 be amended to read as follows: (a) in resh waters, the draining, dumping, or discharg- ıg of waste or refuse, including human waste, rom any vessel into the waters within the bounda- ıes of any federal area administered by the Na- onal Park Service is prohibited; (b) in salt water, ıe draining, dumping, or discharging of waste or efuse, including human waste, from any vessel, ıto the waters within the boundaries of any ederal area administered by the National Park ervice is prohibited within 1 nautical mile from ıe mean low waterline of the nearest shore. (Wid- ıan-Florida)
/72-13212

OTOMAC RIVER-WASHINGTON IETROPOLITAN REGION ENFORCEMENT 'ONFERENCE.

or primary bibliographic entry see Field 05G.
/72-13213

;RACI V. UNITED STATES (GOVERNMENTAL MMUNITY FROM SUIT FOR FLOODWATER)AMAGE).

56 F.2d 20-28 (5th Cir. 1971).

)escriptors: *Louisiana, *Mississippi River, Flood damage, *Judicial decisions, *Damages, .egislation, Legal aspects, Navigation, Projects, 'ederal project policy, Negligence, Federal ju- ›diction, Hurricanes, Storms.
dentifiers: *Governmental immunity, *Federal 'oet Claims Act, *Flood Control Act.

Plaintiffs, landowners in Orleans and St. Bernard Parishes, Louisiana, sued the United States under the Tort Claims Act for floodwater damage. Plaintiffs contended that due to defendant's negligence in constructing the Mississippi River-Gulf Outlet, hurricane-driven waters from Hurricane Betsy overflowed the outlet onto their lands. Defendant contended that it was immune from suit for floodwater damages by virtue of Section 3 of the Flood Control Act of 1928. The United States Court of Appeals, Fifth Circuit held that from a reading of the history and case law construction of the Flood Control Act it was clear that Section 3 prohibits suit only in relation to flood control programs authorized by Congress and not to flood damage arising out of acts unrelated to such programs. The court ruled that the Gulf Outlet was not a flood control project, but a navigation project and therefore Section 3 did not confer immunity from suit for flood damage proximately caused by defendant's negligence in project construction. The court also held that the Tort Claims Act overruled any cases which recognized wholesale governmental immunity for any flood damage. (Grant-Florida)
W72-13215

UNITED STATES V. CROW, POPE AND LAND ENTERPRISES, INC. (DEFINITION OF NAVIGABILITY UNDER THE REFUSE ACT).

340 F.Supp. 25-37 (N.D. Ga. 1972).

Descriptors: *Georgia, *Rivers and Harbors Act, *Navigable rivers, *Legal aspects, Water pollution, Riparian land, Non-navigable waters, Constitutional law, Federal jurisdiction, Feasibility, Economic feasibility, Project feasibility, Discharge (Water), Rivers, Judicial decisions, Legal aspects.
Identifiers: *Corps of Engineers, *Refuse Act.

Plaintiff United States brought suit against defendant real estate developer and apartment complex owner to enforce the Refuse Act. Defendant owned riparian land on the west bank of the Chattahoochee River, near Atlanta. Defendant contended that the portion of the river in question was nonnavigable and therefore the Refuse Act was inapplicable. The United States District Court for the Northern District of Georgia held that in order to be navigable and within the federal jurisdiction a water body must be presently used as or suitable for use as a navigable waterbody, have been used as or been suitable for such use in the past, or suitable for such use in the future by reasonable improvement. The court also held that the portion of the river in question was nonnavigable and that there was no evidence that defendant's discharge would be washed down to a navigable part of the river. The court ruled that use of the river by light pleasure craft was insufficient evidence of present navigability, that past use by three ferries was insufficient to prove past navigability, and that a Corps of Engineers feasibility study in 1879 was not relevant in 1972. (Grant-Florida)
W72-13218

ENVIRONMENTAL PROTECTION AGENCY--GENERAL GRANT REGULATIONS AND PROCEDURES; STATE AND LOCAL ASSISTANCE.

Federal Register, Vol 37, No 112, p 11650-11663, June 1972.

Descriptors: *Water pollution control, *Planning, *Grants, *Regulations, Administrative agencies, Adoption of practices, Administration, Administrative decisions, Standards, Institutions, Institutional constraints, Federal government, Air pollution, Governmental interrelations, Legal aspects, Waste water treatment, Water quality control.
Identifiers: *National Environmental Policy Act, *Environmental Protection Agency.

Interim regulations are promulgated to amend the Environmental Protection Agency's general grant regulations and to publish a new codification of state and local assistance grant regulations supplementing the general grant regulations. The purpose of the regulations is to better coordinate policies and procedures and to better inform prospective grantees. The revisions of EPA general grant regulations constitute purely technical clarifications and not substantive changes. The new part relative to supplemental grants is an attempt to better coordinate EPA policy and procedure. The grant regulations deal with water pollution control planning requirements, water quality management planning grants, solid waste planning grants, air pollution control program grants, water pollution control state and interstate program grants, and grants for construction of wastewater treatment works. The procedures cover eligibility, application requirements, grant limitations, award criteria, required reports, continuation grants, grant amounts, and other administrative requirements. (Grant-Florida)
W72-13219

MARINE SANITATION DEVICE STANDARD.

Federal Register, Vol 37, No 122, p 12391-12393, June 1972.

Descriptors: *Water pollution sources, *Regulation, *Sewage effluents, *Sanitary engineering, *Standards, Boating regulations, Ships, Marine bacteria, Adoption of practices, Administrative agencies, Technology, Microorganisms, Coliforms, Sewage bacteria, Environmental effects, Disposal.
Identifiers: *Marine sanitation devices, Environmental Protection Agency.

Marine sanitation device discharge regulations have been rewritten to conform to the state of existing technology. The regulation applies only to vessels operating in navigable waters of the United States which are equipped with marine toilets. Such vessel toilets must be designed so as to completely prevent any discharge of treated or untreated sewage into navigable waters. The prohibition becomes effective for new vessels two years after promulgation of the regulations and for old vessels five years after such regulations. The regulation is designed to coincide with widespread construction of dockside pumpout treatment facilities. As an interim measure a marine sanitation device which is capable of reducing fecal coliform bacteria to 1,000 per 100 mililiters and which prevents the discharge of an effluent with visible floating solids is acceptable. If such device is installed three years after promulgation of regulations the interim permission lasts for the life of the device. Those installed after three years from promulgation but before discharge is prohibited may be used for three years after the discharge prohibition becomes effective. Provisions are made for states to apply for regulations completely prohibiting sewage discharge into their waters. (Grant-Florida)
W72-13220

AN ACT...IN RELATION TO PROHIBITING INSURANCE COVERAGE AGAINST ENVIRONMENTAL POLLUTION.

New York Laws ch. 765 (1971).

Descriptors: *New York, *Legislation, *Damages, *Insurance, *Compensation, *Protection, Pollution, Legal aspects, Negligence, penalties (Legal), Regulation, Contracts, Discharge, Disposal, Air pollution, Water pollution, Environmental effects, Bodies of water.

The Act is amended to prohibit insurance carriers from insuring commercial and industrial enterprises against environmental pollution they cause. Section 1 prohibits insurance against liability for

personal injury, wrongful death, or economic loss from the negligent rendering of professional services causing pollution or contamination caused by discharge, disposal, release or escape onto land, water or the atmosphere unless it is sudden or accidental. Section 2 prohibits insurance against property damage liability incurred by the insured arising from such pollution or contamination as is specified in section 1. (Grant-Florida)
W72-13221

AN ACT...IN RELATION TO REMOVAL OF ILLEGAL FILL IN PROTECTED WATERS.
New York Laws ch. 713 (1971).

Descriptors: *New York, *Land fills, *Excavation, *Administrative agencies, *Taxes, *Penalties (Legal), Law enforcement, Legislation, Public health, Environmental effects, Bodies of water, Public rights, Penalties, Legal aspects, Adoption of practices, Environment.

The Act confers authority on the Commissioner of public safety to investigate any and all fills or excavations in or on waters of the state which in his judgment are illegal. The Commissioner may investigate the effect such fills or excavations may have on the health, safety, and welfare of the people and their effect on the natural and other environmental resources of the state. After notice and hearing the Commissioner may order any person or local public corporation who henceforth makes an illegal or unsafe fill or excavation to remove, replace, or correct the excavated materials or fill. The Commissioner may enforce his orders upon the respondent's failing omitting, or neglecting to comply by seeking a fine in court. The Commissioner may additionally, upon violation of any such order, enter lands or water where the condition exists and take such actions as are necessary to safeguard life, property, and the environment. Any costs incurred by the state for taking such necessary action may be taxed to the real property upon which the excavation or fill was made and shall become a tax lien against the property. (Grant-Florida)
W72-13222

WATER--RIVERS AND STREAMS--MINIMUM FLOW.
Conn. Public Act No 229 (1971).

Descriptors: *Connecticut, *Legislation, *Flow rates, *Regulation, *State governments, Flow control, Legal aspects, Water management (Applied), Standards, Stocking, Penalties (Legal), Law enforcement, Public rights, River regulation, Administrative agencies, Adoption of practices.

The water resources commission shall, after due consultation, consideration, and notice, hold a public hearing and, not earlier than thirty days thereafter, shall promulgate regulations establishing instantaneous minimum flow standards and regulations for all stocked river and stream systems. These shall: (1) apply to all river and stream systems for which it is reasonably necessary to keep a sufficient flow of water to protect and safely maintain the fish placed therein, (2) preserve and protect the natural aquatic life contained within such waters, (3) preserve and protect the natural and stocked wildlife dependent upon the flow of such water, (4) promote and protect the usage of such water for public recreation, and (5) be consistent with the public need and lawful uses of such waters. The commission shall issue an order, which shall include a time schedule to be followed, to any violators of this act to comply with its regulations. If such person does not comply the commission is empowered to seek injunctive relief to stop such person, firm or corporation from restricting the flow of such water. (Widman-Florida)
W72-13223

SALT WATER IS A MINERAL: OWNERSHIP OF A NATURAL RESOURCE OF INCREASING IMPORTANCE IN OIL PRODUCING STATES,
For primary bibliographic entry see Field 03E.
W72-13225

ON BUYING CLEAN WATER--REFLECTIONS ON THE GEORGIA WATER POLLUTION CONTROLS,
For primary bibliographic entry see Field 05G.
W72-13226

GEORGIA'S ENVIRONMENTAL LAW: A SURVEY,
For primary bibliographic entry see Field 05G.
W72-13227

WATER POLLUTION CONTROL LEGISLATION--1971 (H.R. 11896, H.R. 11895).
For primary bibliographic entry see Field 05G.
W72-13228

A CITIZEN'S ACTION HANDBOOK: THE REFUSE ACT PERMIT PROGRAM,
Natural Resources Defense Council, New York.
For primary bibliographic entry see Field 05G.
W72-13229

ON MARYLAND'S ENVIRONMENTAL SERVICE,
E. E. Halmos.
Water and Sewage Works, Vol 119, No 4, p 54-59, April 1972. 7 fig.

Descriptors: *Management, *Legislation, *Financing, *Personnel, Water supply, Sewage, *Maryland state governments, Administrative agencies, Local governments.
Identifiers: *Environmental service.

Through its 1 1/2 year old Maryland Environmental Service (MES) the State is offering help to its counties and municipalities in matters such as local financing, availability of trained operators, and possible cost reductions through scale of projects. Upon request, the MES can perform several tasks. (1) Undertake design, construction and operation of either large scale regional systems or local systems, (2) 'Buy out' a local treatment plant and operate it-or operate a whole system - for an agreed-upon fee based on retirement of bonds and operating costs (collector systems and decisions on extensions remain with the local government). (3) Assist in financing, by arranging temporary loans, then combining several such into a major bond issue for long-term retirement, with each participating government picking up payments of interest and principal on its share of the total. For such service, MES has set an annual service charge of $250. Obtaining trained, qualified personnel has been a serious problem for many communities, most of which cannot individually pay salaries commensurate with responsibilities. MES can provide such personnel by (1) buying and operating, or (b) agreeing to a contract to operate the system, while ownership remains local. The Governor has designated MES as the official river basin planning agency. The regional approach seems best in a state whose terrain varies from tidal lowlands in the East to mountainous western sectors. One of the MES biggest tasks is to educate local governmental leaders as to what the organization can do. There is no plan to build a large organization. (Bean-AWWARF)
W72-13256

GUIDELINES FOR DISCHARGE WATERS ARE BEING STUDIED.
For primary bibliographic entry see Field 05G.
W72-13328

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Department of Housing and Urban Development, Washington, D.C. Community Resources Development Administration.
R. M. Paul.
Journal of the American Water Works Association, Vol. 63, No. 4, p 206-209, April 1971. 2 photo.

Descriptors: *Federal government, *Government finance, *Utilities, *Planning, Environment, Long-term planning, Economics.
Identifiers: *Federal assistance, *Water utility goals, Revenue-sharing.

Very few water utilities have well-defined long-range plans concerning such questions as where water lines will be built, how much the water will cost, when water will be supplied, and where future supplies will be found. Until answers are provided, serious doubt will exist about whether accurate forecasts of future federal assistance are possible. Although many federal agencies dealing with water utility matters have not defined their objectives, this is not the case with the Department of Housing and Urban Development (HUD). The objectives of HUD are: (1) to provide decent housing for all Americans, (2) to provide a suitable living environment for every American, and (3) to improve the management of community development. An overview for water planning is needed. Too often, urban-development projects have ignored the opportunities and constraints of the physical environment. The primary environmental consequences of a project have not been considered important. Federal assistance for water utilities will depend on providing adequate consideration of the social environment. There is a need for communication directly with the people to be served in order to understand their particular problems. This 'new look' in water-utility planning and construction will be paralleled by new approaches at the federal level. Emphasis will be on revenue-sharing to filter money back to state and local governments. The water utilities must clearly demonstrate their commitment ot help meet national environmental goals. (See also W72-13556 and W72-13557) (Strachan-Chicago)
W72-13555

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Farmers Home Administration, Washington, D.C. Community Services Div.
D. E. Sprague.
Journal of the American Water Works Association, Vol. 63, No. 4, p 209-210, April 1971.

Descriptors: *Federal government, *Government finance, *Utilities, *Planning, Waste disposal, Resources development, Economics, Loans, Grants.
Identifiers: *Federal assistance, *Water utility goals, Funding.

The Farmers Home Administration (FHA) has helped rural communities with the development of water facilities since 1937. Public Law 89-240 (1965) amended the Agricultural Act of 1961, to provide authority for the FHA to extend financial assistance, including both loans and grants up to a maximum of $4,000,000 to rural communities for the development or improvement of domestic water and waste disposal facilities. Public or quasi-public agencies and private nonprofit corporations may recieve financial and technical assistance in planning, developing, and improving facilities for extending water and waste-disposal service, provided they are unable to obtain adequate credit from other sources. Funds may be used to install and improve: (1) works for the development, treatment, purification, and distribution of water, and (2) facilities for the collection, treatment, and disposal of human, animal, and other wastes. The

Economic Research Service of the Department of Agriculture has determined that there are over 34,000 rural towns without adequate water systems and 44,000 communities without adequate central sewer systems. The needs for water and waste disposal plus assistance in their development are great. It is obvious that the FHA will be unable to handle all requests for financial assistance. Other federal agencies, such as the Economic Development Administration, the Federal Water Pollution Control Administration, and the Department of Housing and Urban Development have been authorized to assist communities with the development of water and waste disposal facilities. Cooperation between interests and these agencies is the best approach to water problems. (See also W72-13555 and W72-13557) (Strachan-Chicago)
W72-13556

FEDERAL ASSISTANCE IN ACHIEVING WATER UTILITY GOALS, JOINT DISCUSSION,
Economic Development Administration, Washington, D.C.
H. S. Brooks.
Journal of the American Water Works Association, Vol. 63, No. 4, p 210-212, April 1971.

Descriptors: *Federal government, *Government finance, *Utilities, *Planning, Economics, Resources development, Coordination, Grants, Loans, Training.
Identifiers: *Federal assistance, *Water utility goals, Economic-development oriented, Technical assistance.

The Economic Development Administration (EDA) in the Department of Commerce was created in 1965 to provide federal financial assistance to economically distressed areas of the US in order to enable those areas to plan and finance effective development. The basic objectives of the program are to cut down on joblessness in depressed areas, to bring employment more in line with the rest of the country, and to restore vitality and growth to those areas. EDA is economic-development oriented. It encourages overall area planning. Grants and loans for public works and development projects, business loans, technical assistance, and retraining of workers are the implements of the Administration. The jobless worker and the depressed area are impediments to a vibrant economy. In helping to alleviate these conditions, the EDA program is promoting the well-being and prosperity of the entire country. The policy of EDA is that projects must be originated by local interest. EDA participation must be requested by a responsible area organization, and the initiating body must be willing to commit local funding. Projects accepted by EDA for consideration are coordinated with interested local and state agencies, plus other elements of the federal government. (See also W72-13555 and W72-13556) (Strachan-Chicago)
W72-13557

PRICING POLLUTION AND OTHER NEGATIVE EXTERNALITIES,
Ohio State Univ., Columbus. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-13559

BENEFITS OR COSTS. AN ASSESSMENT OF THE WATER RESOURCES COUNCIL'S PROPOSED PRINCIPLES AND STANDARDS,
Resources for the Future, Inc., Washington, D.C.; George Washington Univ., Washington, D.C.; Johns Hopkins Univ., Baltimore, Md.; Wisconsin Univ., Madison; and Harvard Univ., Cambridge, Mass. Harvard Development Advisory Service.
For primary bibliographic entry see Field 06B.
W72-13562

PUBLIC WATER RESOURCE PROJECT PLANNING AND EVALUATION: IMPACTS, INCIDENCE, AND INSTITUTIONS,
Wisconsin Univ., Madison. Dept. of Agricultural Economics; and Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W72-13565

6G. Ecologic Impact of Water Development

TOWARD AN ECONOMICS OF ECOLOGY,
H. Henderson.
Columbia Journal of World Business, p 31-40, May-June, 1972. 15 ref.

Descriptors: *Ecology, *Economics, *Environmental effects, *Social impact, Equilibrium, Cost-benefit analysis, Profit.
Identifiers: *Economic incentives, Economic growth, Steady state equilibrium.

Narrowly defined economic values have recently been seriously questioned by ecologists and environmental protectionists. This growing consciousness that policies of maximum growth, by private or state-directed means, often produce unacceptable and unanticipated social and environmental costs has led to deeper questioning of such economic concepts as profit and gross national product. By focusing on concepts as profit, an economy maximizes its pollution-creating activities. Consequently, new analytical tools need to be developed. Such tools should be aimed at an accurate assessment of the social and environmental diseconomies of private and public economic policies. Only with improved measurement tools can the impact of such projects as the Royal Dutch/Shell's proposed supertanker port in Wales be fully evaluated. Once we begin to account for diseconomies, we should enjoy benefits in the form of (1) better energy-conversion ratios, (2) better resource management and rehabilitation, and (3) better market research into those areas where individual consumer choice is inoperative until it is 'aggregated'. Furthermore, we will better recognize the need to approach a steady-state equilibrium which will make realistic demands on our natural resource reserves. (Settle-Wisconsin)
W72-13087

DIMENSIONS OF THE ENVIRONMENTAL CRISIS,
J. A. Day, F. F. Fost, and P. Rose.
John Wiley and Sons, Inc.: New York, N. Y., London, England. 1971. 212 p. Illus. Pr. $5.95.
Identifiers: Conservation, Dimensions, Ecosystems, *Environment, Human population, Pollution, *Interdisciplinary approach.

The purpose is to emphasize the many interrelated dimensions of the environmental crisis and to demonstrate that a permanent solution can come only through an interdisciplinary approach in which knowledge of the humanities is integrated with that of science and technology. An attempt is made to explore the basic nature of environmental problems and their solutions. Section 1, cultural background includes the following papers: The Cultural Basis for Our Environmental Crisis, by L. W. Moncrief; The Population Explosion and the Rights of the Subhuman World, by J. B. Cobb, Jr.; Our Treatment of Environment in Ideal and Actuality, by Yi-Fu Tuan. Section 2, the global aspect, includes Montgaging the Old Homstead, by Lord Ritchie-Calder, and The Convergence of Environmental Disruption, by M. I. Goldman. Population and the Dignity of Man, by R. L. Shinn, and The Energy Revolution: Peril and Promise, by G. Taylor are found in Section 3. Section 4, basic appraoches to the solution, includes the following papers: Ecosystem Science as a Point of Synthesis, by S. D. Ripley and H. K. Buechner; How Should the University Treat Environment, by F. K. Hare; From Conservation to Environmental Law, by D. Sive; Pollution Problems, Resource Policy, and the Scientist, by A. W. Eipper; and The Experimental City, by A. Spilhaus. Reference sources for each section are included.--Copyright 1972, Biological Abstracts, Inc.
W72-13145

THE CHESAPEAKE BAY, REPORT OF A RESEARCH PLANNING STUDY,
Johns Hopkins Univ., Baltimore, Md.; Maryland Univ., College Park; and Virginia Inst. of Marine Science, Gloucester Point.
R. F. Beers, B. Filmore, L. M. Brush, Jr., R. J. Byrne, and L. E. Cronin.
Available from the National Technical Information Service as PB-201 189, $3.00 in paper copy, $0.95 in microfiche. March 1971. 219 p, 7 fig, 7 tab. NSF G I-47.

Descriptors: *Chesapeake Bay, *Environmental control, *Planning, *Regional analysis, *Decision making, *Environmental effects, Management, Water conservation, Census, Administration, Project post-evaluation, Bays, Water quality, Systems analysis, Input-output analysis, Computer models, Estuaries, Forecasting, Project planning, Oceanography.
Identifiers: *Impact studies, Interdisciplinary studies, Research management, Research needs.

An interdisciplinary study team of personnel from universities and other organizations conducted studies of the environment in Chesapeake Bay. There were three objectives: (1) to design a program to enable various institutions within the Chesapeake Bay region to contribute more effectively to better management and control of this complex environmental system; (2) to define and coordinate the research which must be done to best contribute to the decision-making process; and (3) to propose an organization for coordinating and directing the program. To achieve these first objectives, an inventory was made of entities, processes and characteristics of the region. Ways were suggested for extending and utilizing the inventory. Systems models and information procedures were explored and research was proposed to contribute to better management of the environment. A Chesapeake Research Consortium is proposed. It would be under the direction of a full-time executive who would be answerable to a Board of Directors comprised of representatives from The Johns Hopkins University, The University of Maryland and the Viriginia Institute of Marine Science. Case studies of existing and proposed facilities surrounding Chesapeake Bay are suggested as a means of contributing to the inventory data bank and to prosecution of long-range goals directed to input-output analysis. (Poertner)
W72-13165

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI (NATCHEZ AREA) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 08A.
W72-13217

PROPOSED BIG CYPRESS NATIONAL FRESH WATER RESERVE, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
National Park Service, Richmond, Va. Southeast Region.

Available from the National Technical Information Service as PB-206 380D, $3.00 in paper copy, $0.95 in microfiche. February 5, 1972. 84 p, 3 map, 1 tab, 10 ref, 2 append.

Descriptors: *Wetlands, *National parks, *Florida, *Environmental effects, Multiple-purpose projects, Conservation, Federal reservations, Public lands, Adoption of practices, Social aspects, Water quality control, Water management (Applied), Comprehensive planning, Project planning, Estuaries, Aquatic habitats, Swamps.
Identifiers: *Environmental Impact Statements, *Big Cypress Swamp (Fla.).

The proposed project involves acquisition of 585,000 acres in Big Cypress Watershed in Collier, Monroe, and Dade Counties, Florida, by the federal government. These areas are critical to the protection of freshwater resources of the Everglades National Park, estuarine regions, and cities of southwest Florida. The acquisition period would cover 10 years. The ecosystem of Big Cypress is described in detail. The project will have a favorable impact on the environment by controlling drainage and maintaining high water quality, quantity, and flow to park estuaries and preserving future water supplies for southwest Florida. Indian cultures in the area can continue in traditional surroundings. Unfavorable impacts are all economic, including loss in taxes and development opportunities. Alternatives considered include taking no action to protect Big Cypress and the following alternative methods of protection: land use planning and zoning, joint local-federal control, control by trusteeship, federal land use restrictions, and control by a public corporation. Appendices contain lists of flowering plants and animals considered significant to the ecosystem. (Widman-Florida)
W72-13224

ON BUYING CLEAN WATER--REFLECTIONS ON THE GEORGIA WATER POLLUTION CONTROLS,
For primary bibliographic entry see Field 05G.
W72-13226

GEORGIA'S ENVIRONMENTAL LAW: A SURVEY,
For primary bibliographic entry see Field 05G.
W72-13227

THE CRISIS IN POWER-PLANT SITING,
Oak Ridge National Lab. Tenn.
For primary bibliographic entry see Field 05B.
W72-13321

ENERGY-ENVIRONMENT DILEMMA: SOLUTIONS SOUGHT.
For primary bibliographic entry see Field 05G.
W72-13323

CONSERVATIONISTS WIN LAKE COOLING TOWER BATTLE.
For primary bibliographic entry see Field 05G.
W72-13326

MANAGING THE POWER SUPPLY AND THE ENVIRONMENT.

Report of the Federal Power Commission's National Power Survey Task Force on Environment, Washington, D.C., July 1, 1971. 41 p.

Descriptors: *Electric power, *Environmental effects, *Electric power industry, *Nuclear powerplants, Costs, Regulation, Air pollution, Aesthetics, Water pollution, *Thermal pollution, Sites, Radioactivity effects.

The Task Force urges that the electric utilities should take the responsibility for resolving environmental problems. Regulatory agencies should face squarely the fact that the cost of environmental safeguards is a part of the cost of producing electricity. The future demand for power is discussed, considering forces which accelerate electrical power usage and possibilities for slowing it down. The electric industry's growth produces environmental effects in the areas of air, water and land use, thermal and radiological pollution and aesthetics. Problems in these areas, effects of regulations on costs and competitive energy sources and some possible solutions are mentioned. Research and development are needed to make the process of power supply more efficient so that environmental consequences will be less. The costs of lessening environmental problems are predicted with a recommendation for better cooperation among the industry, the regulatory authorities and the public. The task force listed problems with power production which nuclear power can solve and stated that with effort, nuclear power should provide electricity at the least cost and with little environmental impact. (Eagle-Vanderbilt)
W72-13332

THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION.
National Water Commission, Arlington, Va. Consulting Panel on Waste Heat.
For primary bibliographic entry see Field 05B.
W72-13355

THERMAL POLLUTION IN UNCHARTED WATERS.
For primary bibliographic entry see Field 05C.
W72-13452

WORLD AND WATER IMPERATIVES: WORLD CITY OF THE FUTURE,
Doxiadis Associates, Athens (Greece).
For primary bibliographic entry see Field 05G.
W72-13549

INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS, UNITED STATES.
National Air Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 06B.
W72-13563

07. RESOURCES DATA

7B. Data Acquisition

DETECTION OF ABANDONED UNDERGROUND COAL MINES BY GEOPHYSICAL METHODS.
HRB-Singer, Inc., State College, Pa. Environmental Sciences Branch.
For primary bibliographic entry see Field 05B.
W72-13045

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley; California Univ., Irvine; California Univ., Davis; California Univ., Los Angeles; California Univ., Riverside; and California Univ., Santa Barbara.
R. N. Colwell, C. W. Churchman, R. H. Burgy, G. A. Thorley, and G. Schubert.
Available from NTIS, Springfield, Va 22151 as N71-32896, Price $3.00 paper copy, $0.95 microfiche. California University Space Science Laboratory Report, May 1, 1971. 255 p. NASA Grant NGL 05-003-404.

Descriptors: *Remote sensing, *Water resources development, *California, Aircraft, Satellites (Artificial), Data collections, Data processing, Environmental effects, Water pollution sources, Pollutant identification.
Identifiers: California Water Project.

This progress report describes (1) the integrate approach in the study of earth resources in th State of California by means of remote sensin and (2) the concentrated effort on one of the mo significant components of California's eart resources, the California Water Project. Some o the complex socio-economic factors involved i the California Water Project are reviewed, cor sidering the potential users of water resources an the potential managers of water resources. Th parameters that govern the yield of water, espe cially in the source or headwaters area of th California Water Project, the surface and subsu face flow of water, and the consumption of wate are defined. The largest section deals with effor to determine the extent to which remote sensin can be used to measure hydrologic parameters i the source, central, and sink areas of the Califo nia Water Project. Remote sensing studies ar proposed for the Coastal and River Delt resources. Approximately 75% of California population lives in the Coastal zone. Suc problems as monitoring compliance to law governing sewage disposal and industrial develo ment and the resultant change in land use and e vironment, provide additional uses of remot sensing technology. (Knapp-USGS)
W72-13052

AN ANNOTATED BIBLIOGRAPHY O REMOTE SENSING OF AIR AND WATER POL LUTION,
Iowa Univ., Iowa City.
For primary bibliographic entry see Field 05A.
W72-13055

AN AUTOMATIC DIGITAL WATER LEVE FOLLOWER,
Centre National de la Recherche Scientifiqu Toulouse (France). Hydraulic Lab.; and Toulou Univ. (France) Institut de Mecanique des Fluides J. Piquemal.
Journal of Hydraulics Research, Vol 9, No 4, 555-563, 1971. 8 fig, 1 ref, append.

Descriptors: *Water levels, *Water level fluctu tions, *Instrumentation, Measurement, Accurac Data processing, Digital systems, Automatic co trol, Manual control, Remote sensing, Autom tion, Gages.
Identifiers: *Water-level recorders, France, Co savings.

A new system for remote reading of a digital wat level gage, which automatically follows very slo water level variations, provides a simpl economical means of continuous water level me surement. The measuring system is simple design, inexpensive, and accurate within a fe tenths of a mm when operating automatically. Th remote-reading water level measuring device easily adapted to automatic data processing app cations. The principle of the water level follow and the practical features of the system a discussed. The system may be operated manua by switching from the automatic position manual. When manually operated, the water le accuracy is plus or minus 0.1 mm. (USBR)
W72-13118

THE VERTICAL SLOT AS A FLOW MEASUR MENT DEVICE,
Waterloo Univ. (Ontario); and Ontario Wa Resources Commission, Toronto.
H. M. Hill, F. C. Ford, and T. E. Unny.
Engineering Journal, Canada, Vol 55, No 1-2, F V, Jan-Feb 1972. 10 fig, 4 ref, 2 append.

)escriptors: *Flow measurement, *Open channel low, *Water measurement, Hydraulic structures, nalysis, Limiting factors, Measurement, Viscosi-y, Discharge coefficient, Velocity, Discharge Water).
dentifiers: Canada, Slots, Critical depth, Test esults.

. simply constructed, low cost open channel flow easurement device with minimal submergence ermits passing debris without changing flow con-itions within the measurement structure. The ow constriction which causes critical depth to oc-ur, is accomplished by 2 walls of equal length rotruding from channel walls. Because this flow easurement structure causes critical depth, pro-ided the submergence ratio is not less than a miting value, the flow is a unique function of the pstream depth, allowing the designer to take only ne measurement. Wingwalls may be used with ie slot to prevent silting when the water carries ebris. The vertical slot is simple to build, inex-ensive, and may be built of either steel plate or oncrete, depending on the size of the channel and pplication. The discharge coefficient is deter-ined for the normal operating regime of the mea-uring device. The limitations caused by viscosity, rowning, and constricting wall thickness are efined. (USBR)
/72-13129

ISIBLE AND NEAR INFRARED REMOTE-SENSING OF SOIL MOISTURE LEVELS,
ennessee Univ., Knoxville.
I. Sewell, W. H. Allen, and R. S. Pile.
ransactions American Society of Agricultural ngineers, Vol 14, No 6, p 1163-1166, Nov-Dec. 971. 5 fig, 4 tab, 9 ref.

)escriptors: *Remote sensing, *Aerial photog-aphy, Soil moisture, Water content, Photog-aphy, Drainage, Irrigation, Laboratory tests, On-te tests, Films, Cameras, Loam, Thermal radia-on, Soil surfaces, Soils, Moisture, Moisture con-nt filters.
dentifiers: Infrared imagery, Infrared photog-aphy, Photography, Optical instruments, Photo nterpretation, Infrared detectors.

aboratory and field tests using infrared photo-raphic techniques show that detecting differences surface soil moisture levels of fallow soils is chnically possible. A technique for evaluating ie soil moisture levels of large areas will be useful locating areas needing improved drainage and or scheduling irrigation. Differences between film ensity and surface moisture were detected best ith color infrared film and Wratten No 15 or No 5 plus 80B film filters. While black-and-white in-ared film can also be used to detect surface soil oisture differences, color infrared film exhibited eater variations in the tone associated with soil oisture differences. Variations in optical density f infrared photographs are more closely related to olor and reflected light than to thermal proper-es. The precision of aerial infrared photographic udies may be adversely affected by varying oud cover, different sun angles, differences etween film lots, and differences between runs in lm processing. Evaluating soil moisture levels of oils having heavy vegetal cover may be difficult. JSBR)
/72-13130

MICROSPLITTER FOR SUBSAMPLING MALL PARTICULATE SAMPLES,
ommonwealth Scientific and Industrial Research rganization, Canberra (Australia). Div. of Soils.
or primary bibliographic entry see Field 02J.
/72-13183

NEW FILTERING WATER BOTTLE,
ohns Hopkins Univ., Baltimore, Md. Chesapeake ay Inst.
or primary bibliographic entry see Field 02J.
W72-13184

A QUANTITATIVE X-RAY DIFFRACTION TECHNIQUE APPLIED TO FINE-GRAINED SEDIMENTS OF THE DEEP GULF OF MEXICO,
LeNickel (Australia) Exploration Party Ltd., Perth.
For primary bibliographic entry see Field 02J.
W72-13186

A NOTE ON THE MEASUREMENT OF PLANAR VELOCITY FIELDS BY STEREO--PHOTOGRAMMETRY,
Southampton Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13200

IMMEDIATE AND REMOTE DATA PROCESSING SYSTEM FOR LAKE CHAMPLAIN,
Vermont Univ., Burlington. Lake Champlain Studies Center.
E. B. Henson.
Available from the National Technical Information Service as PB-211 606, $3.00 in paper copy, $0.95 in microfiche. Vermont University Lake Champlain Studies Center, Completion Report, March 1972. 19 p, 5 fig. OWRR B-003-Vt (1).

Descriptors: *Remote sensing, *Data processing, *Lakes, *Data collections, *Telemetry, Radio communication systems, Instrumentation, Water temperature, Winds, Currents (Water), Electronic equipment, Data transmission, *Vermont, New York.
Identifiers: *Lake Champlain (Vermont and New York).

Details are given for communications and data processing system developed to assist and facilitate hydrologic research on Lake Champlain (Vermont and New York). The system functions for Audio Information Transmission (AITS) and for Remote Information Processing (RIPS). Both of these functions utilize broadcasting signals to a repeater unit situated on a television tower on the top of Mt. Mansfield. The repeater then transmits the signal to base control at the University of Vermont on another assigned frequency. The AITS allows voice communication between base control and any of four research vessels on the lake, or between any of the four vessels. The research leader is therefore able to coordinate sampling with as many as four boats on the lake at the same time. The RIPS is able to collect, translate, transmit, and record selected data from a remote position on the lake according to an assigned time schedule. RIPS is housed in a buoy anchored in open Lake Champlain, and is designed to telemeter data to base control 12 times a day, giving information on wind and sea state conditions, water temperature, and water current direction. (Woodard-USGS)
W72-13262

A NEW TECHNIQUE FOR TIME-VARIANT GROUND WATER FLOW ANALYSIS,
For primary bibliographic entry see Field 02F.
W72-13263

'REAL-TIME' THERMAL-PROFILE MONITOR IS GIVEN A CHECKOUT.
For primary bibliographic entry see Field 05B.
W72-13327

A NEW MODEL OF THE KAJAK BOTTOM SAMPLER, AND OOTHER IMPROVEMENTS IN THE ZOOBENTHOS SAMPLING TECHNIQUE,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
Ilpo Hakala.
Ann Zool Fenn, Vol 8, No 3, p 422-426, 1971, Illus.
Identifiers: Benthos, *Bottom sampling, Improvements, Kajak corer, New, Sampling, Techniques, *On-site data collections.

Two multiple-unit versions of the Kajak type corer are described, one with 6 units and the other with 3 units and an automatic releasing mechanism. Both corers are made of polyvinylchloride and brass. A slicing device for use with the corers was designed to permit study of the vertical distribution of the zoobenthos. Further, a sieving technique especially suited for the study of the zoomeiobenthos is described, in which the sieving residue can be studied with the aid of a movable grooved disc in which the entire width of each groove is visible simultaneously at a magnification suitable for the study of the meiofauna. Detailed diagrams of the construction of these improvements are presented. It is suggested that the relatively large number of animals per unit area obtained with the aid of the technique described is chiefly due to the fact that, as in the original model, the tube corers do not disturb the surface layer of the bottom, where the density of zoobenthos is highest.--Copyright 1972, Biological Abstracts, Inc.
W72-13338

THE IMPORTANCE OF AERIAL PHOTOGRAPHY IN ESTABLISHING MORPHOGENETIC CLASSES OF BOG AREAS AND SYSTEMS,
E. A. Galkina, and V. N. Kiryushkin.
Dokl Komis Aeros'Emki Fotogrammetrii Geogr O-Va SSSR. 6. p 38-49. 1969.
Identifiers: *Aerial photography, *Bogs, Classes.

In the northern European part of the forest zone of the USSR, 10 classes of distinctive bog areas differing in the configuration of the bog depression and in the forms of the primary water currents are distinguished. These areas are in closed basins (on aerial photographs they are distinguished as round or oval forms, in addition to other characteristics), karst cones (same shape, but not more than 50 m in diameter), runoff depressions (fanshaped), etc. A table shows for each class the nature of the depression, shape of the network of flow lines, the course of development of the bog area and adaptation to the morphogenetic type of the relief. The morphogenetic subdivisions of bog systems are simple (consisting of a single type of bog area), complex (consisting of bog areas of a single class, but of different types), or very complex (consisting of bog areas of different classes).--Copyright 1972, Biological Abstracts, Inc.
W72-13369

TECHNIQUE OF SOIL STUDY OF THE ROUTES OF MOVEMENT OF LIQUID MOISTURE IN THE SOIL,
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 02G.
W72-13373

A NEW HYDROMETER,
California Univ., Davis.
K. Arulanandan, and S. S. Smith.
Soil Sci. Vol 112, No 3, p 206-212. 1971. Illus.
Identifiers: *Hydrometers, *Instrumentation, Moisture, Soils.

A new hydrometer is described that offers both the accuracy of the pipette method and the simplicity of the Cassagrande Hydrometer. The hydrometer and the pipette give the same results allowing for slight differences in the preparation of the sample. The hydrometer is a continuous recording device. The necessary calculations are few and the distribution and summation curves can be obtained quickly from the deflection accumulation curve.--Copyright 1972, Biological Abstracts, Inc.
W72-13432

AN EVALUATION OF TWO NEUSTON SAMPLERS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05A.
W72-13446

RAIN GAGE CATCH VARIATION DUE TO AIRFLOW DISTURBANCES AROUND A STANDARD RAIN GAGE,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02B.
W72-13463

ULTRASONIC VELOCITIES OF THE DILATATIONAL AND SHEAR WAVES IN FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H. Foundations and Materials Research Branch.
For primary bibliographic entry see Field 02C.
W72-13470

ELECTRONIC MEASURING DEVICES IN AGROPHYSICAL INVESTIGATIONS (IN RUSSIAN).
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 03F.
W72-13486

7C. Evaluation, Processing and Publication

WATER RESOURCES OF WISCONSIN, CHIPPEWA RIVER BASIN,
Geological Survey, Washington, D.C.
H. L. Young, and S. M. Hindall.
For sale by USGS, Washington, DC 20240, Price $1.75 per set. Geological Survey Hydrologic Investigations Atlas HA-386, 4 sheets, 1972. 26 fig, 5 tab, 40 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater resources, *Water supply, *Wisconsin, Streamflow, Hydrogeology, Aquifers, Water yield, Water quality, Water utilization, Groundwater recharge, Water level fluctuations, Hydrologic cycle, Hydrologic data, Data collections, Maps, Hydrographs, Sediment transport.
Identifiers: *Chippewa River Basin (Wis).

This 4-sheet hydrologic atlas describes the physical environment and water resources of the Chippewa River Basin in Wisconsin. Igneous and metamorphic rocks of Precambrian age underlie the basin. Average annual precipitation is greatest in the east and northeast (34 inches) and lowest in the west (28 inches). Average runoff, 7,431 cfs, equals 10.7 inches per year on the basin. Water-level records for the wet and dry years generally responded to the extremes in precipitation. The net annual rise or fall of the water table is about 6 inches and 3 inches, respectively. Assuming a storage coefficient of 0.15, these changes in water level equal about 1 and 0.5 inch of water, respectively. High concentration of iron or manganese is the most common groundwater quality problem. About 1,750 billion gallons of surface water leave the basin as streamflow each year. The chemical quality of water in streams and lakes in the Chippewa River Basin is generally very good. The water is characteristically soft, except in the southwestern part of the basin. Average annual sediment yields range from less than 10 to more than 40 tons per square mile. (Woodard-USGS)
W72-13046

GEOLOGY, HYDROLOGY, AND WATER QUALITY OF THE TRACY-DOS PALOS AREA, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-13051

A WIDE-AREA INVESTIGATION OF WATER UTILIZATION--PRIMARY REPORT.
Ministry of Construction, Tokyo (Japan). River Bureau.
For primary bibliographic entry see Field 06D.
W72-13054

WATER RESOURCES INVESTIGATIONS IN HAWAII AND OTHER PACIFIC AREAS, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1970. 6 fig.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Rainfall, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in Hawaii, Guam, American Samoa, the Trust Territory of the Pacific Islands, and Okinawa are summarized. A selected bibliography of material concerning the areas is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 184 primary, secondary, and water management streamflow stations; 40 groundwater observation wells; and 26 surface water and 49 groundwater quality observing sites. Small State maps show principal sources of groundwater and average annual precipitation. A map, scale 10 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Hawaii, Guam, and American Samoa in September 1969. Other maps show hydrologic data networks in the Trust Territory of the Pacific Islands and Okinawa as of September 1969. (Woodard-USGS)
W72-13061

OPTIMIZATION MODEL FOR CHURCHILL RIVER DIVERSION,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 04A.
W72-13134

A MULTIPLE GROUPING METHOD FOR THE CHOICE OF ISOPLETH VALUES OF MINERAL DISTRIBUTION MAPS,
LeNickel (Australia) Exploration Party Ltd., Perth.
For primary bibliographic entry see Field 02J.
W72-13185

MAP PATTERN RECONSTRUCTION FROM SAMPLE DATA: MISSISSIPPI DELTA REGION OF SOUTHEAST LOUISIANA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W72-13190

IMMEDIATE AND REMOTE DATA PROCESSING SYSTEM FOR LAKE CHAMPLAIN,
Vermont Univ., Burlington. Lake Champlain Studies Center.
For primary bibliographic entry see Field 07B.
W72-13262

RADIOLOGICAL SURVEYS OF PEARL HARBOR, HAWAII, AND ENVIRONS, 1966-1968,
Eastern Environmental Radiation Lab., Montgomery, Ala.
For primary bibliographic entry see Field 05B.
W72-13271

SATELLITE CLIMATOLOGY,
K. Ya. Kondrat'yev.
Available from NTIS, Springfield, Va 22151- NASA TT F-723 Price $3.00 paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Technical Translation Report (NASA TT F-723), June 1972. 77 p, 24 fig, 9 tab, 102 ref. (Originally published as 'Sputnikova Klimatologiya, Hydrometeorological Press, 1971, Leningrad).

Descriptors: *Climatology, *Remote sensing, *Satellites (Artificial), *Cloud physics, *Data collections, Aerial photography, Infrared radiation, Climatic data, Temperature, Moisture content, Atmosphere, Precipitation (Atmospheric), Snow, Ice cover, Hydrology, Reviews, Analytical techniques, Instrumentation.

The successful functioning of meteorological space systems in the USSR and USA has resulted in a situation where the volume of satellite meteorological information exceeds by far the volume of all the usual meteorological data accumulated during many decades. The gigantic amount of data from satellite meteorological observations and their global nature have introduced the problem of utilizing all these data for climatological investigations. A generalization is made of the problem of the classification of cloudiness on the basis of satellite data and the regularities of the planetary distributions of cloud cover are discussed. The possibilities of working out semiempirical procedures are explored for determining the fields of temperature, moisture content, precipitation, vertical motions, and the distribution of snow and ice covers on the basis of utilizing television and infrared information. This report may be of interest to a broad group of specialists in the area of meteorology and atmospheric physics for space research. A bibliography includes 102 documents. (Woodard-USGS)
W72-13274

DATA FROM CONTROLLED DRILLING PROGRAM IN DU PAGE, KANE, AND KENDALL COUNTIES, ILLINOIS.
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 04B.
W72-13275

SIMULATION MODEL FOR THE UPPER WABASH SURFACE WATER SYSTEM,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W72-13301

SOME FEATURES IN THE DIURNAL VARIATIONS OF RAIN AND WIND OVER NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 02B.
W72-13302

PHYSICAL AND HYDROMETEOROLOGICAL CHARACTERISTICS OF THE SNOWY RANGE OBSERVATORY,
Wyoming Univ., Laramie. Water Resources Research Inst.
P. A. Rechard, and V. E. Smith.

Available from the National Technical InformationService as PB-211 618, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No. 30, June 2972, 168 p. OWRR-A-001-Wyo (56).

Descriptors: Precipitation (Atmospheric), Temperatures, *Solar radiation, *Wind velocity, *Streamflow, Snow, *Wyoming, *Meteorological data, Data collections.
Identifiers: *Snow depth, *Snow density.

Physical and hydrometeorological data from the Snowy Range Observatory are summarized and analyzed. Much of the data came from instrument sites operated and maintained by the Wyoming Water Resources Research Institute, but complementary data observed by the U.S. Geological Survey and the U.S. Soil Conservation Service are included. The kinds of data that are summarized are precipitation, temperature, solar radiation, wind, streamflow, and snow course.
W72-13306

HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM (HISARS) REFERENCE MANUAL,
North Carolina Water Resources Research Inst., Raleigh.
E. H. Wiser.
Available from the National Technical Information Service as PB-211 620, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 66, June 1972, UNC-WRRI-72-66, 194 p, 37 fig, 4 append. OWRR-A-045-NC (1).

Descriptors: *Data storage and retrieval, *Hydrologic data, *Climatic data, Information retrieval, *North Carolina, *Publications, *Compute programs, *Basic data collections, Streamflow forecasting, *Data processing.

This manual describes a computerized system for storage, retrieval, and routine processing of hydrologic data. Known as HISARS, the Hydrologic Information Storage and Retrieval System has been under development for several years. Although additional features of the system are planned, the current version will be useful for a larger number of potential users. The Reference Manual was prepared with the intention of making the system more widely available. The system is running on the IBM System/370 Model 165 computer at the Triangle Universities Computation Center, and can be used at any of the remote terminals scattered around the State. Data are stored on magnetic disk packs. By making use of an operating system feature known as the indexed sequential access method together with direct access capabilities of the PL/1 language, HISARS can retrieve any one of approximately 350,000 records directly. This makes it possible to determine weather or streamflow characteristics at any location and at any time for which data are available. It is also possible to compare different locations at the same time and to process records through time at a single location.
W72-13308

COMPILATION TECHNIQUES FOR MEDIUM--SCALE CADASTRAL MAPS ON HILLY TERRAIN,
R. Stalbov.
Sb Uch Zap Aspir Latv Nauchno-Issled Inst Zemled. 1. p 5-17. 1969.
Identifiers: *Mapping, *Crop production, Agriculture, Amelioration, Cadastral, Compilation, Crops, Distribution, Erosion, Hills, Maps, Soils, Structure, Terrain, Soil texture.

A method is proposed for compilation of cadastral maps required by agricultural boards (for the correct distribution of crops, specialization of farms, planning of crop yields, etc.) using large-scale maps. The maps are accompanied by data on the soil textures, relief, erosion by water and deflation, amelioration techniques, soil structure, structure of land utilization, fertilizer requirements and other data facilitating prediction of crop yields and the correct distribution of state purchases of agricultural produce.--Copyright 1972, Biological Abstracts, Inc.
W72-13371

BUMINES DATA PROMISE HELP IN IDENTIFYING PETROLEUM-SPILL SOURCES,
Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 05A.
W72-13443

CONCEPTUAL ANALYSIS OF RAINFALL AND RUNOFF DATA WITH A HYBRID COMPUTER,
Field Associates, Tucson, Ariz.
For primary bibliographic entry see Field 02A.
W72-13477

GROUND-WATER RESOURCES OF BENSON AND PIERCE COUNTIES, NORTH-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
P. G. Randich.
Available from U.S. Geological Survey, Washington, D.C., 20242, for $0.75. Geological Survey Hydrologic Investigations Atlas HA-476, 1972. 1 sheet, 7 fig, 11 ref.

Descriptors: *Groundwater resources, *Water supply, *Water yield, *Water quality, *North Dakota, Aquifer characteristics, Water wells, Water utilization, Maps, Curves, Hydrologic data, Water resources development, Irrigation water, Industrial water, Municipal water, Stock water.
Identifiers: *Benson County (N Dak), *Pierce County (N Dak).

This one-sheet hydrologic atlas provides information concerning groundwater resources in Benson and Pierce Counties, North Dakota for planning the development of water supplies for irrigation, domestic, stock, industrial, and municipal purposes. Groundwater is obtainable both from aquifers in the glacial drift of Quaternary age and in underlying bedrock formations of Cretaceous age. Aquifers of the glacial melt-water deposits generally will yield more than 50 gpm to individual wells and, in places, will yield more than 500 gpm. Three bedrock units of Cretaceous age supply water to wells in Benson and Pierce Counties. These are, in descending order, the Fox Hills Sandstone, Pierre Shale, and Dakota Sandstone. Most of the water from glacial-drift aquifers has a medium to high salinity hazard, but low sodium hazard. Water from the bedrock aquifers generally exceeds the very high salinity and sodium hazards. (Woodard-USGS)
W72-13587

INVESTIGATIONS OF SEAS BORDERING CENTRAL AMERICA (ISSLEDOVANIYA TSENTRAL'NO-AMERIKANSKIKH MOREY).
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 02L.
W72-13589

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (THE TRINITY RIVER BASIN, TEXAS),
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 04A.
W72-13609

08. ENGINEERING WORKS

8A. Structures

AN ALGORITHM FOR OBTAINING OPTIMAL LOOPED PIPE DISTRIBUTION NETWORKS,
Parsons, Brinckerhoff, Quade and Douglas, New York. Water Resources Systems Group.
C. A. Kohlhass, and D. E. Mattern.
In: Papers of the 6th Annual Symposium on the Application of Computers to the Problems of Urban Society, Association for Computing Machinery, New York, N.Y., October 29th, 1971, p 138-151. 5 fig, 1 tab, 9 ref.

Descriptors: *Linear programming, *Water distribution systems, Computer models, Mathematical models, Operations research, Systems analysis, Water works, Pipelines.
Identifiers: *Separable non-linear programming, Computer implementation.

The optimization of additions to a municipal water distribution system involves more than efficiency considerations. Such factors as public health and reliability of service must also be considered. A review of the state-of-the-art in water distribution system optimization is made. A new algorithm is defined to enable a linear program to optimize a looped distribution system. Its basis is the specification of minimum sized pipes to meet emergency flow requirements and the specification of flow as the linear programming decision variable. A discussion of the computer implementation of the algorithm includes decomposition of the distribution system, matrix generation, optimization using separable non-linear programming, and report writing. The checking of the optimization of a water distribution simulation model is discussed and typical computer run times are given. Cost savings resulting from application of the model are discussed.
W72-13042

TURBULENT PRESSURE FLUCTUATIONS IN WATER WITH ADDITIVES,
Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
For primary bibliographic entry see Field 0208B.
W72-13047

GEOPHYSICS AND GROUND WATER, PART 2, APPLIED USE OF GEOPHYSICS.

Water Well Journal, Vol 25, No 8, p 35-38. Aug. 1971.

Descriptors: *Drilling, *Seismic studies, *Logging (Recording), Electrical well logging, *Geophysics, Resistivity, Rock properties, Radioactive well logging, Gamma rays, On-site tests.
Identifiers: Drilling rates, *Well logs, Characteristics of rock, Micrologs, Neutron logs, Caliper logs.

The applied use of geophysics in ground water exploration and drilling is described. Electrical resistivity, seismic methods, electrical logging, radioactivity logs, seismic surveys, gravity surveys, use of logs in identification of rock characteristics, and drilling rate interpretation are discussed. (Campbell-NWWA)
W72-13146

DIFFERENTIAL PRESSURE STICKING - LABORATORY STUDIES OF FRICTION BETWEEN STEEL AND MUD FILTER CAKE,
Humble Oil and Refining Co., Houston, Tex.
M. R. Annis, and P. H. Monaghan.
Journal of Petroleum Technology, Vol No 6 p 537-543, May 1962. 7 fig, 1 tab, 12 ref.

Descriptors: *Drilling, *Rotary drilling, Fluid friction, Pressure, *Surfactants, *Drilling fluids.
Identifiers: Quebracho, Ferrochrome lignosulfate, *Filter cake, *Mud cake, *Differential pressure, Drill string, Barite mud, Spotting fluids.

Often during drilling operations the drill string becomes stuck and cannot be raised, lowered, or rotated. One cause is the sticking of the mud column against the filter cake on the hole wall. Experiments were carried out to determine how the sticking friction varied with changes in mud composition and with changes in differential pressure, time of contact of plate and mud cake, and filter-cake thickness. The 'sticking' coefficient increased with increasing time of contact between place and mud cake, and with increased barite content of the mud. Quebracho and ferrochrome lignosulfate reduced the sticking coefficient at short set times but did not reduce the maximum value. Carboxymethylcellulose had no effect on the 'sticking' coefficient. Also reducing the sticking coefficient was emulsification of oil in the mud, some oils were more effective than others. Certain surfactants when added to the oils further reduced the sticking coefficient. When a clean fluid was spotted over the stuck place, the 'sticking' coefficient was reduced only if the differential pressure was reduced also. (Campbell-NWWA)
W72-13148

AWWA STANDARD FOR DEEP WELLS.
American Water Works Association, New York.
For primary bibliographic entry see Field 08B.
W72-13150

TUBEWELLS CONSTRUCTION AND MAINTENANCE,
N. Ahmad.
Ripon Printing Press Ltd., Lahore, 1969. 250 p.

Descriptors: *Irrigation wells, Alluvial fans, Alluvium, Arid lands, Freshwater-saline water interfaces, Salts, Well screens, Discharge measurement.
Identifiers: *Coir string, *Tubewells, Strainers, *West Pakistan.

In West Pakistan, a large alluvial plain extending across much of the province stores large supplies of groundwater, which is used for irrigation in a dry climate. The main method for extraction is tubewells. A scientific background for the operation and maintenance of these wells is presented. Included are chapters on the geology and hydrology of the Indus formations: the results of field investigations, and modern scientific methods of exploration; chemical quality of groundwater; techniques of utilization of groundwater; hydraulics of the tubewell; methods for measuring discharge; pumping machinery, and installation methods. (Campbell-NWWA)
W72-13151

SURVEY REVEALS AVERAGES IN DRILLING OPERATIONS.

Ground Water Age, Vol 2, No 5, p 8-9, Jan 1968. 1 fig.

Descriptors: *Drilling, *Surveys, *Water wells, Groundwater.
Identifiers: *Well contractors.

The average water well in the United States was drilled to a depth of 172.3 feet in 1967. Three quarters of all such wells had depths in the 51-200 foot range. 607 replies to a Ground Water Age survey were received from well contractors. The average number of wells drilled per year by each of these respondents was 72, totalling about 45,000 of the approximately half-million wells drilled in 1967. Findings were restricted to drilled wells; those constructed by boring, digging, or the use of well points were not included in the survey. (Campbell-NWWA)
W72-13159

MISSISSIPPI RIVER, EAST BANK, WARREN TO WILKINSON COUNTIES, MISSISSIPPI (NATCHEZ AREA) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.

Available from the National Technical Information Service as PB-206 461-D, $3.00 in paper copy, $0.95 in microfiche. December 1, 1971. 40 p, 1 map, 8 tab.

Descriptors: *Mississippi, *Environmental effects, *Flood control, *Flood protection, *Adoption of practices, Pumping plants, Channel improvement, Floodgates, Levees, Weirs, Administrative agencies, Comprehensive planning, Alternative planning, Multiple-purpose projects, Alternative costs, Mississippi River, Project planning, Wildlife habitats, Fisheries, Wetlands.
Identifiers: *Environmental Impact Statements, *Natchez area (Miss).

The project calls for flood control improvements for the Natchez Area (Warren to Wilkinson Counties, Mississippi) consisting of 12.4 miles of levee to protect against the Mississippi River Project Design Flood, a 300-cubic-foot-per-second pumping plant, 12 miles of channel improvements, three 8-foot floodgates with concrete box culverts, and a conservation weir. The project would also provide for the acquisition and development of 2,000 acres of bottomland outside of the leveed area to mitigate project-induced fish and wildlife losses. Environmental impacts include flood protection, improved economic conditions for Adams County, and diminished fish and wildlife productivity within the protected area. Adverse environmental effects include a reduction of wildlife habitat and wildlife productivity, and increased pollution of natural waters and damage to fisheries from expanded and more intensive agricultural uses of protected lands. Alternatives include alternative levee alignments, flood forecasting and warning, flood plain regulation, and permanent evacuation of the flood plain. Attached are comments from several federal and state agencies and a brief economic analysis of the project. (Widman-Florida)
W72-13217

HOW ROTARY SPEED AFFECTS PENETRATION RATE,
Humble Oil and Refining Co., Houston, Tex.
J. R. Eckel, and D. S. Rowley.
Oil and Gas Journal, Vol 55, No 47, p 86-87, Nov. 1957. 5 fig.

Descriptors: *Rotary drilling, Drilling, Test wells, Oil wells.
Identifiers: *Rotary speed, *Penetration rate, Carbide bits, Milled-tooth bits.

A graphic picture is presented of drilling rate versus rotary speed. 36 drilling tests were run on two wells, with rotary speed the only variable, weight and all other functions were held constant. Rotary speed ranged from 20 to 50 RPM with milled tooth bits. Although local formation changes in the test intervals radically influenced the results of any one given test, in general, drilling rate increased with rotary speed, but less than proportionally. The flattening of the rotary speed-penetration rate curve at higher speeds was attributed to less effective tooth contacts at higher speeds for a given bit weight. (Campbell-NWWA)
W72-13230

LABORATORY STUDIES OF THE EFFECT OF ROTARY SPEED ON ROCK-BIT PERFORMANCE AND DRILLING COST,
Hughes Tool Co., Houston, Tex.
R. A. Cunningham.
American Petroleum Institute Drilling and Production Practice p 7-14, 1960. 11 fig, 1 tab, 9 ref.

Descriptors: *Rotary drilling, Drilling equipment.
Identifiers: Turbodrilling, *Optimum rotary speed, *Drilling costs, *Rock-bit performance.

Laboratory data are presented which show relationships between rock-bit bearing life and rotary speed, drilling rate and rotary speed, rock-bit tooth wear and rotary speed. These relationships combine in such a manner as to result in decreased rock-bit footage and increased costs at high rotary speeds. Results giving the optimum rotary speed for constant bit weights, where bearings limit footage per bit, are given. Calculations of lowest costs using the optimum constant rotary speed for a given bitweight are also given, as well as results showing that still lower costs may be obtained by increasing rotary speed as the bit dulls. (Campbell-NWWA)
W72-13231

HOW TO EVALUATE MUD DESANDING,
Loffland Brothers Co., Tulsa, Okla.
R. J. Duran.
Petroleum Engineer, Vol 33, No 9, p 39-44, August 1961. 4 fig, 2 tab.

Descriptors: *Drilling fluids, Rotary drilling, Bentonite, *Mud, *Mississippi.
Identifiers: *Desanding, Mud pumps.

An evaluation procedure to determine exactly how much money desanding saves was developed in a year-long program and tested on a 12,000 ft. well in Mississippi. By applying this procedure, which takes operational aspects also into consideration, $8,112 was saved through use of a desander on the Mississippi well. The saving consisted of $6,420 in mud materials and $1,692 in water costs. Desanding drilling fluid from top to bottom made it possible to carry less mud weight (from 1/2 to 1 lb. per gal. less) than offset wells. Hydraulics were improved, penetration rates were increased, and the hole was well maintained. (Campbell-NWWA)
W72-13232

EFFECT OF MUD PROPERTIES ON DRILLING RATE,
Humble Oil and Refining Co., Houston, Tex.
J. R. Eckel.
American Petroleum Institute Drilling and Production Practice, p 119-125, 1954. 6 ref.

Descriptors: *Drilling fluids, Density, Viscosity, Mud.
Identifiers: Oil-emulsion mud, Filtration rate, *Drilling rate, Circulation rate, *Mud properties, Bit weight, Cutting recovery.

Field observations indicate that the drilling rates obtainable with muds may vary from 30 to 70 percent of those obtainable with water under the same conditions. The causes of this reduction based on laboratory and field experiences are discussed. Fluid viscosity appears to be the significant factor affecting drilling rate through cleaning action. In the field, oil in emulsion muds may improve drilling rate through its lubricating qualities. (Campbell-NWWA)
W72-13233

THE SIGNIFICANCE OF CURRENT PRACTICES IN DRILLING HYDRAULICS,
Reed Roller Bit Co., Houston, Tex.
R. A. Bobo.
Paper presented at Spring meeting, Pacific Coast District Division of Production, American Petroleum Institute, May 1966, Los Angeles, California. 12 p, 7 fig, 1 ref, 2 append.

Descriptors: *Rotary drilling fluids.
Identifiers: *Drilling hydraulics, Hydraulic horsepower, Drilling rate.

The current need in the study of drilling hydraulics is to ascertain those variables, which, when applied at the bit under otherwise optimized conditions, will result in the lowest overall cost per foot of hole drilled. The principles of drilling hydraulics, both those that relate to factors of scavenging at the bit and those that pertain to the control of surface conditions in order to get optimum conditions for scavenging at the bit are described. Volume rate, velocity, hydraulic horsepower, and impact at the bit are discussed, along with required pump horsepower at the surface. (Campbell-NWWA)
W72-13234

TOOLS FOR WELL DEVELOPMENT,
D. C. Ault, and R. H. Bethart.
Water Well Journal, Vol 24, No 3, p 45-47, March 1970.

Descriptors: *Water wells, *Unconsolidated aquifers, *Testing procedures.
Identifiers: *Well development, Surge-blocks, Compressed air, *Jet washing tool, Overpumping, Acid treatment, Backwashing.

Well development equipment is defined as tools which produce an effect on unconsolidated aquifers at or near the borehole to increase the yield of the well. This is accomplished by creating a zone of material around the screen coarser than that of the undisturbed aquifer. This is accomplished by installing a screen (strainer) which has openings large enough to permit 50-65 percent of the formation to enter the well. The equipment used for development is designed to break up the 'bridging effect' of particles which are small enough to pass through the screen. Tools discussed are the solid surge block, compressed air tools, and high velocity jet washing tools. The technique of overpumping , and acid treatment are described. Advantages and disadvantages of each are included. (Campbell-NWWA)
W72-13235

LOST CIRCULATION--A MAJOR PROBLEM IN EXPLORATION AND DEVELOPMENT,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 08B.
W72-13237

A GRAPHIC VIEW OF PRESSURE SURGES AND LOST CIRCULATION,
Baker Oil Tools, Inc., Los Angeles, Calif.
E. H. Clark, Jr.
American Petroleum Institute Drilling and Production Practice, p 424-438, 1956. 7 ref.

Descriptors: *Drilling fluids, *Circulation, *Rotary drilling.
Identifiers: *Pressure surges, Mud losses.

Pressure surges can be a major factor in lost circulation. When and how these pressure surges take place and the important factors which must be controlled in order to reduce them are discussed. There are very few natural combinations of geostatic and hydrostatic gradients that cannot be successfully drilled, provided: (1) operators are willing to put forth the time and effort required for proper mud control; and, (2) drilling crews can be trained to avoid the practice of running and pulling pipe in a fast and rough manner. (Campbell-NWWA)
W72-13238

ENGINEERING DESIGN OF DRILLING OPERATIONS,
Tenneco Oil Co., Houston, Tex.
J. A. Edwards.
American Petroleum Institute Drilling and Production Practice, p 39-55, 1964. 20 fig, 3 tab, 17 ref, append.

Descriptors: *Drilling, Economics, *Rotary drilling, *Design, *Operating costs.
Identifiers: *Drilling costs, Penetration rate, Big weight, Rotary speed, Tooth wear, Bottom hole horsepower, Crooked-hole problems.

The purpose is to enable the drill operator or engineer to select the design parameters of his drilling operation which would give the best drilling rate at the lowest cost. Every quantity in a drilling operation can be varied, except the formation character. Explored are effects of weight and RPM on drilling rate, effects of weight and RPM on tooth wear, effects of tooth wear on drilling rate, effects of weight and RPM on bearing wear, and hydraulic horsepower versus penetration rate. The trip-time of the rig at various depths, another time-cost factor is discussed. (Campbell-NWWA)
W72-13239

CONSTANT ROTARY SPEED AND VARIABLE WEIGHT FOR REDUCING DRILLING COST,
Pan American Petroleum Corp., Liberal, Kans.
S. A. Billington, and K. A. Blenkarn.
American Petroleum Institute Drilling and Production Practice, p 52-63, 1962. 5 fig, 1 ref, 2 append.

Descriptors: *Drilling, *Rotary drilling, *Operating costs.
Identifiers: *Rotary speed, *Bit weight, Optimizing systems, Bit wear, *Drilling costs.

Theoretical charts are presented for use in calculating the optimum constant-speed and variable-weight program to be followed during a bit run to obtain minimum drilling cost. Field tests have been conducted with this calculating system, which may be used on rigs with fixed-speed rotary drives; and other tests with a similar variable-weight and variable-speed system. Results show that both systems lead to 12 to 51 percent reductions in calculated direct drilling cost as compared to conventional drilling. (Campbell-NWWA)
W72-13240

MICROBIT STUDIES OF THE EFFECT OF FLUID PROPERTIES AND HYDRAULICS ON DRILLING RATE,
Esso Production Research Co., Houston, Tex.
J. R. Eckel.
Journal of Petroleum Technology, Vol 240, p 541-546, 1967. 13 fig.

Descriptors: *Drilling fluids, *Rotary drilling, Reynolds number.
Identifiers: *Microbits, Kinematic viscosity, *Drilling rates.

Mud properties affect drilling rate. Drilling with water is as much as six to seven times faster than with mud. It is not known why drilling rates with mud are lower. Recent studies show what fluid properties govern microbit drilling rate and also provide a quantitative correlation of these fluid properties and hydraulics with microbit drilling rate. Tests showed that (1) drilling rate in a given system with constant circulating rate and nozzle velocity is a function of the kinematic viscosity of the drilling fluid measured at near bit nozzle shear rates; (2) the combined effect of fluid properties and hydraulics on microbit drilling rate is defined by a Reynolds number function; (3) for the same kinematic viscosity, drilling rate is independent of solids content; (4) for the same kinematic viscosity, drilling rate is independent of fluid loss. (Campbell-NWWA)
W72-13242

EFFECT OF PRESSURE ON ROCK DRILLABILITY,
Humble Oil and Refining Co., Houston, Tex.
J. R. Eckel.
Transactions, Society of Petroleum Engineers of AIME, Vol 213, p 1-6, 1958. 23 fig, 2 ref.

Descriptors: *Rotary drilling, Hydrostatic pressure, Drilling fluids, Limestone.
Identifiers: *Formation pore pressure, Terrastatic pressure, Microbits, Air drilling, Bit weight.

A laboratory drilling rig was devised and placed in operation which permits the application of hydrostatic, terrastatic, and formation pore pressures to a rock sample for drilling under controlled conditions. Tests under pressure, using water and air as the drilling fluids, indicate that when drilling saturated limestone samples, a pressure differential between hydrostatic and formation pressure is the only pressure which affects drilling rate. A differential in either direction causes a reduction in drilling rate, but the same differential from the wellbore into the formation causes the greater reduction. In general, the magnitude of the changes due to the pressure effect were small compared to changes in drilling rate obtainable by changing either bit weight or rotary speed. (Campbell-NWWA)
W72-13243

LABORATORY STUDY OF EFFECT OF OVERBURDEN, FORMATION AND MUD COLUMN PRESSURES ON DRILLING RATE OF PERMEABLE FORMATIONS,
Hughes Tool Co., Houston, Tex.
R. A. Cunningham, and J. G. Eenink.
Transactions, Society of Petroleum Engineers of AIME, Vol 217, p 9-17, 1958. 14 fig, 10 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Overburden, Sandstone, Limestone.
Identifiers: *Mud column pressure, *Formation pressure, *Drilling rates, *Permeable formations.

One phase has been completed of a laboratory investigation of formations with relatively high permeability under conditions of over-burden, formation, and mud column pressures. Drilling rate decreased when mud column pressure was greater than formation pressure. The decrease was primarily due to a layer of cuttings and mud particles held to the hole bottom by the difference in pressure. Adequate jet velocities helped clean away the filter cake and chips and resulted in increased drilling rate--the higher the jet velocity, the faster the drilling rate. Drilling rate increased slightly when formation pressure was greater than mud column pressure. Overburden pressure had practically no effect on drilling rate. (Campbell-NWWA)
W72-13244

DESIGN OF PVC WATER-DISTRIBUTION PIPE,
Johns-Manville Research and Engineering Center, Manville, N.J. Fluids Handling Dept.
R. T. Hucks, Jr.
Civil Engineering, ASCE, Vol 42, No 6, p 70-73, June 1972. 6 fig.

Descriptors: *Water supply, *Distribution systems, *Design, Water hammer, Pipes, Corrosion control, Water pollution control.
Identifiers: *Polyvinyl chloride pipe.

Polyvinyl chloride pipe is inert to the chemical actions of natural waters and soils. This study determined that PVC pipe design is adequate for water-distribution systems. PVC pipe can withstand occasional high pressure surges under static pressure. It can resist surges in pressure to a degree that depends on the number of surges and their magnitude (cyclic pressure). Crushing does not appreciably affect hydrostatic strength of PVC pipe. Three studies of operating systems further verified the experimental results. Present design methods for PVC pipe are reviewed. (Bean-AWWARF)
W72-13255

CALIFORNIA WATER PROJECT,
California State Dept. of Water Resources, Sacramento.

For primary bibliographic entry see Field 04A.
W72-13259

A COASTAL POLLUTION PROBLEM AND ITS SOLUTION - THE DESIGN AND CONSTRUCTION OF A SUBMARINE SEWER OUTFALL AT EASTBOURNE,
For primary bibliographic entry see Field 05D.
W72-13485

8B. Hydraulics

CAVITATION TESTS ON BAFFLE PIERS AND BUCKET SPLITTERS OF SPILLWAY HYDRAULIC STRUCTURES,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
N. P. Rozanov, R. M. Razakov, and A. T. Kaveshnikov.
Proceedings, 14th Congress of the International Association for Hydraulics Research, Vol 5, Paris, France, p 57-60, Aug-Sept 1971. 5 fig, 4 ref.

Descriptors: *Cavitation, Baffles, Hydraulic structures, Laboratory tests, Fluid mechanics, Hydraulic jump, Hydraulic models, Test procedures, Erosion, Energy dissipators, Stilling basins.
Identifiers: *Cavitation parameters, *Baffle blocks, *Cavitation control, *Baffle piers, *Vacuum apparatus, Experimental models, Cavitation index, USSR, Test results.

Cavitation failures often occur during operation of hydraulic structures. Many of these failures occur at relatively low flow velocities. Much interest has been generated in cavitation prediction and erosion in baffle piers and bucket splitters. As a result, engineers found that the simple conventional procedure of incipient cavitation prediction based upon vacuum measurement with transducers is unreliable and leads to underestimation of cavitation danger. Serious errors can result when the transducers are not placed in exactly the maximum vacuum zone. Results obtained from cavitation tests in vacuum tanks are more reliable. Basic experiments on cavitation were so made. Various shapes of baffle piers were mounted on an apron and subjected to a hydraulic jump. The inception and development of cavitation were investigated by an ultrasonic transducer. Visual observations of the cavitation zone were made with stroboscopic light. Critical cavitation parameters obtained by the ultrasonic method coincided with those obtained by visual observation of the moment of cavitation inception. Air injection into the zone of maximum vacuum was the most effective method for improving cavitation characteristics of the piers investigated. (USBR)
W72-13120

THE VERTICAL SLOT AS A FLOW MEASUREMENT DEVICE,
Waterloo Univ. (Ontario); and Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 07B.
W72-13129

WATER SYSTEM AND TREATMENT HANDBOOK.

Water Systems Council, Chicago, 1966, fourth ed. 108 p.

Descriptors: Groundwater, Water wells, *Water supply development, *Pumps, Electric motors, Treatment facilities, Water treatment.
Identifiers: *Submersible pumps, *Jet pumps, *Reciprocating pumps, Pressure tanks.

It is estimated that 95 percent of all freshwater available in the nation at any time is groundwater. Systems which are used to tap this resource, along with insuring its chemical and biological purity are discussed. The general aspects of well construction, operation and installation of jet, submersible, and positive displacement pumps, service for these pumps, well sanitation, distribution equipment, air controls, electric motors, and treatment of domestic water are described. (Campbell-NWWA)
W72-13147

DIFFERENTIAL PRESSURE STICKING - LABORATORY STUDIES OF FRICTION BETWEEN STEEL AND MUD FILTER CAKE,
Humble Oil and Refining Co., Houston, Tex.
For primary bibliographic entry see Field 08A.
W72-13148

AWWA STANDARD FOR DEEP WELLS.
American Water Works Association, New York.

American Water Works Association, Standard AWWA A 100-66, Revised Edition, 1966. 57 p.

Descriptors: *Water wells, *Standards, Construction materials, Contracts, Testing procedures, Grouting, Disinfection, Chlorination.
Identifiers: Permits, *Methods, Equipment, Plumbness, Unit price method, Lump sum method, Guaranteed yield method, Gravel packing, Drive shoes.

A guide in the preparation of contract documents governing well construction is provided. Discussed are the nature of the work; permits, certificates, laws, and ordinances; and other legal aspects of well contracting. Standards of construction and maintenance are defined for well casings, screens, testing for yield, grouting, plumbness and alignment, and disinfection. (Campbell-NWWA)
W72-13150

TUBEWELLS CONSTRUCTION AND MAINTENANCE,
For primary bibliographic entry see Field 08A.
W72-13151

JET DEVELOPMENT DOES THE WORK.

Johnson National Drillers Journal, Vol 33, No 6, p 1-4, Nov-Dec 1961. 3 fig, 1 tab.

Descriptors: *Water wells, *Screens, Drilling, Unconsolidated aquifers.
Identifiers: Pumping rate, *Jetting, Washing, *Well development, Flushing, Slot size.

Jetting can be thought of as a special scheme for backwashing and developing a well. A relatively simple jetting tool together with a high pressure pump and the necessary hose and piping are the principal items of equipment needed. The forceful action of high velocity jets working through the screen openings agitates and rearranges the sand and gravel particles of the formation surrounding the screen. The jet is designed so that the water slows under pressure horizontally through the screen openings; by rotating, raising and lowering the jetting tool, full coverage is achieved. 65 percent increase in yield was obtained by the jetting method. Methods of installation and techniques of operation are described. Tables of discharge and velocity as related to nozzle orifice size are presented. (Campbell-NWWA)
W72-13153

A NOTE ON THE MEASUREMENT OF PLANAR VELOCITY FIELDS BY STEREO-PHOTOGRAMMETRY,
Southampton Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13200

RANDOM WALK MODEL FOR MOTION OF A SOLID PARTICLE IN TURBULENT OPEN-CHANNEL FLOW,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
For primary bibliographic entry see Field 02J.
W72-13201

SOME ASPECTS OF ANALYZING TRANSVERSE DIFFUSION IN RIVERS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-13202

LOST CIRCULATION--A MAJOR PROBLEM IN EXPLORATION AND DEVELOPMENT,
Shell Oil Co., Houston, Tex.
J. M. Bugbee.
American Petroleum Institute Drilling and Production Practice, p 14-27. 1953.

Descriptors: *Drilling fluids, *Rotary drilling, *Circulation, Limestones.
Identifiers: *Formation damage, *Lost zones, *Mud losses.

The major drilling problem of lost circulation can be avoided or minimized by the study of possible losses and the programming of treating procedures in advance of drilling. Not only must there be openings in the formation of sufficient size to accept and store the lost mud, but excessive pressures must act to force it away. The nature of loss zones, their formation-fluid pressures and the hydrostatic and mechanical pressures that can be imposed are explored. (Campbell-NWWA)
W72-13237

A GRAPHIC VIEW OF PRESSURE SURGES AND LOST CIRCULATION,
Baker Oil Tools, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 08A.
W72-13238

MIXING OF MERGING BUOYANT JETS FROM A MANIFOLD IN STAGNANT RECEIVING WATER OF UNIFORM DENSITY,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 05B.
W72-13312

IDENTIFICATION OF PARAMETERS IN UNSTEADY OPEN CHANNEL FLOWS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 02E.
W72-13476

EROSION OF SAND BEDS AROUND SPUR DIKES,
Ministry of Natural Resources, Sokoto (Nigeria).
For primary bibliographic entry see Field 02J.
W72-13572

MEASUREMENT OF VELOCITY-CONCENTRATION COVARIANCE,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 05B.
W72-13574

CONTROL OF SEDIMENT IN CANALS.
For primary bibliographic entry see Field 04D.
W72-13576

HELE-SHAW MODEL OF LONG ISLAND AQUIFER SYSTEM,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 02F.

W72-13578

8C. Hydraulic Machinery

THE ECONOMICS OF GEOTHERMAL POWER,
For primary bibliographic entry see Field 06C.
W72-13092

AMERICAN STANDARD FOR VERTICAL TURBINE PUMPS.
American Water Works Association, New York.

American Water Works Association, Standard AWWA E 101-61, 1961, revised ed. 49 p.

Descriptors: *Water wells, *Pump turbines, *Pumps, *Standards.
Identifiers: *Vertical turbine pumps, *Line shaft pumps, *Submersible pumps.

A guide is provided for users of vertical turbine pumps in selecting new equipment. Both the line shaft and the submersible types of vertical turbine pumps are discussed, with complete specification standards for each. The suggested standards are to be considered a minimum requirement for first-quality vertical turbine pumps. Definitions of each type of pump, with nomenclature, general specifications, engineering data, and factory inspection and tests for each are included. (Campbell-NWWA)
W72-13149

JET DEVELOPMENT DOES THE WORK.
For primary bibliographic entry see Field 08B.
W72-13153

DESALTING,
National Water Commission, Arlington, Va. Engineering and Environmental Div.
For primary bibliographic entry see Field 03A.
W72-13354

8E. Rock Mechanics and Geology

COMPUTER SIMULATION OF SECOND ORDER FAULTS,
Karlsruhe Univ. (West Germany).
H. Bock.
Rock Mechanics, Vol 3, No 4, p 225-238, Dec. 1971. 11 fig, 1 tab, 16 ref.

Descriptors: *Finite element analysis, *Faults (Geologic), Mathematical models, *Fractures (Geologic), Rock mechanics, Simulation, Stress analysis, Computer models, Mohr failure theory, Rock foundations, Structural geology, Deformation, Bibliographies, Sliding, Shear cracks.
Identifiers: *Crack propagation, Germany, Iteration method, Shear planes, Discontinuities, Stress distribution.

A finite element model simulates complex rock fracture patterns. These fracture patterns include second order faults--faults which branch off from a principal fault. Principal shortcomings of previous methods were: (1) stress rearrangements along the principal fault surface during sliding were not considered; and (2) the rock materials and discontinuity properties were not entirely correct. To overcome these problems, the finite element model uses an iterative process to transfer the stress of an overloaded element to neighboring elements. The strength properties of the rock material and the discontinuities are defined using Mohr criteria. The finite element method indicates that stress rearrangements occur during shear movement along the principal fault, contributing to the development of new second order faults. (USBR)
W72-13128

GEOPHYSICS AND GROUND WATER, PART 2, APPLIED USE OF GEOPHYSICS.
For primary bibliographic entry see Field 08A.
W72-13146

SHALE ALTERATION BY WATER ADSORPTION,
Esso Production Research Co., Houston, Tex.
M. E. Chenevert.
Journal of Petroleum Technology, p 1141-1148, Sept. 1970. 14 fig, 4 tab, 14 ref.

Descriptors: *Shales, *Adsorption, *Hydration, *Montmorillonite shale, *Illite shale.
Identifiers: Shale adsorptive potential, *Hydrational strain, *Hydrational stress, Hydrational rupture, Yield stress, Triaxial tester, *Chloritic shale.

The purpose was to observe the behavior and measure the properties of a broad range of shale types - montmorillonitic, illitic and chloritic - when exposed to water. An adsorptional isotherm technique makes it possible to define quantitatively the hydrational tendencies of any formation, thereby eliminating the cumbersome rock classification schemes presently used in industry. All types of shales tested were reactive to fresh water. Montmorillonitic shales, not unexpectedly, evidenced alteration of properties as a result of water adsorption. (Campbell-NWWA)
W72-13241

EFFECT OF PRESSURE ON ROCK DRILLABILITY,
Humble Oil and Refining Co., Houston, Tex.
For primary bibliographic entry see Field 08A.
W72-13243

8F. Concrete

DISTRIBUTED LOADS CREATING COMBINED TORSION, BENDING, AND SHEAR ON L--BEAMS WITH STIRRUPS,
Mullen and Powell, Inc., Dallas, Tex.; and Texas Univ., Austin.
K. S. Rajagopalan, and P. M. Ferguson.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 1, p 46-54, Jan 1972. 10 fig, 2 tab, 8 ref.

Descriptors: *Beams (Structural), *Reinforced concrete, *Loads (Forces), Shear, Stiffness, Safety factors, Test procedures, Shear stress, Reinforcing steel cracks, Stress.
Identifiers: *Flexural strength, Concentrated loading, Uniform loading, T-beams, Stirrups, Twisting stress, Test results, Stress distribution, Eccentric loading, Torsion, Ultimate loads, Bending stress.

The extent of additional safety associated with distributed, as compared to point loads, on reinforced concrete beams with stirrups was explored. The investigation was restricted to L-beams which are most subject to torsion. Tests on semicontinuous L-beams with stirrups, under distributed loads creating torsion combined with flexure and shear, showed about 25% greater load capacities than similar beams under point loads. In this evaluation, shears and torques were taken at a distance d from the support. Despite a negative moment yield line in the slab at the face of web, the flange appeared to be effective in resisting the torsion. The post-cracking torsional stiffness dropped to from 3 to 7% of the initial stiffness. Strain gage measurements at the point of inflection showed steel stress from torsion varying more nearly with the twist angle than with torque. (USBR)
W72-13117

REINFORCED CONCRETE EXTERIOR BEAM--COLUMN JOINTS UNDER SEISMIC LOADING,
Ministry of Works, Wellington (New Zealand); and Canterbury Univ., Christchurch (New Zealand).
L. M. Megget, and R. Park.
New Zealand Engineering, Vol 26, No 11, p 341-353, Nov 1971. 14 fig, 4 tab, 16 ref, append.

Descriptors: *Reinforced concrete, *Joints (Connections), Seismic studies, Building codes, Design practices, Test procedures, Instrumentation, Shear, Shear forces, Cracks, Bibliographies.
Identifiers: *Beam columns, *Seismic tests, *Earth-resistant structures, Seismic regime, Plastic hinges, New Zealand, Crack propagation, Stress-strain curves, Test results.

Described is an experimental investigation into the behavior of exterior beam-column joints of reinforced concrete frames with low axial load. Three beam-column test units, each designed by different methods, were tested and results compared. Each beam-column was subjected to the same program of static cyclic loading. The design parameters examined were the methods of anchoring the longitudinal beam reinforcement within the column and the amount of transverse shear reinforcement within the joint region. The joints of all 3 specimens proved to be inadequately reinforced to resist the large joint shears present under intense seismic loading conditions in the inelastic range. (USBR)
W72-13119

RECOMMENDATIONS FOR ESTIMATION OF QUALITY OF CONCRETE IN FINISHED STRUCTURES,
Cement- Och Betonginstitutet, Stockholm (Sweden).
N. Petersons.
Materials and Structures, Vol 4, No 24, p 379-397, Nov-Dec 1971. 11 fig, 6 tab, 55 ref, append.

Descriptors: *Concrete technology, *Concrete properties, *Concrete testing, *Core drilling, Concrete structures, Test specimens, Chemical analysis, Dynamic tests, Ultrasonic tests, Structural behavior, Test procedures, Bibliographies.
Identifiers: *Quality levels, Sweden, *Concrete properties, Structural concrete.

Recommendations for estimating the quality of concrete in finished structures are presented. These recommendations are to be regarded as a guide only and not a standard or a code of practice. The term quality is primarily used to designate the strength of concrete, but may also be used to denote other properties, such as cement content, air content, and porosity. The strength level of the concrete in a structure should be determined on the basis of results from tests on core cylinders drilled, or cubes sawn from the structure. The scope of the investigation required in estimating the quality of concrete in a given structure is dependent upon the reasons for the investigation. Strength level is a decisive factor in determining the quality of concrete, and many other properties of concrete can be related to strength. Discussed are: (1) methods of testing, (2) sampling procedures, (3) number of test specimens required, (4) location of sampling area, (5) effect of core drilling on behavior of the structure, (6) evaluation of compression tests, (7) analysis of results from other tests, and (8) estimation of quality level. (USBR)
W72-13121

MOMENTS IN BEAM SUPPORTED SLABS,
Illinois Univ., Urbana.
W. L. Gamble.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 3, p 149-157, Mar 1972. 9 fig, 15 ref, append.

Descriptors: *Slabs, *Beams (Structural), *Reinforced concrete, *Concrete structures, Moments, Columns, Structural analysis, Structural concrete, Panels, Analysis, Bibliographies.
Identifiers: *Concrete slabs, *Floors, *Moment distribution, *Bending moments, Stiffness.

Charts are presented showing the theoretical distribution of elastic moments in interior panels as a function of the slab stiffness in relation to the beam stiffness. Previous design methods for beam-supported slabs assumed that the slabs were on rigid beams. A beam stiffness parameter, alpha, was used to relate the stiffness of the beam to the stiffness of the width of the slab supported by the beam. Results show that for a large portion of slabs supported by beams on all 4 sides, the value of alpha will exceed 2, resulting in moment distributions relatively insensitive to further increases in beam stiffness. These results pertain to the panels under uniformly distributed loads. Moments in panels at the edge of a structure were not investigated. The influence of the supporting column size on the bending moment distribution is considered. (USBR)
W72-13124

SEEPAGE THROUGH SOIL-CEMENT FACINGS,
Bureau of Reclamation, Denver, Colo.
G. DeGroot.
Paper, American Society of Civil Engineers, Conference on Performance of Earth and Earth-Supported Structures, Purdue Univ., Lafayette, Ind. June 1972. 16 p, 9 fig, 7 ref, append.

Descriptors: *Soil cement, *Permeability, *Seepage, Field tests, Cost savings, Bonding, Shrinkage, Cracks, Test procedures, Construction materials, Algae, Laboratory tests, Thermal expansion, Slope protection, Dam design, Permeability coefficients.
Identifiers: Lubbock Regulating Reservoir (Tex), Canadian River Aqueduct (Tex), Test results, Seepage losses, Dam facings, Field permeability tests, Seasonal variations.

Seepage through 2 soil-cement test sections constructed at Lubbock Regulating Reservoir indicated that soil-cement permeability ranged from semipervious to impervious. Each test section, composed of 12% cement mixed with silty sand, was about 1,200 ft sq and 2.54 ft thick. The seepage water flowed into a layer of pervious sand and then drained into a collection tank. Calculated seepage rates varied from as high as 0.15 ft/day initially, to an average of 0.005 ft/day in warm months, and about 0.04 ft/day in colder months. These rates were somewhat greater than the rate from a standard laboratory test, indicating that considerable seepage flowed through shrinkage cracks and construction contact planes between layers. The decrease in seepage rates following the higher initial rates indicates the soil-cement tends to seal during use. Decreases in flow during the warm months were attributed to thermal expansion, which reduced crack widths. (USBR)
W72-13126

CARBON FIBRE REINFORCEMENT OF CEMENT,
Building Research Station, Watford (England).
M. A. Ali, A. J. Majumdar, and D. L. Rayment.
Cement and Concrete Research, Vol 2, No 2, p 201-212, Mar 1972. 3 fig, 4 tab, 5 ref.

Descriptors: *Concrete technology, *Fibers, Reinforcement, Physical properties, Laboratory tests, Reinforced concrete, Asbestos cement, Tensile strength, Impact tests, Carbon, Cements, Strength, Durability, Corrosion.
Identifiers: *Carbon fibers, *Reinforcing materials, Great Britain, Composite materials, Modulus of elasticity, Rupture modulus, Stress-strain curves.

Because of chemical inertness at ambient temperatures, carbon fibers are used to reinforce reactive matrices, such as cement, despite high costs. These fibers have very high strength and elastic modulus; therefore, only a small volume of fiber is required for producing composites having strengths similar to those of commercial asbestos-cement sheets. A 3% by volume addition of the high-modulus carbon fiber to cement results in a 2-fold increase in the modulus of elasticity and a 5-fold increase in the tensile strength over the values of the unreinforced matrix. Carbon fibers also increased the cracking strain observed in tensile tests. Results of durability tests of samples continuously stores in 50 deg C water indicated the carbon reinforced fiber specimens had higher moduli of rupture than asbestos-cement specimens; no significant improvement in impact strength was observed. (USBR)
W72-13131

VARIABILITY OF DEFLECTIONS OF SIMPLY SUPPORTED REINFORCED CONCRETE BEAMS.
American Concrete Inst., Detroit, Mich. Committee 435.

Journal of the American Concrete Institute, Proceedings, Vol 69, No 1, p 29-35, Jan 1972. 10 fig, 1 tab, 5 ref.

Descriptors: *Reinforced concrete, *Beams (Structural), *Deflection, *Design standards, Variability, Loads (Forces), Probability, Structural design, Structural behavior, Probability theory, Histograms, Building codes.
Identifiers: Deflection measurement, American Concrete Institute, Camber.

The variability of measured deflection of simply supported reinforced concrete beams compared to deflection calculated by accepted methods is discussed. The probability of the deflection of a particular beam falling within a given level of uncertainty is evaluated by analyzing existing data and fitting a probability distribution to the data. Using the criteria of ACI 318-71, the deflections of a particular beam have approximately a 90% possibility of being within the range of 20% less than, to 30% more than, the calculated value, a slight improvement over ACI 318-63. Figures for the 90% interval based on ACI 318-63 are 30% less than and 30% greater than the calculated value. Tables are given to evaluate the minimum expected variability of calculated deflections using either ACI 318-63 or ACI 318-71. (USBR)
W72-13133

8G. Materials

INVESTIGATION OF METALLIDE COATINGS FOR SEAWATER PUMP COMPONENTS,
Little (Arthur D), Inc., Cambridge, Mass.
J. L. O'Brien.
Report available for sale by Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 - Price $0.50. Office of Saline Water Research and Development Progress Report No 716, September 1971. 43 p, 29 fig, 3 ref. OSW Contract 14-30-2638.

Descriptors: *Desalination, *Pumps, *Cavitation, Metallurgy, *Alloys, *Corrosion control, *Coatings, *Protective coatings.
Identifiers: *Diffusion coatings, Beryllides, Borides, Chromides, *Seawater pumps.

This report describes an exploratory investigation on the use of diffusion coatings to improve the erosion resistance of materials. Primary applications for the coatings would be in seawater pumps. Although expensive alloys exist which have good erosion resistance, the hope in this program was to develop a coating-substrate combination which would have good erosion resistance and be cheaper than these alloys. With the proper coating, a low-cost substrate could be upgraded so that its erosion resistance becomes comparable to that of the expensive alloys. Diffusion coatings were applied using the molten salt electrolytic process developed by the General Electric Company. Erosion testing was done using an ultrasonic horn which causes cavitation in the test liquid. Specimens under test were attached to the tip of the horn and immersed in seawater, the test liquid. Diffusion coatings tested included: beryllium into copper, 90-10 copper nickel, 70-30 copper nickel, monel, nickel, copper-6% aluminum and 1018 steel; boron into 1018 steel, 4340 steel, nickel electrodeposited on 1018 steel, nickel, and molybdenum sprayed on 1018 steel; and chromium into 1018 steel, 4340 steel. Of the diffusion coating-substrate combinations, those with highest erosion corrosion resistance were beryllium diffused into the copper-based alloys. The erosion-corrosion resistance of the beryllide coatings on these alloys was comparable to Inconel 718 and considerably better than 316 stainless steel. (OSW abstract)
W72-13141

8I. Fisheries Engineering

MIGRATION RESPONSE OF JUVENILE CHINOOK SALMON TO SUBSTRATES AND TEMPERATURES,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 02I.
W72-13293

OXYGEN LEVEL EVALUATION AT SOME SALMONID FISH HATCHERIES,
J. Wieniawski.
Rocz Nauk Roln Ser H Rybactwo, Vol 93, No 3, 83-108, 1971, Illus.
Identifiers: *Fish physiology, Hatcheries, *Oxygen requirements, *Salmonids, *Trout.

O2 consumption measurements were taken in the fattening ponds of 8 French trout hatcheries. A direct relationship between O2 consumption and the weight gained by the fish was observed but the difference was noted as a function of the water temperature (within a limit of 11 to 18C). According to the literature and personal observations variations in the activity of the fish influenced O consumption more than temperature differences.
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W72-13414

THE RELATIONSHIP BETWEEN TROUT RAISING SUCCESS, ENVIRONMENT AND RAISING TECHNIQUE FACTORS,
Instytut Rybactwa Srodladowego, Warsaw (Poland). Dept. of River Fishery.
J. Wieniawski.
Rocz Nauk Roln Ser H Rybactwo. Vol 93, No 2, 95-120. 1971. Illus.
Identifiers: Fish diets, *Fish hatcheries, *Fish management, Environment, Mortality, Temperature, *Trout.

The relationship between trout raising success, environment, and raising technique factors was investigated at 11 salmonid hatcheries in France that varied as to their natural conditions and raising techniques. Except for the influence of temperature, no dependance between raising success and natural environmental factors (CO_2, pH, water hardness) was noted with regard to the tolerance of the rainbow trout. A correlation was, however, noted between the raising success and raising technique factors (sanitary conditions, production organization, amount of handling of the fish, population density in the raising ponds). Raising success was most influenced by fish mortality and by dietary efficacy.--Copyright 1972, Biological Abstracts, Inc.

72-13425

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0F. Preparation of Reviews

REVIEW OF AUTECOLOGICAL AND APROBIOLOGICAL DATA ON FRESHWATER LIATES, (EINE ZUSAMMENSTELLUNG ON AUTOKOLOGISCHEN UND SAPROBIOLOGISCHEN BEFUNDEN AN SUSS-WASSERCILIATEN),
Bonn Univ. (West Germany). Zoological Inst.
For primary bibliographic entry see Field 05C.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

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SELECTED WATER RESOURCES ABSTRACTS

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DECEMBER 1, 1972

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SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 23
DECEMBER 1, 1972

W72-13610 — W72-14200

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS AND FACILITIES
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SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
For primary bibliographic entry see Field 10B.
W72-13820

ANOMALOUS WATER,
Tyco Labs. Inc., Waltham, Mass.
For primary bibliographic entry see Field 01B.
W72-13842

1B. Aqueous Solutions and Suspensions

ANOMALOUS WATER,
Tyco Labs. Inc., Waltham, Mass.
S. B. Brummer, J. I. Bradspies, G. Entine, E. Trickett, and H. Lingertat.
Available from NTIS, Springfield, Va 22151 as AD-737 295, for $3.00 paper copy; $0.95 microfiche. First Semiannual Technical Contract Report, January 1972. 54 p, 22 fig, 3 tab, 28 ref. Contract DAAHOI-71-C-1216 (ARPA).

Descriptors: *Water chemistry, *Gels, *Silica, *Water structure, *Synthesis, Water properties, Water types, Laboratory tests, Test procedures, Mass spectrometry, Condensation.
Identifiers: *Anomalous water, *Polywater, Zirconia-based glass.

Experiments were made on the preparation and characterization of anomalous water. Preparations are reported with various glass substrates drawn into the forms of cones. Zirconia-based glass yields the purest 'polywater' infrared spectrum. Data suggest that anomalous water is formed when glass reacts with certain (unidentified) airborne organic compounds. The final product appears to be the salt of an organic acid. Mass spectroscopy suggests a molecular weight of 207 for the most thermally stable component of this material. Refractive index data show that the material is similar to that produced in the USSR, and distillation-decomposition experiments argue strongly that none of their material is polymerized water. (Woodard-USGS)
W72-13842

AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,
Midwest Research Inst., Kansas City, Mo.
F. T. Greene, J. Beachey, and T. A. Milne.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.45. Office of Saline Water Research and Development Progress Report No. 772, February 1972, 33 p, 15 fig, 3 tab, 7 ref. OSW Contract 14-01-0001-1479.

Descriptors: *Thermodynamics, *Water structure, *Water types, *Mass spectrophotometry, *Kinetics.
Identifiers: *Dimers, *Trimers.

A mass spectrometer has been used to obtain equilibrium thermochemical data for water dimer and water trimer. This data is being used to derive kinetic information on water cluster formation. Specifically, experimental apparatus has been modified for use with the new single-focusing mass spectrometer and molecular beam sampling system, and significantly improved performance has been obtained. Reliable equilibrium thermochemical data have been obtained for water dimer as well as very encouraging preliminary data for water trimer and several larger polymers. Extensive measurements were also made of dimer and trimer concentrations following the free-jet expansion of water vapor from higher pressures. These data contain unique kinetic information. (OSW abstract)
W72-14060

PROPERTIES OF SEAWATER AND ITS CONCENTRATES AND RELATED SOLUTIONS AT TEMPERATURES UP TO 400 DEGREES F,
California Univ., Berkeley.
L. A. Bromley.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Report No. 747, February 1972, 96 p, 25 fig, 41 tab, 24 ref. Grant No. 14-30-2525.

Descriptors: *Seawater, *Thermal capacity, *Thermal properties, Physical properties, Thermodynamics.
Identifiers: *Sea salt solutions, *Heats of mixing, *Viscosities, Boiling point elevation.

Heat capacity measurements are reported for NaCl, KCl, MgSO4, Na2SO4 and MgCl2 solutions. Tables of Cs, saturation heat capacity, and Cp, heat capacity at constant pressure, are shown for varying salinities and temperatures. Polynomial equations obtained from curve fitting are given for both sets of values. Heats of mixing for sea salt solutions are reported for 73 degrees C. The relative enthalpies of sea salt solutions at 25 degrees C and 50 degrees C have been previously reported. A limited number of experimental boiling point elevations of sea salt solutions between 80 and 120 degrees C are reported. These are considered to be accurate to plus or minus 0.001 degrees C. Kinematic viscosity values for sea salt solutions to 11% salinity between 0 and 150 degrees C are reported. The values should be accurate to plus or minus 0.002 centistokes. (OSW abstract)
W72-14062

A NEUTRON SCATTERING STUDY OF THE KINETICS OF DIFFUSION AND THE RELATION TO THE STRUCTURES OF IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
G. J. Safford, and P. S. Leung.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.75. Office of Saline Water Research and Development Progress Report No. 708, July 1971. 78 p, 18 fig, 1 tab, 80 ref, append. OSW Contract 14-01-0001-1484.

Descriptors: *Water structure, *Water properties, Hydrogen bonding, Equilibrium, Solvation, Diffusion, Kinetics, Ion exchange, Chemical reactions, Hydration, Hydrate processes, Ions.
Identifiers: *Neutron scattering, *Salt hydration.

The frequencies characteristic of H2O molecules in hydration complexes and the associated diffusive kinetics were investigated by neutron scattering to determine (a) the dependence of the diffusive motions of ion-water complexes on temperature, on cation, and on anion, and to study their relationship to glass formation; (b) the changes in the hydration of ions and the diffusive kinetics which occur upon mixing in ternary solutions. For concentrated solutions of a series of lithium salts, of chromium salts, and of calcium nitrate with decreasing temperature, it has been shown that relaxation times characteristic of individual primary waters of hydration increase and exceed interaction time. (OSW contract)
W72-14067

02. WATER CYCLE

2A. General

DIGITAL SIMULATION OF THUNDERSTORM RAINFALL,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 02B.
W72-13634

APPLICATION OF MODELS IN GEOHYDROLOGICAL INVESTIGATIONS,
Koninklijke Nederlandsche Heidemaatschappij, Arnhem (Netherlands).
J. H. Van Ouwerkerk, and D. A. Zeilmaker.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 85-110, 1972. 1 tab, 469 ref.

Descriptors: *Model studies, *Hydrogeology, *Reviews, *Bibliographies, Analog models, Mathematical models, Groundwater movement, Hydraulic models.

The application of models in geohydrological investigations is closely related to the use of quantitative methods in groundwater hydrology. To help determine which type of model should be chosen an analysis of the following aspects is required: nature of the problems, structure of the hydrological system, types of models, and general conditions. The large number of factors involved in this analysis and the small numbers of results of alternative methods of investigations, preclude the formulation of a generally applicable rule of selecting a model. (Knapp-USGS)
W72-13731

ON SOME MODIFICATIONS IN THE VENETIAN CLIMATE DURING THE LAST THIRTY YEARS: REPERCUSSIONS OF THE PHENOMENON OF FLOOD WATERS,
Istituto Bioclimatol. Ospedale Mare, Lido, Venice (Italy).
For primary bibliographic entry see Field 02B.
W72-13757

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
V. O. Shanholtz, J. B. Burford, and J. H. Lillard.
Available from the National Technical Information Service as PB-212 000, $3.00 in paper copy, $0.95 in microfiche. Research Division Bulletin 73, Aug. 1972, 213 p, 38 tab, 104 fig, 23 ref, 4 append. OWRR A-018-VA (5).

Descriptors: *Water yield, *Model studies, *Agricultural watersheds, Hydrographs, Forecasting, *Small watersheds, Hydrologic data, *Estimating.
Identifiers: *Stanford watershed model.

A Fortran version of the Stanford Watershed Model, without snowmelt, was used to generate streamflow data on two small agricultural watersheds. Five years of recorded data were used to 'calibrate' the model after which 5 additional years were generated using the model parameters developed for the first period. In general, annual water yield estimates appeared to be within measurement accuracy. Estimates for shorter periods tended to be less accurate with daily estimates showing considerable scatter. Errors in monthly flows when compared to respective annual yields were usually less than 5 percent. Estimates of maximum mean daily peak discharge were somewhat erratic. Absolute differences between estimates and observed values were not great; but,

because of small yields, percentage errors were in many instances very high. The model reproduced within acceptable limit, a given hydrograph, ignoring all other events during the year. Difficulty was encountered in obtaining a set of values for the model parameters that would give the best fit of water yield and peak discharge. In general, a sacrifice in peak estimates was required for the best fit of yields and vice versa, for the best fit of peaks. A variety of sensitivity runs were made to gage the effectiveness of different model parameters. The four most important parameters were the interflow index (CC), the infiltration index (DBI), lower zone storage index (FLZSN), and an infiltration - evaporation index (EF) for applying a seasonal variation to infiltration.
W72-13824

TECHNIQUES OF STATISTICAL EVALUATION OF RUNOFF RESULTS OF PRECIPITATION MODIFICATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from NTIS, Springfield, Va 22151 as PB-208 836 for $3.00 paper copy; $0.95 microfiche. Final Contract Report, March 1972. 44 p, 11 fig, 11 tab, 20 ref. Contract 14-06-D-6597.

Descriptors: *Rainfall-runoff relationships, *Colorado River basin, *Weather modification, *Water resources development, *Runoff forecasting, Mathematical studies, Hydrologic data, Data collections, Prototype tests, Evaluation, Hydrology, Water demand, Precipitation (Atmospheric).
Identifiers: Statistical analysis.

Techniques were developed for evaluation of the effect of precipitation modification on runoff with special emphasis on the Colorado River Basin Pilot Project. The test variable is a linear combination of runoff variables with unknown weights. Maximization of the power of the test is achieved by a proper choice of the weights, compatible with constraints of a hydrologic nature. When applied to the Colorado River Basin Pilot Project area the power of the test, expressed in years needed for detection, is increased by a factor of two. If the precipitation increase is 10% on the average for the region over a 50-year period, the chance of detecting it in the runoff is slightly better than one in two. If the average precipitation increase over the same period is 15%, the chance jumps to seventeen in twenty. (Woodard-USGS)
W72-13841

AN INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 06D.
W72-13993

DIGITAL COMPUTER MODELING OF LIMESTONE GROUNDWATER SYSTEMS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02F.
W72-14001

PROCEDURES FOR ESTIMATING THE HYDROLOGIC IMPACT OF URBANIZATION,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W72-14002

DYNAMICS OF FLOOD FREQUENCY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-14003

STREAMFLOW SYNTHESIS -- A CASE STUDY,
Nevada Univ., Reno. Dept. of Civil Engineering.
V. L. Gupta, and J. W. Fordham.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY6, Paper 8969, p 1049-1055, June 1972. 2 fig, 3 tab, 3 ref. OWRR A-037-NEV (2).

Descriptors: *Synthetic hydrology, *Simulation analysis, *Nevada, Data collections, Data processing, Mathematical models, Statistical models, Statistical methods, Statistics.
Identifiers: Truckee River (Calif), Lake Tahoe.

A statistical simulation was prepared for monthly streamflow sequences in a multiple-site configuration in the Tahoe-Truckee system. Data preparation consisted of: (1) conversion of historic streamflow values, wherever necessary, to what the values would be if it were not for regulation; and (2) reconstitution of missing flow values in the record. The general statistical properties of the simulated sequences were comparable to those of historic sequences. Inconsistencies with regard to monthly water balance of the simulated sequences are outlined. (Knapp-USGS)
W72-14005

THEORY OF STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. T. Chow, and T. Prasad.
Journal of Hydrology, Vol 15, No 4, p 261-284, April 1972. 7 fig, 6 tab, 9 ref. OWRR B-038-ILL (8).

Descriptors: *Statistical models, *Rainfall-runoff relationships, *Mathematical models, *Stochastic processes, Regression analysis, Model studies, Systems analysis, Time series analysis, Storm runoff, Statistical methods.
Identifiers: *Stochastic models, French Broad River (NC).

A theory of stochastic modeling of watershed systems is proposed. Hydrologic phenomena may be expressed as stochastic hydrologic systems in terms of mathematical models whose components are represented by stochastic processes. These stochastic hydrologic models are based on mathematical formulation of the principle of systems continuity. The component stochastic processes are precipitation, runoff, evapotranspiration, losses, and basin storage. An annual storm-flood model is used to simulate the hydrologic system of a watershed. The input hourly rainfall of the annual storm is represented by a first-order nonstationary Markov chain and the annual storm-flood is represented by multiple linear regression. The rainfall and runoff relationship of the watershed is represented by a bivariate Markov process. As a numerical example for the analysis, the French Broad River basin above Bent Creek, North Carolina is used as the watershed for the model. (Knapp-USGS)
W72-14007

2B. Precipitation

DIGITAL SIMULATION OF THUNDERSTORM RAINFALL,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
U. A. Sorman, and J. R. Wallace.
Available from the National Technical Information Service as PB-211 806, $3.00 in paper copy, $0.95 in microfiche. Georgia Environmental Resources Center, Atlanta, Report ERC-0972, August 1972. 177 p, 49 fig, 10 tab, 55 ref, 3 append. OWRR A-036-GA (1).

Descriptors: *Thunderstorms, *Simulated rainfall, *Rainfall intensity, *Cloud bursts, *Hydrologic models, Storm structure, Spatial distribution, Temporal distribution, Rainfall gages, *Georgia, Southeast U.S., *Coastal plains, Model studies, *Stochastic processes.
Identifiers: Little River Watershed, Tifton (Ga.).

The purpose was to obtain a better understanding of the temporal and spatial variability of thunderstorm rainfall and to develop a digital model for the stochastic simulation of thunderstorm rainfall for the Southeast Coastal Plain areas. Rainfall patterns were thoroughly analyzed from rainfall data made available by the Agricultural Research Service, U. S. Department of Agriculture. Statistical properties and frequency distributions of rainfall cell characteristics, such as cell duration, size, spatial and temporal distribution of rainfall intensity, cell movement, and the number and orientation of cells, were analyzed. A digital model of thunderstorm rainfall was formulated from observed storm cell characteristics and the parameters of the model were evaluated from isolated thunderstorms. The model tochastically generates rainfall patterns for ten-minute intervals and the rainfall intensity and location of the rainfall cell vary with time. Knowledge was developed on the characteristics of summer thunderstorm rainfall in the Coastal Plain areas of Georgia. The size, movement, and intensity of rainfall from thunderstorm cells measured, and a stochastic model was developed which will generate precipitation patterns like those observed by a raingage network. (Conway-Ga.Tech)
W72-13634

AN ANALYSIS OF THE RAINFALL VARIATIONS IN COUNTY LEITRIM AND THEIR INFLUENCE ON AGRICULTURAL PRODUCTION,
Foras Taluntais, Drumboylan (Ireland).
For primary bibliographic entry see Field 03F.
W72-13713

TUNABLE INFRARED LASER SPECTROSCOPY OF ATMOSPHERIC WATER VAPOR,
Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
F. A. Blum, K. W. Nill, P. L. Kelley, A. R. Calawa, and T. C. Harman.
Science, Vol 177, No 4050, p 694-695, August 25, 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Infrared radiation, *Water vapor, *Spectroscopy, *Meteoric water, Atmosphere, Absorption, Methodology, Remote sensing, Analytical techniques.
Identifiers: *Laser radiation.

Water vapor plays a prominent role in determining the infrared properties of the atmosphere. Absorption lines in the v sub-2 band of water vapor at 6.3 micrometers have been fully resolved by using a tunable semiconductor laser. Three atmospheric vapor lines near 5.32 micrometers were studied in detail and found to have line widths two to four times narrower that the width calculated by Benedict and Kaplan. (Lang-USGS)
W72-13732

ON SOME MODIFICATIONS IN THE VENETIAN CLIMATE DURING THE LAST THIRTY YEARS: REPERCUSSIONS OF THE PHENOMENON OF FLOOD WATERS,
Istituto Bioclimatol. Ospedale Mare, Lido, Venice (Italy).
A. Giordani-Soika, and D. Meneghini.
Boll Mus Civ Stor Nat Ven. 20/21, p 13-26. 1970.
Identifiers: *Wind velocity, Climate, *Floods, Italy, Modifications, Repercussions, Years.

The analysis of extensive meteorological records shows that the unusually high tides of recent years have been caused by the increased intensity of prevalent winds.--Copyright 1972, Biological Abstracts, Inc.
W72-13757

FOUR-DIMENSIONAL WORLD-WIDE ATMOSPHERIC MODELS (SURFACE TO 25 KM ALTITUDE),
Allied Research Associates, Inc., Baltimore, Md. Baltimore Div.
D. B. Spiegler, and M. G. Fowler.
National Aeronautics and Space Administration Contract Report (NASA CR-2082), July 1972. 66 p, 29 fig, 8 tab, 7 ref. NASA Contract NA58-26928.

Descriptors: *Weather forecasting, *Meteorological data, *Computer models, *Atmospheric physics, Input-output analysis, Moisture, Pressure, Temperature, Density, Cloud physics, Precipitation (Atmospheric), Cloud cover, Attenuation.

Four-dimensional atmospheric models previously developed for use as input to atmospheric attenuation models are evaluated to determine where refinements are warranted. A computerized technique was developed that has the unique capability of extracting mean monthly and daily variance profiles of moisture, temperature, density and pressure at 1 km intervals to the height of 25 km for any location on the globe. This capability could be very useful to planners of remote sensing of earth resources missions in that the profiles may be used as input to the attenuation models that predict the expected degradation of the sensor data. Recommendations are given for procedures to use the four-dimensional models in computer mission simulations and for the approach to combining the information provided by the 4-D models with that given by global cloud models. (Woodard-USGS)
W72-13843

RELATION OF PRECIPITATION TO SOIL TEMPERATURE (2ND REPORT)--EFFECT OF SOIL MOISTURE ON HEAT-EXCHANGE IN THE SOIL,
Fukushima Univ. (Japan). Dept. of Earth Science.
For primary bibliographic entry see Field 02G.
W72-13845

ESTIMATING THE WETTING OF WALLS BY DRIVING RAIN (OB OTSENKE UVLAZHENIYA STEN PRI KOSYKH DOZHYDAKH),
Main Geophysical Observatory, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W72-13855

USE OF ZAYTSEV METHOD FOR DETERMINING THE WATER CONTENT OF FOGS IN CHAMBERS,
For primary bibliographic entry see Field 07B.
W72-13863

TEST OF RUNOFF INCREASE DUE TO PRECIPITATION MANAGEMENT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03B.
W72-13912

ELECTRICITY OF CLOUDS,
I. M. Imyanitov, Ye. V. Chubarina, and Ya. M. Shvarts.
Available from NTIS, Springfield, Va 22151 as NASA TT F-718. Price $3.00 paper copy. National Aeronautics and Space Administration Technical Translation (NASA TT F-718), June 1972. 122 p, 18 fig, 16 tab, 181 ref. (Trans. of 'Elektrichestvo oblakov', Leningrad, 1971).

Descriptors: *Clouds, *Electrical properties, *Cloud physics, *Electricity, *Atmosphere, Data collections, Lightning, Storm structure, Electrical properties, Electric fields, Electrical resistance, Thunderstorms, Rainfall.
Identifiers: *Cloud electricity.

Data are presented on electrical characteristics of clouds including the electrical properties of clouds, the processes which lead to cloud electrification, methods devised by man to change the electrical properties of clouds, and the influence of electrical properties on cloud development. On the basis of the distributions of potential gradients of the electrical fields in and near clouds, the distributions of densities of space charges can be determined, and by including the effects of the electrical conductivity of the air and the field of air movement velocities, it is possible to calculate the distribution of the total electrical current density of the atmosphere. This report is designed to serve as an aid in bridging the gap between the concepts of specialists in atmospheric electricity and the concepts of specialists in other studies of cloud electricity. A bibliography containing 181 documents is included. (Woodard-USGS)
W72-14039

MAN AND HIS ENVIRONMENT: CLIMATE,
For primary bibliographic entry see Field 06G.
W72-14137

2C. Snow, Ice, and Frost

THE BIODEGRADATION OF ORGANIC SUBSTRATES UNDER ARCTIC AND SUBARCTIC CONDITIONS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W72-13822

PERMAFROST IN CANADA.
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 07C.
W72-13831

SNOWFALL AND SNOW TRANSPORT DURING SNOWSTORMS OVER THE USSR,
Main Geophysical Observatory, Leningrad (USSR).
V. M. Mikhel, A. V. Rudneva, and V. I. Lipovskaya.
Available from the National Technical Information Service as TT-70-50181, $3.00 in paper copy, $0.95 in microfiche. National Oceanic and Atmospheric Admin., by Israel Program for Scientific Translations, Jerusalem, 1971. 174 p, 35 fig, 11 tab, 145 ref. Trans. of Perenosy Snega Pri Metelyakh i Snegopady Na Territorii SSR, Leningrad, 1969.

Descriptors: *Snow, *Snow cover, *Snowpacks, *Snowfall, *Storms, Meteorology, Wind velocity, Atmospheric pressure, Water equivalent, Depth, Density, Distribution, Variability, Probability, Frequency, Zoning, Mapping, Agriculture, Transportation, Precipitation gages.
Identifiers: *USSR, *Snow transport, Anemoscopes.

This book analyzes the physical conditions of snowstorms in various physiographic regions of the USSR and presents methods of calculating snow transport during snowstorms. Three types of snowstorms are identified: (1) a general snowfall where atmospheric pressure is less than 1,015 mb; (2) blowing snow where atmospheric pressure is greater than 1,015 mb and no precipitation collects in the precipitation gage; and (3) drifting snow. Depth, density, water equivalent, and geographic distribution of snow cover are analyzed in connection with the intensity, duration, and amount of transported snow. Analysis of snowpack and snow transport characteristics will help climatologists and scientific workers in various branches of the national economy assess the effects of snow on surface transportation systems and the importance of snow control in agriculture. (Josefson-USGS)
W72-13852

DISTRIBUTION PATTERNS FOR SOME PARTICULATE AND DISSOLVED TRACE METALS WITHIN AN ACTIVE GLACIAL FJORD,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W72-13973

DEVELOPMENT OF FOREST MANAGEMENT PRACTICES FOR INCREASING SNOWPACK WATER YIELD,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. F. Ffolliott, and D. B. Thorud.
Available from the National Technical Information Service as PB-212 029, $3.00 in paper copy, $0.95 in microfiche. Completion Report, September, 1972, 5 p. OWRR A-029-ARIZ (2).

Descriptors: *Snowpack, *Snow management, *Water yield improvement, *Forest management, *Arizona, Ponderosa pine trees.
Identifiers: *Forest Management Guidelines, *Snowpack runoff.

Much of the recoverable precipitation in Arizona originates from snowpacks occurring in the ponderosa pine type of the State. Water yields from these snowpacks provide surface water supplies to Phoenix and central Arizona, where groundwater tables are declining. Forest management practices aimed at increasing water yields may be one alternative for relieving water shortages in this area. Source information was obtained for the preparation of forest management guidelines designed to increase snowpack water yield. Specifically, guidelines for reducing timber density and complete removal of timber overstories appropriate to the ponderosa pine type of Arizona, and designed to increase snowpack water yield, were formulated. Hopefully, with these guidelines, land managers will be able to prescribe and implement forest management practices likely to provide maximum snowpack accumulation on-site, and to identify sites likely to yield maximum snowpack runoff. To facilitate operational application, the effects of proposed guidelines on water, wood, forage, wildlife, and aesthetic qualities of the land were considered in physical and economic analyses. (See also W72-13996)
W72-13995

USE OF FOREST ATTRIBUTES IN SNOWPACK INVENTORY - PREDICTION RELATIONSHIPS FOR ARIZONA PONDEROSA PINE,
Arizona Univ., Tucson. Dept. of Watershed Management.
D. B. Thorud, and P. F. Ffolliott.
Journal of Soil and Water Conservation, Volume 27, Number 3, p 109-111, May-June 1972. 1 fig, 2 tab, 14 ref. OWRR A-014-ARIZ (7).

Descriptors: *Snowpack, *Snow management, *Water yield improvement, *Forest management, *Ponderosa pine trees, *Arizona.

Inventory-prediction equations describing snowpack accumulations as functions of readily available or easily obtained measurements of forest density and land form were developed for use in Arizona ponderosa pine (Pinus ponderosa Laws.). Although empirical, these equations include forest density measurements assumed to index interception of input precipitation, obstruction of direct-beam solar radiation, and radiation emission from trees onto the snowpack. Measurements of land form factors index the quantity of direct-beam solar radiation. (See also W72-13995)
W72-13996

RIVER DISCHARGE INTO AN ICE-COVERED OCEAN AND RELATED SEDIMENT DISPERSAL, BEAUFORT SEA, COAST OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-14020

GROWTH OF A TALUS CONE IN THE WESTERN CHUGACH MOUNTAINS, ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-14026

USE OF CAPILLARY COLUMNS TO STUDY INFILTRATION OF WATER INTO FROZEN SOIL (SKHEMA KAPILLYARNYKH KOLONN DLYA VPITYVANIYA VODY V MERZLYY GRUNT),
Severni Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W72-14031

CALCULATION OF RATE OF EXTENSION OF ICE COVER IN AFTERBAYS OF RESERVOIRS (RASCHET NASTUPLENIYA KROMKI LEDYANOGO POKROVA V NIZHIKH B'YEFAKH VODOKHRANILISHCH),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
V. A. Miloshevich.
Meteorologiya i Gidrologiya, No 12, p 59-64, December 1971. 1 fig, 8 ref.

Descriptors: *Ice, *Ice cover, *Afterbays, *Reservoirs, *Flow, Flow rates, Properties, Heat balance, Heat transfer, Heat flow, Temperature, Air temperature, Water temperature.
Identifiers: *USSR, *Ice properties, Ice thickness, Ice accretion.

Factors which determine average rate of extension of ice cover on rivers in afterbays of reservoirs are: (1) rate of heat transfer in the ice-forming reach; (2) length of the ice-forming reach; (3) average open-channel rate of flow; (4) density of ice; and (5) density of water. Equations are developed to compute rate of ice extension and position of the ice edge. Results obtained for 160 computed ice-extension rates are within 10% of the true value in 34 cases and within 20% of the true value in 87 cases. In 149 cases, the computed rates are within 40% of true values. (Josefson-USGS)
W72-14033

PHYSICS OF FRESHWATER ICE (FIZIKA PRESNOVODNOGO L'DA),
V. V. Bogorodskiy, A. V. Gusev, and G. P. Khokhlov.
Gidrometeoizdat, Leningrad, 1971. 228 p.

Descriptors: *Ice, *Ice cover, *Freshwater, *Physics, *Physical properties, Water properties, Water structure, Molecular structure, Snow, Freezing, Crystallization, Crystallography, Acoustics, Electrical properties, Mechanical properties, Thermal properties, Radiation, Measurement, Investigations, Equations.
Identifiers: *USSR, *Freshwater ice, *Ice properties, *Ice structure, *Ice crystals, Ice thickness, Ice formation.

This monograph, which consists of 9 chapters, examines the physical processes occurring during freezing of water and growth of ice cover and the properties and structure of ice. Specific topics discussed include: (1) physics of the liquid state and phase transitions of water; (2) formation of ice cover; (3) thermal properties of ice; (4) radiation properties of ice; (5) methods of measuring mechanical properties of ice and snow; (6) mechanical properties of freshwater ice and snow; (7) application of acoustical methods to the study of ice; (8) electrical properties of ice; and (9) electromagnetic methods of measuring ice thickness. The text will prove of particular value to hydrologists and geophysicists interested in the latest techniques of ice research. (Josefson-USGS)
W72-14037

OIL AND THE ECOLOGY OF THE ARCTIC,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-14188

2D. Evaporation and Transpiration

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 03F.
W72-14009

DISPOSAL OF BRINE BY SOLAR EVAPORATION,
New Mexico State Univ., University Park.
N. N. Gunaji, and C. Keyes, Jr.
Available from the National Technical Information Service as PB-206 045, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 351, May 1968. 213 p, 58 fig, 20 tab, 65 ref, 4 append. Contracts 14-01-0001-511 and 14-01-0001-969.

Descriptors: *Brine disposal, *Brines, *Solar radiation, *Evaporation, Energy balance, Waste disposal, Desalination, New Mexico.
Identifiers: *Evaporation rates, *Mass transfer method, Effluent ponds, Energy budget method, Dyes, Water budget method, *Roswell (N Mex).

An investigation was made to determine the rate of evaporation of brine in solar ponds by methods of energy budget, water budget and mass transfer. The investigation included the effect of salinity and dyes on solar evaporation of brine at Roswell, New Mexico. The dyes used in the study were: Bismark Brown, Congo Red, Methylene Blue, Naphthol Green and Nigrosine Dyes. The water budget method for determining evaporation depth in a Modified Cummings Radiation Integrator is more reliable than the Energy Budget Method. Naphthol Green was found to increase evaporation more than the other dyes. (OSW abstract)
W72-14077

THE EFFECT OF FRUITING UPON TRANSPIRATION RATE AND STOMATAL OPENING IN APPLE LEAVES,
For primary bibliographic entry see Field 03F.
W72-14097

TRANSPIRATION OF ANTIRRHINUM MAJUS L. 'PANAMA' AS INFLUENCED BY SOIL TEMPERATURE,
Georgia Univ., Athens. Dept. of Horticulture.
R. B. Rutland, and J. E. Pallas, Jr.
J Am Soc Hort Sci, 97 (1): 34-37, Illus, 1972.
Identifiers: *Antirrhinum-Majus-D, Panama, *Soil temperature, Stomatal, Suction, *Transpiration, Wilting.

The rate of transpiration of A. majus L. 'Panama' increased as the daytime temperature (T) was increased in the range 20 deg C to 35 deg C while vapor pressure deficit (v.p.d.) and night T were held constant in a controlled environment chamber. Transpiration rates declined when day T was 20 or 25 deg C after nights of 15 deg C, but remained steady during days of 30 or 35 deg C following 15 deg C nights. The slower rates of soil warming with 20 and 25 deg C days after 15 deg C nights influenced the rate of transpiration by causing early morning wilting and by increasing stomatal resistance (RS). The decline in transpiration at 20 and 25 deg C was similar to that observed when soil water suction was increasing and slowing water flow. Total daily transpiration was 1/3 less when rhizosphere T was controlled at 10 deg C in contrast with 25 deg C when plants were grown in either a gravel-peat-vermiculite medium or nutrient solution. Plants in 25 deg C soil responded to increasing evaporative demand by increasing transpiration, but those in 10 deg C soil wilted under even low v.p.d. and transpired at a low rate under any condition tested. The declining rate of transpiration at 20 and 25 deg C during the day when soil T was not controlled was due to cold soil. This work suggests that under glass culture, where wilting can be identified as a result of cold soil, soil heating may be necessary as a preventative treatment.--Copyright 1972, Biological Abstracts, Inc.
W72-14102

AN INSTRUMENT FOR CONTINUOUS RECORDING OF NATURAL EVAPORATION,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 07B.
W72-14136

2E. Streamflow and Runoff

A STATISTICAL ANALYSIS OF BASE-FLOW FLOOD DISCHARGE DATA,
Cornell Univ., Ithaca, N.Y.
R. M. Shane.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-1409, Microfilm $3.00, Xerox $5.40. Ph. D. Dissertation, 1966, 106 p.

Descriptors: *Flood forecasting, *Mathematical models, *Statistical methods, Base flow, Design flood, Design flow, Model studies.
Identifiers: *Method of maximum likelihood, Confidence limits.

A probability model was developed from assumptions made about the occurrence of flood peaks. Equations were derived which relate design flow to several commonly used measures of risk. These equations contain parameters which must be estimated from base flow data. Estimators which require very little computation were developed using the method of maximum likelihood. Also, confidence limits for design flow were presented which can be used for predicting the design flow necessary to provide a desired level of risk with some specified degree of confidence. The uncertainty of a prediction due to the inherent random nature of flood occurrences was separated from the uncertainty due to a finite length of record. (Galwardi-Texas)
W72-13700

FLOODING ALONG THE RIO PIEDRAS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 07C.
W72-13714

PREHISTORIC NEAR-SURFACE SUBSIDENCE CRACKS IN WESTERN FRESHNO COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
W. B. Bull.
Available from GPO, Washington, DC 20402-Price $1.75. Geological Survey Professional Paper 437-C, 1972. 85 p, 65 fig, 2 plate, 3 tab, 40 ref.

Descriptors: *Land subsidence, *Wetting, *California, *Paleohydrology, *Alluvial fans, Alluvium, Alluvial channels, Compaction, Irrigation water, Canals, Soil physical properties, Stress, Stratigraphy.
Identifiers: *Fresno County (Calif).

Thousands of clay-filled tension cracks found in the alluvial fans of the San Joaquin Valley, Calif., during the excavation of the California Aqueduct raised the possibility of postconstruction tensional rupture of the canal. Virtually all the cracks in the large fans are the result of prehistoric compaction due to wetting caused by streamflow. Evidence for prehistoric cracking includes cracks that parallel former stream courses, crack fillings truncated by buried stream channels, crack filling in the present streambanks, variable depth of burial of the crack tops, absence of widespread historic near-surface subsidence, and the presence of field capacity moisture conditions in the deposits of unirrigated areas. About 5-10 feet of near-surface subsidence occurred on the large fans after accumulation of at least 65 feet of deposits during the last 45,000-100,000 years-deposits that remained moisture-deficient even during times of Pleistocene glacial and lacustrine expansion. The wetting of the moisture deficient deposits occurred during the last 10,000 years. Depths of crack burial indicate that wetting has continued to the present time on the large fans, but ceased on the small fans about 5,000 years ago. The possibility of future near-surface subsidence on the large fans which would cause serious damage to the San Luis Canal section of the California Aqueduct is slight, because nearly all the cracks in the large fans are prehistoric. Small pockets of moisture-deficient deposits left as a result of erratic prehistoric percolation from the streams probably have been wetted and compacted during 20 years of irrigation. (Knapp-USGS)
W72-13717

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W72-13720

AN EXPERIMENTAL STUDY OF THE GROWTH OF MECHANICALLY GENERATED SURFACE WATER WAVES WHEN SUBJECTED TO A FULLY DEVELOPED TURBULENT CHANNEL AIRFLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
W. S. Wilson.
Chesapeake Bay Institute Technical Report 74 (Reference 72-2), March 1972. 85 p, 30 fig, 4 tab, 37 ref. NR 083-016. ONR Contract N00014-67-A-0163-0006.

Descriptors: *Waves (Water), *Wave pile-up, *Channel flow, *Turbulence, *Hydraulic models, Wind velocity, Air circulation, Analytical techniques, Mathematical studies, Theoretical analysis, Correlation analysis, Air-water interfaces, Surface waters.
Identifiers: *Wave growth rates, Airflow.

An experimental study was conducted to measure the growth rates of mechanically generated surface water waves when subjected to fully developed turbulent channel airflow. For a series of wave frequencies from 2 to 6 Hz at 0.5-Hz increments and centerline velocities of 0.20, 1.12, and 1.84 m/s (meters per second), wave amplitudes were measured at three stations, 2.21, 3.43, and 4.65 meters downwind from the wave generator. In addition, for centerline velocities of 1.12 and 1.84 m/s, Ul (the velocity at the outer edge of the viscous sublayer) and U* (the shear velocity) were obtained from measured mean velocity and Reynolds stress profiles. The wave amplitude measurements at the wind velocity of 0.20 m/s provided attenuation rate estimates which agreed with theoretical attenuation rates based on viscous effects both on the walls and in the bulk of the water. The amplitude measurements at the wind velocities of 1.12 and 1.84 m/s provided growth rate estimates which were compared with theoretical growth rates (computed using the wage frequency, Ul and U*) predicted by the Mile's 1962 Theory. At 1.12 m/s Mile's growth rates were two to five times larger than those measured; at 1.84 m/s, Mile's growth rates were about two times larger. (Woodard-USGS)
W72-13734

SELECTED STREAMFLOW CHARACTERISTICS AS RELATED TO CHANNEL GEOMETRY OF PERENNIAL STREAMS IN COLORADO,
Geological Survey, Lakewood, Colo.
E. R. Hedman, D. O. Moore, and R. K. Livingston.
Geological Survey Open-file Report, May 1972. 14 p, 3 fig, 2 tab, 5 ref.

Descriptors: *Streamflow, *Flow characteristics, *Perennial streams, *Colorado, Channel morphology, Cross-sections, Flow rates, Discharge measurement, Stream gages, Rating curves, Streamflow forecasting, Estimating.
Identifiers: Ungaged streams.

The mean annual runoff and peak discharges having selected recurrence intervals are related to the width and average depth of cross sections between channel and point bars for 53 gaged sites on perennial streams in the mountain region of Colorado. These relations and measures of channel dimensions can be used to estimate streamflow characteristics for ungaged streams in the Colorado mountain region. The standard error of estimate is 18.3% for the relation with mean annual runoff, and ranges from about 30% to 45% for the relations with peak discharges having recurrence intervals of 2, 5, 10, 25, and 50 years. The standard error of estimate generally increased with the recurrence interval for peak discharges. (Woodard-USGS)
W72-13736

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
For primary bibliographic entry see Field 02A.
W72-13824

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65, PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 2. BASINS FROM NEW YORK TO DELAWARE.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13827

FLOOD PLAIN INFORMATION, TALKEETNA RIVER-SUSITNA RIVER-CHULITNA RIVER, TALKEETNA, ALASKA.
Corps of Engineers, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-13836

CHANNEL NETWORK OF A BASIN AND FORMATION OF RUNOFF (RUSLOVAYA SET' BASSEYNA I PROTSESS FORMIROVANIYA STOKA VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. A. Nezhikhovskiy.
Gidrometeoizdat, Leningrad, 1971. 476 p.

Descriptors: *Runoff, *Flow, *Channel flow, *Channels, *River basins, Watersheds (Basins), Drainage area, Water distribution (Applied), Water storage, Discharge (Water), Flood discharge, Flood routing, Flood flow, Flow rates, Time lag, Hydrographs, Water balance, River forecasting, Hydrography, Fluctuations.
Identifiers: *USSR, *European USSR, Hydrometric stations.

This 3-section monograph examines the channel network of a river basin and its role in the formation of flood runoff. Section I (Chapter I-V) provides information on the hydrographic network of a basin (including stream density, composition, and structure) and on the calculation of channel storage and storage changes. The contribution of channels to flood runoff, including the volume and distribution of water and channel inflow, is described in the second section (Chapters VI-IX). River-forecasting procedures based on these parameters are outlined in the final section (Chapters X-XI). (Josefson-USGS)
W72-13853

HYDROLOGIC INVESTIGATIONS, COMPUTATIONS, AND FORECASTS (VOPROSY GIDROLOGICHESKIKH ISSLEDOVANIY, RASCHETOV I PROGNOZOV).
For primary bibliographic entry see Field 04A.
W72-13854

FORMATION, CALCULATION, AND REGULATION OF STREAMFLOW (FORMIROVANIYE, RASCHETY I REGULIROVANIYE RECHNOGO STOKA).
For primary bibliographic entry see Field 04A.
W72-13857

PROBLEMS IN HYDROLOGIC INSTRUMENTATION (VOPROSY GIDROLOGICHESKOGO PRIBOROSTROYENIYA).
For primary bibliographic entry see Field 07B.
W72-13859

TECHNIQUES AND HYDRULIC VERIFICATION OF HYDROMETRIC STUDIES (METODIKA I GIDRAVLICHESKOYE OBOSNOVANIYE GIDROMETRICHESKIKH RABOT).
For primary bibliographic entry see Field 08B.
W72-13861

DYNAMICS OF FLOOD FREQUENCY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
P. S. Eagleson.
Water Resources Research, Vol 8, No 4, p 878-898, August 1972. 14 fig, 2 tab, 16 ref. OWRR C-2137 (No 3403) (3).

Descriptors: *Floods, *Frequency analysis, *Flood recurrence interval, *Probability, Numerical analysis, *Connecticut, Statistical methods, Peak discharge, Land use.
Identifiers: Kinematic wave theory.

The probability mass function of peak streamflow is derived from the density functions for climatic and catchment variables by the kinematic wave method of hydrograph forecasting. The exceedance probability for a flood peak is then related to the annual exceedance recurrence interval. The resulting theoretical flood frequency relation shows a changing form with change in catchment and climate parameters and agrees well with observations from three Connecticut catchments. It provides a theoretical basis for estimating flood frequency in the absence of streamflow records and for extrapolating empirical estimates based on short records. Because of explicit, physically meaningful catchment parameters, it also allows quantitative estimates of the effect on flood frequency of changes in land use. The flood frequency relation is averaged across the population of catchments of given size to provide a theoretical regional flood frequency function that compares favorably with observations of mean annual floods on 44 Connecticut catchments. (Knapp-USGS)

W72-14003

STREAMFLOW SYNTHESIS -- A CASE STUDY,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14005

CALIFORNIA HIGH WATER, 1969-1970,
California State Dept. of Water Resources, Sacramento.
W. A. Arvola, D. E. Martfeld, W. B. Chan, J. C. Bringham, and G. W. Patrick.
California Department of Water Resources Bulletin No 69-70, August 1971. 50 p, 19 plate, 3 tab.

Descriptors: *Floods, *Flood damage, *Flood data, *California, Flood peak, Streamflow, Rainfall-runoff relationships, Mudflows, Reservoirs, Storms, Hydrologic data, Data collections.

Most of the precipitation in California during the 1969-70 water year fell in December 1969 and January 1970. Above-normal January rainfall affected the northern half of the State with many stations reporting two to three times the normal for the month. Precipitation totals for the 3-day period of January 21-23 were especially heavy causing runoff in the North Coast streams from 400 to 600% above normal. January precipitation in the Sacramento Valley ranged from 200 to 350% above normal causing peaks of record at several locations along the Sacramento River. Runoff in the Sacramento Valley ranged from 500% above normal on the Sacramento River to 600% on the Feather and Yuba Rivers. Inflow into Shasta Lake peaked near 210,000 cfs, the highest inflow of record. Releases from Keswick Dam were increased to 79,000 cfs, the maximum allowable under flood control regulations, for the first time since 1958. The Governor proclaimed 17 counties disaster areas. (Woodard-USGS)
W72-14013

RIVER DISCHARGE INTO AN ICE-COVERED OCEAN AND RELATED SEDIMENT DISPERSAL, BEAUFORT SEA, COAST OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-14020

LONGITUDINAL PROFILES OF EPHEMERAL STREAMS IN SOUTHEASTERN ARIZONA,
Princeton Univ., N.J. Dept. of Geological Sciences.
D. S. Cherkauer.
Geological Society of America Bulletin, Vol 83, No 3, p 353-365, February 1972. 7 fig, 6 tab, 20 ref.

Descriptors: *Geomorphology, *Profiles, *Channel morphology, *Ephemeral streams, *Arizona, Terrain analysis, Erosion, Bed load, Particle size, Roughness (Hydraulic), Topography, Graded, Sediment load, Geologic control, Statistical methods.
Identifiers: *Stream profiles.

Longitudinal profiles in ephemeral streams heading in the mountains of southeastern Arizona are related to the longitudinal variation of drainage area, bed-material size, and channel width to depth ratio. These parameters are related to discharge, sediment load, and roughness, which have been found to control stream profiles in other regions, but were unavailable for this ephemeral-stream study. Inclusion of basin relief and lithology allowed development of statistically significant equations for both segments of streams draining granitic and sedimentary terrains. Profiles of streams in two additional mountain ranges were predicted from the equations with an accuracy within the limits of accuracy of the field and map measurements. Precipitation-elevation relations have no apparent effect on the accuracy of the predictions or on stream-profile concavity. (Knapp-USGS)

W72-14021

ALLUVIAL CUTOFF DATING FROM SUBSEQUENT GROWTH OF A MEANDER,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 02J.
W72-14025

REDUCTION OF RUNOFF INTO KARA-BOGAZ-GOL AND THE FUTURE LEVEL OF THE CASPIAN SEA (OGRANICHENIYE STOKA V ZALIV KARA-BOGAZ-GOL I BUDUSHCHIY UROVEN' KASPIYSKOGO MORYA),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
K. I. Smirnova.
Meteorologiya i Gidrologiya, No 12, p 65-70, December 1971. 3 fig, 3 tab, 6 ref.

Descriptors: *Runoff, *Streamflow, *Sea level, *Water levels, Water level fluctuations, Water balance, Inflow, Alteration of flow, Diversion, Regulation, Dam construction, Damsites, Probability, Forecasting.
Identifiers: *USSR, *Caspian Sea, *Kara-Bogaz-Gol.

Water from the Caspian Sea flows into the large shallow gulf of Kara-Bogaz-Gol on the coast of the Turkmen Republic through a narrow strait. The depth of the strait is 4.5-6.5 m, and the average rate of flow in the strait is 1.0-1.5 m/sec. Calculations indicate that by the year 2000 the water level of the Caspian Sea could rise 25 cm by limiting runoff into the gulf to 5 cu km/yr and by increasing inflow of water to the sea. The water level could be increased an additional 5 cm during the same period by diversion of the runoff of northern rivers to the Volga basin. Construction of a dam across the strait of Kara-Bogaz-Gol would have little positive effect on raising the sea level. (Josefson-USGS)
W72-14032

HYDROLOGIC COMPUTATIONS AND FORECASTS (VOPROSY GIDROLOGICHESKIKH RASCHETOV I PROGNOZOV).
For primary bibliographic entry see Field 04A.
W72-14038

HYDRODYNAMICS OF FREE-BOUNDARY FLOWS,
For primary bibliographic entry see Field 08B.
W72-14040

HYDROGEOLOGICAL STUDIES IN THE CAPTATION AREA OF THE LOISACH RIVER BETWEEN GARMISCH-PARTENKIRCHEN AND ESCHENLOHE/OBB,
Bayerische Akademie der Wissenschaften, Munich (West Germany).
Jan-Peter Wrobel.
Bayer Akad Der Wiss Math Naturwiss Kl Abh. 146: 1-87. Illus. Maps. 1970.
Identifiers: *Captation area, Eschenlohe, Garmisch-Partenkirchen, Germany, *Loisach River, Minerals, Obb, Rivers, *Hydrogeology.

The hydrological connection between mountain chains partly converted to karst and the Loisach valley, the hydraulic connection between the main drainage channel and ground water, and the water balance in the Loisach basin between Garmisch Partenkirchen and Eschenlohe Obb were studied by analyzing the geology and stratigraphy of the area and by using dyes (uranine, sulf-rhodamine-extra-G) to race the subterranean movements of water. Traces of dyes were absorbed by bags containing activated charcoal and the eluate examined by a fluorometer. Four types of springs draining into the Loisach with water of different mineral content stemming from their different subterranean routes were identified. An equilibrium existed between the river and ground water and at certain times the Loisach gave up water to the ground water reservoir. Two types of ground water, one containing calcium carbonate, the other calcium sulfate were identified.--Copyright 1972, Biological Abstracts, Inc.
W72-14148

MECHANICAL BALANCE: ELECTRICAL READOUT WEIGHING LYSIMETER,
Atmospheric Environment Service, Toronto (Ontario).
For primary bibliographic entry see Field 07B.
W72-14185

2F. Groundwater

GROUND WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13715

GROUND-WATER RESOURCES OF MCLEAN COUNTY, WEST-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13716

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W72-13720

REVIEW OF GEOHYDROLOGICAL ACTIVITIES IN THE NETHERLANDS SINCE WORLD WAR II, IN PARTICULAR OF THE GOVERNMENT INSTITUTE FOR WATER SUPPLY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
E. Romijn.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 1-6, 1972. 40 ref.

Descriptors: *Reviews, *Hydrogeology, Water conservation, Water management (Applied), Drainage, Water supply.
Identifiers: *Netherlands.

Geohydrological activities in the Netherlands since World War II are reviewed. Besides the Government Institute for Water Supply many other agencies and institutes have contributed to progress. Scientific achievements in geohydrology have largely run parallel with the rapid social and economic development of the Netherlands since the war. (Knapp-USGS)
W72-13721

BURIED CHANNEL AQUIFERS AND PRESENT OPEN DRAINAGE SYSTEM OF EAST GELDERLAND, THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
J. J. De Vries, and E. Van Rees Vellinga.
Geologie en Mijnbouw, (Netherlands), Vol 51, No 1, p 45-52, 1972. 5 fig, 16 ref.

Descriptors: *Aquifers, *Alluvial channels, *Drainage patterns (Geologic), Pleistocene epoch, Paleohydrology, Hydrogeology, Glacial drift, Stratigraphy.
Identifiers: *Buried valleys, *East Gelderland (The Netherlands).

In the eastern part of the province of Gelderland, The Netherlands, two buried valley systems have

been traced. One system is filled with fluvioglacial deposits dating from the Saalian Ice Age, the other with preglacial fluvial sediments which are remarkably rich in volcanic minerals. Both systems have courses almost perpendicular to the present drainage system. This change in stream direction is explained by postglacial replacement of the main drainage channel in the area, tectonic movement perpendicular to the old channels, and postglacial filling of the old channels with wind blown sand. (Knapp-USGS)
W72-13722

GEOHYDROLOGICAL INVESTIGATIONS WITH A VIEW TO GROUNDWATER CATCHMENT--A CASE HISTORY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13723

CONTRIBUTION TO THE GEOCHEMISTRY OF GROUNDWATER IN NORTHERN GERMANY,
Geologisches Landesamt Hamburg (West Germany).
For primary bibliographic entry see Field 02K.
W72-13725

THE USE OF GEOHYDROLOGY IN SOLVING WATER MANAGEMENT PROBLEMS IN AGRICULTURE,
Institute for Land and Water Management Research Wageningen (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13726

RECENT DEVELOPMENTS OF PHYSICAL INVESTIGATIONS IN BOREHOLES AND WELLS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13727

APPLICATION OF NATURAL ISOTOPES IN GROUND WATER HYDROLOGY,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
W. G. Mook.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 131-136, 1972. 16 ref.

Descriptors: *Reviews, *Radioisotopes, *Stable isotopes, *Tracers, *Hydrogeology, Tritium, Deuterium, Oxygen, Carbon radioisotopes, Evaporation, Water balance, Groundwater movement.

The naturally abundant isotopes of carbon, oxygen and hydrogen all have their specific contribution to groundwater research. Their best use is to serve as ideal tracers, especially 0-18, deuterium and tritium, which are materials of the water molecule itself. They are largely used to determine the origin of groundwater. The radioactive isotopes, C-14 and T, have a special use, that of dating water. By comparing the ages of samples within a water body, a flow direction and velocity may be deduced. Deuterium and C-13 can reveal more specific information on the degree of evaporation before or during infiltration and the occurrence of hydrologic and chemical processes in the unsaturated zone. (Knapp-USGS)
W72-13728

AN ELECTRONIC GROUNDWATER-LEVEL DETECTOR WITH AUTOMATIC OUTPUT REGISTRATION,
Koninklijke-Shell Exploratie en Produktie Laboratorium. Rijswijk (Netherlands). An Electronic Groundwater-Level Detector with Automatic Output Registration,
For primary bibliographic entry see Field 07B.
W72-13729

PERMEABILITY DISTRIBUTION IN A HOLOCENE DISTRIBUTARY CHANNEL-FILL NEAR LEERDAM (THE NETHERLANDS),
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 02J.
W72-13730

APPLICATION OF MODELS IN GEOHYDROLOGICAL INVESTIGATIONS,
Koninklijke Nederlandsche Heidemaatschappij, Arnhem (Netherlands).
For primary bibliographic entry see Field 02A.
W72-13731

TEST-OBSERVATION WELL NEAR DAVENPORT, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04B.
W72-13733

ELECTRIC ANALOG STUDIES OF FLOW TO WELLS IN THE PUNJAB AQUIFER OF WEST PAKISTAN,
Geological Survey, Washington, D.C.
M. J. Mundorff, G. D. Bennett, and M. Ahmad.
Available from GPO, Washington, DC 20402-Price 65 cents. Geological Survey Water-Supply Paper 1608-N, 1972. 28 p, 12 fig, 1 plate, 6 tab, 5 ref.

Descriptors: *Groundwater movement, *Aquifer characteristics, *Flow characteristics, *Analog models, *Water wells, Test wells, Pumping, Permeability, Drawdown, Flow rates, Foreign research.
Identifiers: *West Pakistan, *Punjab aquifer (Wext Pakistan), Model Design, Time of travel (Groundwater).

A series of experiments was performed with a steady-state electric analog simulating a cylindrical segment of the aquifer underlying the plains of the Punjab region of West Pakistan. Experiments were made with different anisotropies (ratios of lateral to vertical resistance) so that various possible combinations of aquifer thickness and effective radius or radius of influence and combinations of lateral and vertical permeability could be included in the models. Flow nets were constructed to show distribution of potential in the vertical section and intersections of stream surfaces with the vertical plane. Under conditions prevalent in the Punjab, the distance-drawdown method for determining permeability gives results with an error of 10% or less provided that at least one piezometer or observation well is within a few feet of the pumped well and that no observation well or piezometer used is more than 100 feet from the pumped well. Relative traveltime for each of 10 stream tubes is given for three models. Relative traveltimes for one-fourth and one-half the effective radius are given for selected stream tubes. By substituting values for the aquifer parameters, actual traveltimes are computed from the relative-traveltime data. (Woodard-USGS)
W72-13735

NONSTEADY FLOW IN A RECHARGE WELL--UNCONFINED AQUIFER SYSTEM,
California Univ., Los Angeles.
M. A. Marino, and W. W. G. Yeh.
Journal of Hydrology, Vol 16, No 2, p 159-176, June 1972. 9 fig, 1 tab, 21 ref.

Descriptors: *Unsteady flow, *Injection wells, *Groundwater movement, *Mathematical studies, *Recharge wells, Dupuit-Forchheimer theory, Hydrogeology, Hydraulic conductivity, Artificial recharge, Numerical analysis, Model studies, Mathematical models, Dimensional analysis.

A recharge well-unconfined aquifer system is considered in which the well completely penetrates a homogeneous, isotropic, extensive aquifer. The system is characterized also by nonuniformity of the recharge rate, constancy of the injection head, hydraulic conductivity, and specific yield of the aquifer, and the validity of the Dupuit-Forchheimer assumptions. Dimensional analysis and similarity approximation are used to transform the governing second-order, nonlinear, partial differential equation into a second-order, nonlinear, ordinary differential equation. The differential equation is solved by coupling the fourth-order Runge-Kutta method with the Lagrange interpolation method. The method is inherently stable for any times. Dimensionless graphical solutions of water table profiles at different times are presented for various conditions. A closed-form analytical solution based on the linearized equation is developed that closely approximates the flow system under consideration. Dimensionless graphical solutions for volume and average rate of recharge are presented for conditions commonly encountered in practice. The dimensionless form of the solutions makes possible their application to any well-aquifer system with similar characteristics regardless of the values of the hydraulic properties of the aquifer. (Knapp-USGS)
W72-13828

GENERAL GROUND-WATER QUALITY IN FRESH-WATER AQUIFERS OF DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13832

GEOLOGY AND GROUND WATER, UNIVERSITY OF DELAWARE, NEWARK, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 04B.
W72-13833

NITRATE CONTAMINATION OF THE WATER--TABLE AQUIFER IN DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13834

GROUND-WATER GEOLOGY OF THE DELAWARE ATLANTIC SEASHORE,
Delaware Geological Survey, Newark.
J. C. Miller.
Delaware Geological Survey Report of Investigations No 17, August 1971. 33 p, 4 fig, 5 tab, 24 ref.

Descriptors: *Groundwater resources, *Seashores, *Delaware, Hydrogeology, Water demand, Water resources development, Water supply, Water utilization, Water wells, Aquifers, Water yield, Transmissivity, Specific capacity, Water quality, Chemical analysis, Drawdown, Saline water intrustion, Recreation facilities, Planning, Projections.

A new geologic interpretation of occurrence of deep aquifers in the Delaware Atlantic seashore area is presented. Recent data from deep wells has enabled the construction of a more accurate geologic framework upon which the hydrologic data are superimposed. Correlation of Miocene sands concludes that the Manokin aquifer lies at greater depths in southeastern Delaware than previously thought. Present water use is approximately 4 mgpd (million gallons per day) and will reach 9.3 mgpd by the year 2000. Moderately high transmissibility values (54,5000 gpd/ft) and specific capacities (average of 11.7 gpm/ft of drawdown) for the Pocomoke aquifer indicate that further development is possible. The Manokin aquifer has a transmissibility of only 29,250 gpd, but greater drawdowns are available. With proper well spacing and development approximately 10 to 8 mgpd are available from the Pocomoke and Manokin aquifers, respectively. The Columbia

(Pleistocene) aquifer will yield 5.2 mgpd from the headlands south of Lewes and 4.5 mgpd west of Ocean View-Millville. (Woodard-USGS)
W72-13835

GROUND-WATER OUTFLOW FROM CHINO BASIN, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA,
Geological Survey, Washington, D.C.
J. J. French.
Available from Sup Doc, GPO, Washington, DC 20402-Price $0.25. Geological Survey Water-Supply Paper 1999-G, 1972. 28 p, 7 fig, 1 plate, 3 tab, 30 ref.

Descriptors: *Groundwater movement, *Aquifer characteristics, *Discharge (Water), *Mathematical studies, *California, Water yield, Equations, Hydrologic data, Permeability, Sediments, Hydraulic gradient, Water levels, Water wells, Water table, Test wells, Specific capacity.
Identifiers: *Chino Basin (Calif).

Groundwater outflow from Chino basin in Southern California, was calculated by a direct method using the equation Q=PIA, in which Q is the quantity of groundwater outflow, P is the average coefficient of permeability of the sediments through which the flow occurs, I is the average hydraulic gradient, and A is the cross-sectional area of the sediments through which the flow occurs. The period selected for the calculation was 1930-66. Permeability of the water-bearing sediments was calculated from aquifer-test data and from computations involving specific-capacity data from 200 wells in the outflow area. Permeability ranged from less than 100 to more than 5,000 gallons per day square foot. The annual hydraulic gradient was derived from contour maps of average water levels in wells. Gravity and seismic traverses, drill-hole logs, and data from more than 600 drill holes, including eight test holds, were used to delineate the size and the shape of the outflow area. The total area of the outflow section varied from about 16 to 22 million square feet. The fluctuation in total area is caused by changes in the altitude of the water table. Annual groundwater outflow from Chino basin calculated by the direct method for the period 1930-66 ranged from 35,000 acre-feet in the 1941 water year to 9,400 acre-feet in the 1966 water year. (Woodard-USGS)
W72-13838

SEA WATER INTRUSION: MORRO BAY AREA, SAN LUIS OBISPO COUNTY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 02L.
W72-13846

GROUND-WATER OCCURRENCE IN THE MARYLAND PIEDMONT,
Geological Survey, Parkville, Md.
L. J. Nutter, and E. G. Otton.
Maryland Geological Survey Report of Investigations No 10, 1969. 56 p, 27 fig, 1 plate, 9 tab, 47 ref, append.

Descriptors: *Groundwater resources, *Water wells, *Aquifer characteristics, *Water supply, *Maryland, Crystalline rocks, Hydrogeology, Groundwater movement, Pumping, Water yield, Aquifer testing, Groundwater recharge, Storage coefficient, Water level fluctuations, Well data, Logging (Recording), Water utilization, Hydrologic data.
Identifiers: *Maryland (Piedmont Province).

Factors governing the occurrence of groundwater in the crystalline rocks of the Maryland Piedmont are complex and variable. The crystalline rocks consist of schist, gneiss, granite, quartzite, marble, metagabbro, and other rock types of lesser importance. EFFECTIVE GROUNDWATER RECHARGE IS ABOUT 11 INCHES PER YEAR, OR ABOUT 500,000 GPD. Much of the groundwater is stored in the weathered zone (saprolite), having an average thickness of about 45 feet. Based on an analysis of more than 1,300 well records, little significant difference was observed for the yield of wells in different rock types, although, based on mean yields, wells in marble are the most productive. The mean yield of all wells is about 9 gpm and the mean specific capacity is 0.6 gpm per ft of drawdown. Most of these wells were drilled for domestic use. Coefficients of transmissibility range from less than 100 to 35,000 gpd per ft, but commonly are in the range of 2,000 to 7,000 gpd per ft. Coefficients of storage range from 0.002 to 0.05. However, the long-term gravity yield of the regolith (the zone contributing to the base flow of streams) is about 8%. A map shows the extreme areal variability of the yield of wells. (Woodard-USGS)
W72-13848

INVESTIGATIONS OF ORGANIC MATTER IN GROUNDWATER OF OIL- AND GAS-BEARING REGIONS (METODICHESKIYE ISSLEDOVANIYA V OBLASTI IZUCHENIYA ORGANICHESKOGO VESHCHESTVA PODZEMNYKH VOD NEFTEGAZONOSNYKH OBLASTEY),
For primary bibliographic entry see Field 05B.
W72-13856

DIGITAL COMPUTER MODELING OF LIMESTONE GROUNDWATER SYSTEMS,
Kentucky Water Resources Inst., Lexington.
J. Thrailkill, and D. P. Beiter.
Available from the National Technical Information Service as PB-212 054, $3.00 in paper copy, $0.95 in microfiche. Report No 50, 1972. 71 p, 10 fig, 7 tab, 13 ref, append. OWRR A-030-KY (1).

Descriptors: *Groundwater movement, *Aquifer characteristics, *Limestones, *Computer models, Digital computers, Computer programs, Analytical techniques, Laminar flow, Turbulent flow, Numerical analysis, Data collections, Correlation analysis.

Because limestone groundwater flows mainly in discrete openings, limestone aquifers are fundamentally different from aquifers in granular rocks. A digital computer program which simulates flow in a limestone aquifer as a pipe network was written and compared with the Sinkhole Plain aquifer of west-central Kentucky. A reasonably good fit between observed parameters of the aquifer and those calculated were obtained under assumed conditions of both laminar and turbulent flow in the aquifer. The indicated gross permeability of the aquifer is 5600 meinzers with an assumed aquifer thickness of 100 feet. The location and discharge of springs along the streams bounding the aquifer are predicted. (Woodard-USGS)
W72-14001

CARBONATE CHEMISTRY OF AQUIFER AND STREAM WATER IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Geology.
J. Thrailkill.
Journal of Hydrology, Vol 16, No 2, p 93-104, June 1972. 3 fig, 2 tab, 34 ref. OWRR A-009-KY (2).

Descriptors: *Water chemistry, *Karst hydrology, *Limestones, *Dolomite, *Kentucky, Leaching, Karst, Saturation, Carbon dioxide, Solubility, Geochemistry, Recharge, Infiltration, Surface-groundwater relationships.

The principal circulation of the limestone aquifer underlying the Sinkhole Plain of Kentucky is undersaturated with respect to calcite. Two sinking streams which recharge the aquifer are also undersaturated. The smaller stream is much more undersaturated than the larger, but at any one time the equilibrium carbon dioxide pressure of the two streams is the same. The carbon dioxide pressure of the aquifer is higher than that of the recharging streams, and the higher calcium content of the aquifer water indicates solution of limestone is occuring by the introduction of carbon dioxide into the aquifer. At a single site, saturation with respect to calcite varied considerably, with changes apparently related more to discharge than to temperature or season (large undersaturation associated with high flow volumes). Saturation of the streams and aquifer with respect to dolomite was similar to that with respect to calcite, but the waters were always more undersaturated with respect to dolomite by an approximately constant amount. (Knapp-USGS)
W72-14004

THE GENESIS OF SELECTED HYDROCHEMICAL FACIES IN BATON ROUGE, LOUISIANA, GROUND WATERS,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
R. A. Khan, R. E. Ferrell, and G. K. Billings.
Ground Water, Vol 10, No 4, p 14-20, July-August 1972. 4 fig, 2 tab, 17 ref. OWRR A-010-LA (3).

Descriptors: *Water chemistry, *Hydrogeology, *Louisiana, *Bicarbonates, Ion exchange, Leaching, Geochemistry, Aquifer characteristics, Sampling, Water analysis, Sodium, Calcium, Magnesium.
Identifiers: *Baton Rouge (La).

Bicarbonate-rich groundwaters are present beneath Baton Rouge, Louisiana. They may be subdivided into two subtypes based on the dominant cation. Many groundwaters are Na-rich, the others are Ca and Mg-dominant bicarbonate waters. Na/Ca and Na/Mg epm ratios in the Na-rich subfacies are 126-394 and 347-1649, respectively. The corresponding ratios in the Ca + Mg-dominant subfacies are 0.14-0.58 and 0.17-0.58. The HCO3 concentration varies from 77 to 412 ppm and the total dissolved solids content is usually lower than 500 ppm. Multiple regression analyses of the ion distributions and calculated correlation coefficients for ion associations help quantify the distribution of the dissolved species and help to define the proposed mechanisms for genesis of the groundwaters. Ion exchange, selective filtration of dissolved constituents, and mixing of surface waters in the aquifers are the primary mechanisms controlling the chemical composition of the groundwaters. The occurrence of the Na-HCO3 facies at shallow levels in the area of maximum offtake is attributed to the accelerated ion filtration accompanying the high rate of groundwater withdrawal. (Knapp-USGS)
W72-14008

GROUNDWATER RESOURCES OF SALINE COUNTY, MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
J. C. Miller.
Missouri Geological Survey and Water Resources, Water Resources Report 26, 1971. 75 p, 8 fig, 8 tab, 30 ref, append.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Water wells, *Missouri, Hydrologic data, Basic data collections, Geology, Hydrogeology, Salinity, Hydrogen sulfide, Chemical analysis, Well data.
Identifiers: *Saline County (Mo).

Saline County, Missouri, straddles the transition of the fresh groundwater of the Ozarks to the saline groundwater of northwest Missouri. Paleozoic sedimentary rocks have been deformed by a series of northwest-trending anticlines and normal faults. Variations in groundwater quality are correlated with thickness of Pennsylvanian

shales overlying the Paleozoic carbonate rocks, depth of wells, local geologic structure, and biochemical activity. Sulfo-saline groundwater in Saline County often contains offensive amounts of hydrogen sulfide gas and ranges in salinity from 100 to 37,000 parts per million total dissolved solids. The distribution of sulfo-saline groundwater has a definite pattern controlled by geologic processes and structure. The saline groundwater may be best described as a connate water which probably had its origin either by entrapment of seawater by marine sediments or by shale membrane filtration of more dilute waters. Nine water quality areas are outlined on a water quality map and recommendations for obtaining potable water supplies are made where possible. (Woodard-USGS)
W72-14011

MORPHOMETRIC ANALYSIS OF POLYGONAL KARST IN NEW GUINEA,
Trinity Coll., Dublin (Ireland).
For primary bibliographic entry see Field 02J.
W72-14018

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1972,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14023

RECORDS OF WELLS IN HARRIS COUNTY, TEXAS, 1892-1972,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W72-14027

DEVELOPMENT OF GROUND WATER IN THE EL PASO DISTRICT, TEXAS, 1963-70,
Geological Survey, El Paso, Tex.
W. R. Meyer, and J. D. Gordon.
Texas Water Development Board Report 153, August 1972. 50 p, 17 fig, 7 tab, 10 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water supply, *Texas, Withdrawal, Pumping, Water yield, Water utilization, Groundwater recharge, Water quality, Dissolved solids, Salinity, Water level fluctuations, Hydrologic data, Data collections, Hydrologic budget, Water resources development.
Identifiers: *El Paso (Tex).

Development of groundwater in the El Paso district continued to increase from 1963 to 1970, but at a less rapid rate than in previous years. During this period, 82 wells were drilled. In 1963 the pumpage from deep wells was 78.3 mgd (million gallons per day); pumpage in 1969 was 90.2 mgd. The amount of water pumped for irrigation ranged from 159.3 mgd in 1964 to 14.3 mgd in 1969. Approximately 7,500,000 acre-feet of fresh water is stored in the sediments in the bolson area, of which 6,800,00 acre-feet is in the mesa part of the bolson and 700,000 acre-feet is in the city artesian area. An estimated 3,400,000 acre-feet of slightly saline water, 1,000 mg/liter to 3,000 mg/liter dissolved solids, is stored in the bolson deposits that adjoin and underlie the fresh-water zone. This water can be blended with fresh water to produce water that is suitable for public supply. The amount of fresh water available (560,000 ac-ft) in the upper valley has remained essentially unchanged, because the rate of withdrawal is approximately equal to the rate of natural recharge (13.0 mgd).
W72-14029

DELAYED YIELD AND UNSATURATED FLOW ABOVE A FALLING WATER TABLE,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02G.
W72-14052

UNSTEADY FLOW OF GROUND WATER,
Wisconsin Univ., Madison. Water Resources Center.
P. L. Monkmeyer, J. A. Hoopes, W. A. Murray, J. A. Spooner, and C. S. Tong.
Available from the National Technical Information Service as PB-212 031, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Completion Report, June 1972. 95 p, 15 tab, 41 fig, 10 ref. OWRR B-021-WIS (4).

Descriptors: Aquifer characteristics, Aquifers, Capillary conductivity, Dispersion, Drawdown, Groundwater, Permeability, Saline water-fresh water interfaces, Sea water intrusion, Sound waves, Specific yield, Water table, Zone of saturation.
Identifiers: Delayed yield, Seepage face.

The effects of the seepage face and delayed yield on the location of the free surface in unsteady unconfined groundwater flow have been studied theoretically and experimentally. The seepage face was found to decay exponentially with time for instantaneous drawdown and to affect free surface locations significantly near the outflow face. A simple numerical method has been developed for predicting the quantity and duration of delayed drainage to a falling water table. The possibility of using sound waves for the field determination of hydraulic conductivity has been investigated by propagating impulse type pressure waves through saturated, partly saturated, and air dry sand columns. The theoretical solution (including linear inertial terms) shows good comparison with experiments except for the saturated case. Solutions for the concentration distribution of a dissolved substance introduced into steady, one-dimensional flow through layers of sand have been obtained and experimentally confirmed. Sea-water intrusion into layered coastal aquifers was then considered. A numerical solution predicting the effects of tidal motion, dispersion, density differences, and fresh water flow on the salinity and flow patterns was found to be in good agreement with experimental studies.
W72-14053

TRANSFORMATION OF THE TENSOR FORM OF DARCY'S LAW IN INHOMOGENEOUS AND ANISOTROPIC SOILS,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
C. M. Case, and G. F. Cochran.
Water Resources Research, Vol. 8, No. 3, p 728-733, June 1972. 3 fig, 8 ref.

Descriptors: *Darcy's Law, *Anisotropy, *Groundwater movement, Gradient, Permeability, Soils.
Identifiers: *Tensor form, *Arbitrary cartesian coordinate system, Matrix equations, Ellipse.

The transformation of the tensor form of Darcy's law from an arbitrary cartesian coordinate system to one in which the permeability tensor is diagonal is discussed. Matrix equations are developed that allow this transformation to be conveniently performed. This transformation leads in a natural way to a discussion of the ellipses of permeability, which have been used in attempts to find geometrically the direction of the gradient of head given the velocity, and vice versa, in anisotropic media. Equations are derived that allow the magnitude, as well as the direction, of the gradient of head or velocity, as the case may be, to be found from the geometrical constructions; thus the utility of the equations is extended. Finally, the connection between the permeability ellipse and the ellipse of direction, which does not seem to have been previously noted in the literature, is demonstrated, and the implications of the connection are briefly discussed. (Clasen-Nevada)
W72-14055

2G. Water in Soils

RELATION OF PRECIPITATION TO SOIL TEMPERATURE (2ND REPORT)--EFFECT OF SOIL MOISTURE ON HEAT-EXCHANGE IN THE SOIL,
Fukushima Univ. (Japan). Dept. of Earth Science.
Y. Fukuoka.
Geographical Review of Japan, Vol 45, No 7, p 475-483, July 1972. 9 fig, 13 ref.

Descriptors: *Soil water, *Soil water movement, *Soil temperature, *Infiltration, *Heat transfer, Mass transfer, Heat balance, Heat budget, Rainfall, Heat flow, Thermal conductivity, Soil physics.
Identifiers: *Soil heat flow.

The annual amplitude of variation of soil temperature decreases exponentially with depth. Therefore, the annual heat exchange in the soil can be estimated by integrating the soil temperature amplitude from the surface to the isothermal stratum. Because the depth of the isothermal stratum is determined by the amplitude of the variation of the surface temperature, heat exchange is a function of the amplitude of the variation of the air temperature near the ground surface. However, even in regions with the same amplitude of temperature variation, the depth of the isothermal stratum does not always have the same value, because the thermal diffusivity of soil varies with soil moisture. Linear relationships were found and tabulated between heat exchange in soil and the annual amplitude of air temperature variation in soils having 4 ranges in soil moisture as measured by Lang's Regenfaktor. The simplicity of this estimation results from the fact that a variation of Lang's Regenfaktor of 20 mm/deg corresponds to variation of only 5% soil moisture. (Knapp-USGS)
W72-13845

A RADIATION MOLE FLOW-MOISTURE METER,
For primary bibliographic entry see Field 07B.
W72-13862

AMIDE-WATER INTERACTION ON MONTMORILLONITE SURFACE,
Ministry of Agriculture, Zagazig (Egypt). Soil Science Dept.
S. A. Tahoun.
United Arab Republic, Journal of Soil Science, Vol 11, No 2, p 193-203, 1971. 5 fig, 11 ref.

Descriptors: *Water chemistry, *Soil chemistry, *Surfaces, *Clays, *Montmorillonite, Chemical properties, Chemical reactions, Organic compounds, Ion exchange, Hydration, Adsorption, Alkalinity, Molecular structure, Retention, Stability, Infrared radiation, Water quality, X-ray diffraction, Competition.

Studies have been concerned with the interaction between organic and inorganic soil constituents for various theoretical and practical reasons. The objective of this work is to evaluate the relative contribution of exhangeable cations, complex bonds, hydration water, clay surfaces, adsorption sites, basicity, molecular size and retention strength to the stability of amide-clay complexes. Reaction of primary, secondary, and tertiary amides on the surface of montmorillonite was investigated by X-ray diffraction and infrared spectroscopy. The stability of the amide-clay complex depends on the nature of the bond in the complex. Water and amide molecules compete for adsorption sites on clay mineral surfaces. (Popkin-Arizona)
W72-13916

THE SOILS OF THE WOODED DISTRICT OF THE SOUTHEASTERN MORNE DEPART-

MENT: SOIL FORMATION AND GENERAL DATA ON WATER MANAGEMENT,
Institut National de la Recherche Agronomique, Paris (France).
D. Magniant, and P. Dutil.
Bull Assoc Fr Etud Sol. 6 p 3-12. 1970. Illus. Maps.
Identifiers: *Soil profiles, *Soil chemical properties, Composition, Control, Erosion, France, Water management (Applied), Marne River, Soils.

The soil types are described as to profile and chemical composition. The effect of erosion is discussed. To improve the overall drainage, control of the flow of the Marne River in this area is necessary.--Copyright 1972, Biological Abstracts, Inc.
W72-13918

EFFECT OF LAND USE PERIOD ON SOIL PROPERTIES,
Ministry of Agriculture, Cairo (Egypt); Cairo Univ., Giza (Egypt). Faculty of Agriculture; and Cairo Univ., Giza (Egypt). Dept. of Soils.
A. Fathi, M. Naga, M. F. Kandil, and M. El Abbaseri.
United Arab Republic, Journal of Soil Science, Vol 11, No 2, 1971, p 147-157. 3 tab, 3 fig, 10 ref.

Descriptors: *Effects, *Land use, *Soil properties, *Time, *Saline soils, Groundwater, Drainage, Irrigation water, Water quality, Climate, Cultivation, Arid lands, Soil texture, Water table, Soil samples, Salts, Particle size, Organic matter, Leachate, Dissolved solids, Cations, Anions, Cation exchange capacity, Sedimentation.
Identifiers: *Nile Delta, Libyan Desert.

Properties of newly cultivated land are mainly affected by physical and chemical properties of the original soil, depth of groundwater and efficiency of drainage, quality and availability of irrigation water, and prevailing climate. Soil, affected by time, is productive in proportion to new properties developed by cultivation. This work studies changes taking place when a virgin land is cultivated for different periods in the Nubaria region, Behera Governorate, between the alluvial soils of the Nile Delta within the windborne sand drifted from the Libyan Desert. The original soil is of sandy texture. The high water table results in salt accumulations at the surface due to hot weather. Soil samples were taken from seven profiles representing different periods of land use. Particle size distribution, organic matter, water extract for determinations of total soluble salts, cations and anions, cation exchange capacity, and sesquioxides were measured. Soil texture variations were due to sedimentation from irrigation water and windborne particles. Fine fractions accumulate in early cultivation then migrate down the profile, with coarse fractions decreasing. Organic matter accumulates with cultivation. Irrigation causes increase in salts, MgO. Fine fractions increase A1203 and Fe203. (Popkin-Arizona)
W72-13922

WATER AND SOME NUTRIENTS LOSSES BY DEEP PERCOLATION AS INFLUENCED BY THE DEPTH OF WATER TABLE,
Ministry of Agriculture, Cairo (Egypt). Soils Dept.
M. A. Barakat, S. I. Ghowal, and W. M. El-Ghamry.
United Arab Republic, Journal of Soil Science, Vol 11, No 1, 1971, p 47-52. 2 tab, 1 fig, 8 ref.

Descriptors: *Nutrients, *Percolation, *Water table, *Leaching, *Arid lands, Water, Humid areas, Agriculture, Saline soils, Salt balance, Soil chemistry, Irrigation practices, Nitrogen, Phosphorus, Potassium, Lysimeters, Cotton, Grain sorghum, Water loss, Nutrient removal, Irrigation water, Land reclamation.

Leaching of plant nutrients by deep percolation is a major humid region agricultural problem. A similar problem arises in arid lands where reclamation of salt affected soils requires excess water for salt removal, where leaching is required to maintain salt-soil balance, and where water tables are permanently high and irrigation is excessive and frequent. This study is concerned with nitrogen (N), phosphorus (P) and potassium (K) losses with percolated water under the later condition. Average water loss by deep percolation was found to decrease steadily with increasing depth of water table in a lysimeter experiment on cotton and maize crops where 5 depths of water tables varied from 40 to 160 cm. Water losses were 35 cm and 22 cm from water depths of 40 cm and 70 cm. Water loss was 6 cm at a water table depth of 160 cm. Average irrigation water for the whole growing season was 65 cm. Nutrient losses by deep percolation followed that of water; they were found to be 27 kg N, 88 kg K, and 135 kg K per hectare for the 40 cm water table, and 17 kg N, 55 kg K and 0.083 kg P per hectare for the 70 cm water table. Loss of K and P were greater in higher soils. (Popkin-Arizona)
W72-13923

SOIL WATER REGIME IN ECONOMIC EVALUATION OF SALINITY IN IRRIGATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 03C.
W72-13932

PERTURBATION ANALYSIS OF TWO-PHASE INFILTRATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
A. Noblanc, and H. J. Morel-Seytoux.
Proceedings, American Society of Civil Engineers, Journal of the Hydraulics Division, Vol 98, No HY9, Paper 9186, p 1527-1541, September 1972. 10 fig, 5 ref, append. OWRR B-033-COLO (10).

Descriptors: *Infiltration, *Soil water movement, *Unsaturated flow, *Capillary action, Analytical techniques, Percolation, Permeability, Hydraulic conductivity, Capillary conductivity.
Identifiers: *Perturbation analysis, *Multiphase flow.

An analytical treatment for the problem of one-dimensional infiltration into a homogeneous porous medium is presented. Movement of both the air phase and the water phase and compressibility of the air are considered. The procedure assumes that some capillary terms can be neglected in the saturation equation, whereas all capillary terms are retained in an integral equation for the unknown total flow. Infiltration rate curves are obtained for a number of situations involving different boundary or initial conditions or both. Comparisons are made with results of an earlier and simpler procedure, confirming the validity of the simpler procedure. It is recommended that the traditional unsaturated flow equation be abandoned in favor of the two-phase flow approach. (Knapp-USGS)
W72-14006

USE OF CAPILLARY COLUMNS TO STUDY INFILTRATION OF WATER INTO FROZEN SOIL (SKHEMA KAPILLYARNYKH KOLONN DLYA VPITYVANIYA VODY V MERZLYY GRUNT),
Severni Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR).
V. Ya. Kulik.
Meteorologiya i Gidrologiya, No 12, p 71-78, December 1971. 15 ref.

Descriptors: *Infiltration, *Infiltration rates, *Capillary conductivity, *Capillary action, *Frozen soils, Frozen ground, Ice, Freezing, Thawing, Wetting, Properties, Physical properties, Soil physical properties, Porosity, Soil moisture, Moisture content, Bound water, Heat balance, Equations, Model studies.
Identifiers: *USSR, *Infiltration capacity, Ice crystals, Ice lenses, Water films.

Techniaues for studying infiltration of water into unfrozen soil were modified to describe the infiltration of water into coarse-textured frozen soil through use of capillary columns. Equations were developed to determine the relation of hydrophysical parameters to ice content of frozen soil and to calculate ice content on the basis of the soil' initial temperature and moisture content. The equations obtained can be used to design and conduct field and laboratory experiments and to measure the infiltration capacity of sands and loamy sand soils. (Josefson-USGS)
W72-14031

ORIGIN OF SALINE SOILS AND THEIR REGIME, VOLUME 2,
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 03C.
W72-14041

DELAYED YIELD AND UNSATURATED FLOW ABOVE A FALLING WATER TABLE,
Wisconsin Univ., Madison. Water Resources Center.
J. P. Grant, P. L. Monkmeyer, and W. A. Murray.
Available from the National Technical Information Service as PB-212 030, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Completion Report, 1972. 48 p, 14 fig, 9 ref, 6 append. OWRR B-021-WIS (3).

Descriptors: Capillary conductivity, Drawdown, Groundwater, Moisture tension, Permeability, Specific retention, Specific yield, Water table, Zone of saturation.
Identifiers: Delayed yield.

The effects of a falling water table on the gravity drainage of a one-dimensional soil profile and associated delayed yield phenomena are investigated by theory and experiment. The theoretical considerations result in a new type of numerical model which incorporates the falling water table as a time-varying boundary condition. The numerical model differs from conventional models in that the equations of motion (Darcy's Law) and continuity are treated separately and applied to a series of control volumes along the length of the soil profile. Drainage experiments were conducted in a standard sand column which was fitted with an adjustable valve at the base allowing various drawdown rates to occur. The hydraulic conductivity as a function of capillary pressure was determined by a series of steady-state tests in which a constant flow rate was introduced into the column. The moisture content as a function of capillary pressure was determined by disecting the column at equilibrium. A new mathematical model for expressing these soil moisture characteristics was proposed and implemented successfully. The results of this study showed good agreement between the experimental and numerical prediction of delayed yield such as that which might be encountered in pumping-test data in phreatic aquifer.
W72-14052

TRANSFORMATION OF THE TENSOR FORM OF DARCY'S LAW IN INHOMOGENEOUS AND ANISOTROPIC SOILS,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 02F.
W72-14055

YIELD AND WATER CONSUMPTION OF THE PLANTS GROWN IN POTS AS INFLUENCED BY SOIL STRUCTURE, (IN RUMANIAN),
Institutul Agronomic, Bucharest (Rumania).
A. Dorneanu.
Lucrari Stiint Inst Agron 'N Balcescu' Ser A. 12: 201-209. 1969. English summary.
Identifiers: Aggregates, *Water consumption, *Fertilizers, Plants, Pots, Roots, Size, *Soils, Structure, System, Yield.

Two kinds of brown-reddish soil were used; the 1st sample, contained 80-86% stable aggregates the size of which ranged from 0.25 to 10 mm while the 2nd contained 42.5-44.5% stable aggregates, their size ranging from 0.25-1 mm. Water consumption was lower in plants grown on fine structured soils. The addition of fertilizers to the 1st sample increased the yield and reduced water consumption. When the moisture level was kept constant at 70% there was no difference in yields for the plants grown on the 2 soils. The root system of the wheat plants helped to build up the soil. This was particularly true for the 0.25-3 mm aggregates. Soil degradated by mechanical action may build up rapidly if the elements required are present thus contributing to the activity of the root system of the plants.--Copyright 1972, Biological Abstracts, Inc.
W72-14173

EROSION-AMELIORATIVE INVESTIGATIONS OF SOILS IN KAZAKHSTAN, (IN RUSSIAN),
For primary bibliographic entry see Field 04D.
W72-14174

PARTICIPATION OF MOISTURE RISING FROM GROUND WATER IN COVERING WATER DEFICIENCIES BETWEEN EVAPOTRANSPIRATION AND PRECIPITATIONS, (IN POLISH),
Szkola Glowna Gospodarstwa Wiejskiego, Warsaw (Poland).
J. Ostromecki.
Rocz Nauk Roln Ser F Melioracji Uzutkow Zielonych. 77 (2): 165-184. Illus. 1969. English summary.
Identifiers: Covering, Deficiencies, *Evapotranspiration, Moisture, Precipitation, *Soil types, Soil profiles.

The theoretical and practical aspects of water movement in unsaturated soil profile zone are discussed. The results of lysimetric experiments are presented for 2 mineral and 3 peat soil types on the drying of the soil with plant cover. Evapotranspiration was covered partly by the moisture reserves of the unsaturated zone and partly by water transport from the saturated zone.--Copyright 1972, Biological Abstracts, Inc.
W72-14177

THE STRUCTURAL COMPOSITION AND WATER STABILITY OF PODZOLIZED BROWN FOREST SOILS IN THE KRASNODAR TERRITORY, (IN RUSSIAN),
Y. I. Brid'ko.
Tr Kuban S-Kh Inst. 20 (48): 97-99. 1970.
Identifiers: Aggregates, *Soil composition, Cultivation, Forest, *Krasnodar, *Podzolized soils, Stability, USSR.

Cultivation of the podzolized soils decreased the content of agronomically valuable structure, and slightly increased water stability. The content of water-stable aggregates (0.25-3 mm) is smaller in fallow fields than under clover (35 and 66%, respectively, in the upper layer).--Copyright 1972, Biological Abstracts, Inc.
W72-14178

IMPROVEMENT OF SOILS BY CULTIVATION IN THE NON-CHERNOZEM ZONE, (IN RUSSIAN).
For primary bibliographic entry see Field 03F.
W72-14180

INORGANIC PHOSPHATE FRACTIONS IN CALCAREOUS SOILS IN RELATION TO MOISTURE AND INCUBATION PERIOD,
Ranchi Univ. (India).
R. N. Sahay, B. P. Sahi, and H. Sinha.
Ranchi Univ J Agric Res. 4: 21-25. Illus. 1969.
Identifiers: *Calcareous soils, *Incubation periods, *Moisture, *Phosphates, Soils.

Studies were conducted on native inorganic P fractionation and transformations of applied P at various periods and moisture regimes. Incubation of soils with 50 ppm P for 4 days at field capacity resulted in an increase of Ca-P and Fe-P and decrease of other forms. Extending the incubation period to 60 days further increased Ca-P, while the other fractions generally remained unchanged. The reverse was generally true under waterlogged conditions except that there was a somewhat less decrease of Ca-P when the incubation period was raised from 4 to 60 days. Transformation of added P to Ca-P and Fe-P increased with the increase of incubation period. Under waterlogged conditions, however, there was considerable release of P at 4 days but fixation took place at 60 days. Significant positive correlations were observed between Fe-P and Ca-P, NH4Cl-soluble P and Ca-P, Olsen P and Al-P, HCl-soluble P with Olsen P and occluded. Fe-P showed significant negative correlation with occluded, Fe-P.--Copyright 1972, Biological Abstracts, Inc.
W72-14189

THE MAIN PHYSICO-CHEMICAL CHARACTERISTICS OF SOILS OF THE VERTISAL AND SODIUM-CONTAINING TYPE IN THE ROCHEFORT MARSH AT ST-LAURENT-DE--LA-PREE (MARITIME CHARENTE, FRANCE),
Institut National de la Recherche Agronomique, Clermont-Ferrand (France). Station d'Agronomie.
J. Morizet, J. DeJou, J. Guyot, R. Millet, and M. Pouvreau.
Identifiers: Charente, *France, Impermeability, Macro, Maritime, *Marsh soils, Porosity, Rochefort, Salinity, *Sodium soils, St-Laurent-De-La-Pree, *Vertisol soils, Hydrogen ion concentration, Soil types.

In soils of the intermediate 'bri' (clay) type hydromorphism is indicated by the frequent presence of spots of gley starting at a depth of 25 cm. The richness of this soil in fine elements, the relatively high level of swelling clay, and the Na-containing characteristics of the complex give the soil special properties, particularly an almost total impermeability in winter, resulting in the presence of a stagnant surface layer of water for a long period of time. This flooding is accentuated by the total absence of relief in the area and sometimes by practices such as artificial damming caused by mud from ditch clearing. There are enormous prisms separated by large clefts, especially in dry periods. Structural stability is excessively low and gypsum ameliorators can only be effective if preliminary work favoring permeability allows Ca migration in the profile. These soils have a very low macroporosity in winter as well as in summer. Grained moisture is sufficient but effective utilization by plants would require deep rooting which is hindered by the compactness of the soils and their frequent hydromorphic characteristics. The chemical properties of 'bri' are similar to those of Na-containing soils of the slightly saline to the alkaline type. The pH is 8-9 except in the humid profile at 0-8 cm Ao. The profile is slightly calcareous. The complex with a dominant calco-magnesian nature also contains a relatively high amount of Na. Salinity is relatively low as shown by the conductivity values (primarily lower than 7 mmhos/cm).--Copyright 1972, Biological Abstracts, Inc.
W72-14190

AN IMPROVED SOIL WATER FLUX SENSOR,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 07B.
W72-14192

A HAND-AUGERING METHOD OF INSTALLING ACCESS TUBING FOR NEUTRON MOISTURE METERS,
Forestry Office, Atherton (Australia).
For primary bibliographic entry see Field 07B.
W72-14194

INFILTRATION AND STRUCTURAL CHANGES AS INFLUENCED BY INITIAL MOISTURE CONTENT,
Sydney Univ. (Australia). Dept. of Soil Science.
N. Collis-George, and R. Lal.
Aust J Soil Res. 9 (2): 107-116. Illus. 1971.
Identifiers: Aggregates, Flood, *Infiltration, Irrigation, *Soil moisture, Soils, *Unstable soil.

The variation of infiltration behavior, in columns of aggregates of a structurally stable and an unstable soil, caused by pre-equilibrating the aggregates with a range of relative humidities from 0 to 98%, was measured in terms of advance of the front, cumulative infiltration, slaking, and swelling. In this range, the effect of initial moisture condition on the stable soil (krasnozem) was slight compared with that on the unstable soil (black earth); the wetter the soil initially, the greater was the infiltration rate, and the smaller the slaking and swelling. The change in the behavior of infiltration into systems of stable aggregates is reflected as an increase in the importance of the sorptivity, and a reduction in the importance of the hydraulic conductivity contribution to the steady-state infiltration process. (The aggregates of 1/2-1 mm are such a size that the sorptivity contribution should not normally be detectable in stable soils.) In the unstable soil, the heat of wetting is probably associated with aggregate collapse. The degraded structure of the surface layers prevents fast entry of water into the lower layers. The collapse of structure dominates the infiltration process so that the analysis in terms of sorptivity carried out for stable aggregates cannot be made. The effect of entrapped air on slaking of aggregates of these soils is shown to be negligible compared with effect of initial moisture content. The application of the results to flood irrigation of unstable soils under field conditions is briefly considered.--Copyright 1972, Biological Abstracts, Inc.
W72-14196

REDISTRIBUTION OF SOIL WATER AFTER INFILTRATION,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia).
A. J. Peck.
Aust J Soil Res. 9 (2): 59-71. Illus. 1971.
Identifiers: Conductivity, Diffusivity, Distribution, Hysteresis, *Infiltration, *Mathematical models, Mean, Moisture, *Soil water redistribution.

The 1-dimensional vertical redistribution of water is studied following infiltration into deep homogeneous soil with an initially uniform moisture content. There is assumed to be no loss of water by evaporation or transpiration during the redistribtuion. Assuming 2 factors to be constants, a 1st-order ordinary differential equation is derived which can be integrated numerically to compute the mean moisture content in the surface zone of draining soil as a function of the redistribution time. The depth of the draining zone in-

creases with time and can be calculated. These factors are relatively constant. Using mean values of the factors for several soils, and only wetting values of the diffusivity and conductivity functions, predicted redistribution behavior agrees well with experimental data. In the remaining cases calculation of the factors for the particular soils, using an approximate method which includes hysteresis data, gives better results. The model is applied to predict the redistribution behavior of different soils under identical treatments, and of a single soil for various infiltration quantities and initial moisture contents.--Copyright 1972, Biological Abstracts, Inc.
W72-14197

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: I. THE FERTILIZER SOLUTION AND ITS INITIAL REACTION WITH SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 05B.
W72-14198

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: II. MOVEMENT OF THE PHOSPHORUS AND SULPHUR INTO THE SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 05B.
W72-14199

STATISTICAL STUDIES ON THE RELATION BETWEEN NITRIFICATION AND SOIL TEMPERATURE AND SOIL MOISTURE,
Deutscher Wetterdienst, Brunswick (West Germany).
H. Schroedter, and C. Tietjen.
Agric Meteorol. 9 (1/2): 77-91. Illus. 1971. (Engl. summ.).
Identifiers: *Soil moisture, Nitrates, *Nitrification, Nitrogen, Relation, *Soil temperature, Statistical studies, Temperature.

By means of linear, linear-transformed and non-linear statements, the relationship is discussed between soil temperature and soil moisture on the one side and nitrification in the upper layers of a bare soil on the other. A non-linear model gives more information than any other. With linear statements only the influence of soil temperature is determined, whereas the non-linear model gives the combined action of soil temperature and soil moisture on the formation of NO3-N. The non-linear model is based on a known model of the weather-yield statistics. By means of a square function, a hyperplane is fitted on the observed data and is resolved into components, resulting in a response hyperboloid, of which the surfaces of equal response are conic sections. The Eigen-values and Eigen-vectors of the square form are calculated from the coefficients of the components to determine the type of the conic sections and they are used for criteria of the effectiveness of the parameters. The Eigen-vectors show that soil temperature and soil moisture are independent in their influence on the nitrification, while the Eigen-values indicate that the efficiency of the parameters is almost identical. The amount of NO3-N increased with rising soil temperature. In the relation to soil moisture there is an optimum near the field capacity. Falling soil temperature in autumn and winter results in a decrease of NO3-N, but only towards a fixed minimum. Calculations by use of the non-linear model result in a minimum of nearly 2 ppm. A considerable increase of NO3-N in spring, indicative of the beginning of microorganic activity, results only after the soil temperature exceeds 5 degree C, even if the soil moisture is near the optimum.--Copyright 1972, Biological Abstracts, Inc.
W72-14200

2H. Lakes

THE PLANKTON OF LAKE GARDNO NEAR THE BALTIC SEA DURING THE SUMMER SEASON,
Polish Academy of Sciences, Pszczna. Hydrobiological Station.
For primary bibliographic entry see Field 05C.
W72-13637

PROCEEDINGS, FOURTEENTH CONFERENCE ON GREAT LAKES RESEARCH.
For primary bibliographic entry see Field 05C.
W72-13640

Department of Energy Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 05C.
W72-13655

NUTRIENT STUDIES IN TEXAS IMPOUNDMENTS,
Texas Univ., Austin. Dept. of Environmental Health and Engineering.
For primary bibliographic entry see Field 05C.
W72-13692

OBSERVATIONS ON THE MERCURY CONTENT OF MYOXOCEPHALUS QUADRICORNIS (L.) (TELEOSTEI, COTTIDAE) IN FINLAND,
Helsinki Univ. (Finland). Zoological Museum.
For primary bibliographic entry see Field 05B.
W72-13695

SOME OBSERVATIONS ON THE FOOD OF THE GWYNIAD COREGONUS CLUPEOIDES PENNANTII VALENCIENNES OF LLYN TEGID (LAKE BALA), NORTH WALES,
Liverpool Polytechnic (England).
O. J. Haram, and J. W. Jones.
J Fish Biol. Vol 3, No 3, p 287-295. 1971. Illus.
Identifiers: *Fish diets, Coregonus clupeoides pennantii, Cycles, *Gwyniad, Lake Bala (Wales), Seasonal, Wales.

The seasonal variations in the diet of adult gwyniad C. clupeoides pennantii=C. larvaretus from Llyn Tegid, North Wales were studied. Stomachs were examined to determine fullness, volume and identity of contents. A clear seasonal cycle in food intake was found. Feeding rates were low from Jan. to April but increased during the summer (May-June) and remained at a high level until Dec. The period of low feeding intensity coincided with the time of spawning and the time of annulus formation of both scales and otoliths. The diet showed seasonal changes and 2 main periods were distinguished; Dec. to July, when the fish fed mainly on bottom fauna, and Aug. to Nov., when the diet included both bottom fauna and midwater and surface foods. The gwyniad were opportunistic in feeding, the composition of the diet reflecting availability of food items rather than selective feeding on the part of the fish.--Copyright 1972, Biological Abstracts, Inc.
W72-13738

LIMNOLOGICAL STUDIES OF BIG BEAR LAKE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05C.
W72-13739

RAPID METHOD FOR DETECTION AND CHARACTERIZATION OF STEROIDS,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13781

WATER QUALITY PREDICTIONS BASED ON LIMNOLOGICAL PARAMETERS,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-13825

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65, PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 2. BASINS FROM NEW YORK TO DELAWARE.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13827

GEOLOGIC CROSS SECTIONS DERIVED FROM SEISMIC PROFILES AND SEDIMENT CORES FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02J.
W72-13844

LINMOLOGY OF ONEIDA LAKE WITH EMPHASIS ON FACTORS CONTRIBUTING TO ALGAL BLOOMS,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 05C.
W72-13851

LIFE HISTORY AND ECOLOGY OF THE GIZZARD SHAD, DOROSOMA CEPEDIANUM (LE SUEUR) WITH REFERENCE TO ELEPHANT BUTTE LAKE,
New Mexico Agricultural Experiment Station, University Park.
D. B. Jester, and B. L. Jensen.
Agricultural Experiment Station Research Report 218, January 1972, 56 p, 21 tab, 26 fig, 92 ref.

Descriptors: *Lakes, *Life history studies, *Ecology, *Fish control agents, *Fish establishment, Fish food organisms, Fish management, Fisheries, History, Forages, Ranges, Great Plains, Wyoming, Colorado, Continental margin, New Mexico, Food chains, Sport fish, Recreation, Growth rates, Reproduction, Mud flats, Turbidity, Age, Growth stages, Length, Time, Weight, Fecundity, Fish diseases, Mortality, Predation.
Identifiers: *Elephant Butte Lake.

The range of gizzard shad is extended by the locality of this study and by findings in the abundant literature to a broad strip along the western boundary encompassing the Great Plains of Wyoming and Colorado westward to the Continental Divide in New Mexico and north-central Mexico. Shad is valuable as a food chain link of game fishes. Shad has a high reproductive potential and rapid growth rates even in shallow lakes with mud bottoms and excessive turbidity. Shad is an esteemed forage fish even under limited conditions. About 7,500 fish from Elephant Butte Lake were measured by the Lee Method for age and growth, mean total lengths, annual growth increments, and grand mean lengths and increments. Time required to gain 100 grams varied from less than one to five years in the lakes studied. Hile Method was used to determine condition or relative robustness. Fecundity, food habits, disease, sport fishery ability, mortality and predation were also studied. Gizzard shad have great value as forage to support game fish; abundance and continued stunting indicate that shad are sufficiently numerous to support additional game fishes. (Popkin-Arizona)
W72-13927

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT, APRIL 15.
For primary bibliographic entry see Field 05G.
W72-13947

TILAPIA FISHERY IN LAKE MARUIT: AGE AND GROWTH OF TILAPIA NILOTICA L. IN THE LAKE,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. El-Zarka, A. H. Shaheen, and A. A. El-Aleem.
Bull Inst Oceanogr Fish. 1: 149-182. Illus. Map. 1970.
Identifiers: *Age, Fishery, *Growth, *Lake Maruit, Tilapia-Galilaea, *Tilapia-Nilotica, Tilapia-Zilli, United Arab Republic.

Tilapia is an important source of protein food for Egyptians. It provides about 70% of the total fish production in Egypt. Because of the economical importance of this fish extensive research program was started in 1957 to survey its fisheries in the inland waters of Egypt. This study is confined to T. nilotica L. in Lake Maruit. Lake Maruit is a shallow water area that lies along the northern Mediterranean coast to the south of Alexandria, with depth about 1 m. It has no direct connection with the sea and received drainage water from the adjacent cultivated lands. Tilapia species were identified as T. nilotca L., T galilaea Art., T. zilli Gerv. and T. nilotica (variety x). The average annual production of this fish is 1741 tons and constitutes about 80% of the total catch of the lake. The study was based upon monthly samples taken from experimental fishing gears used for catching Tilapia in Lake Maruit as well as from the commercial catch. The T. nilotica fishery depends on age group I. In the combined 1957-1958 samples, age group I contributed 92.1% of the total catch, while older age group II and age group III constituted only 5.7% and 2.2%, RESPECTIVELY.==Copyright 1972, Biological Abstracts, Inc.
W72-14000

EFFECT OF EDDY DIFFUSIVITY ON WIND--DRIVEN CURRENTS IN A TWO-LAYER STRATIFIED LAKE,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. T. Gedney, W. Lick, and F. B. Molls.
Available from NTIS, Springfield, Va 22151 as NASA TN D-6841. Price $3.00 paper copy; $0.95 microfiche. National Aeronautics and Space Administration Technical Note NASA TN D-6841, June 1972. 37 p, 10 fig, 11 ref, 2 append.

Descriptors: *Thermal stratification, *Lakes, *Winds, *Eddies, *Diffusivity, Currents (Water), Circulation, Mathematical studies, Equations, Thermocline, Hypolimnion, Water temperature.
Identifiers: *Wind-driven currents, Eddy diffusivity.

The steady-state wind-driven circulation is numerically calculated in a rectangular stratified lake. The lake is composed of two layers having uniform but unequal densities and eddy diffusivities. The position of thermocline and the three-dimensional velocities in both layers are calculated using the shallow lake equations of P. Welander. The results show that, as the eddy diffusivity in the hypolimnion is increased, the thermocline tilt and hypolimnetic velocities increase. The effect of the other variables such as wind stress, density, basin length, and mean thermocline depth are shown also. (Woodard-USGS)
W72-14010

REDUCTION OF RUNOFF INTO KARA-BOGAZ-GOL AND THE FUTURE LEVEL OF THE CASPIAN SEA (OGRANICHENIYE STOKA V ZALIV KARA-BOGAZ-GOL I BUDUSHCHIY UROVEN' KASPIYSKOGO MORYA),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W72-14032

CALCULATION OF RATE OF EXTENSION OF ICE COVER IN AFTERBAYS OF RESERVOIRS (RASCHET NASTUPLENIYA KROMKI LEDYANOGO POKROVA V NIZHIKH B'YEFAKH VODOKHRANILISHCH),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-14033

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Nevada Univ., Reno. Max C. Fleischmann Coll. of Agriculture.
For primary bibliographic entry see Field 05C.
W72-14054

ECOLOGY AND PRODUCTION OF SALVINIA NATANS HIFFIM; IN KASMIR,
Sri pratap coll., Srinagar (India). Dept. of Botany.
D. P. Zutshi, and K. K. Vass.
Hydrobiologia. 38 (2): 303-320. Illus. Map. 1971.
Identifiers: Carbon, Ceratophyllum-Demersum-D, Control, Ecology, Hydrocharis-Dubia-M, *Kashmir, Organic, Production, *Salvinia-Natans-P, Shade, Hydrogen ion concentration, Lakes.

Ecological problems arising as a result of rapid growth of S. natans Hoffim in some lakes of Kashmir were studied. High viability of spores coupled with rapid vegetative propagation seem to be responsible for the spread of the weed. Lake channels protected from a wind by a canopy of trees are the most favorable situations in which Salvinia produces a thick mat. Water in these channels is rich in nutrients. Oxygen-poor layers of water beneath the mat are detrimental for insect and fish life. Changing light conditions have profound influence on the submerged vegetation. The most common associates of Salvinia are Hydrocharis dubia and Ceratophyllum demersum. Maximum plant biomass is recorded during Aug.-Sept. with higher efficiency at partially shaded sites. A correlation exists between caloric values and dry matter production and between caloric value and percent organic C. Under laboratory conditions, water of a pH between 4.6-6.0, NaCl concentrations higher than 1% and continuous submergence under water are harmful to the growth of the weed. Partial shady situations seem to be quite beneficial for the growth. Harvesting would probably be the most economical method of control.--Copyright 1972, Biological Abstracts, Inc.
W72-14071

THE BIOLOGY AND FISHERY OF MUGIL SALIENS (RISSO) IN LAKE QUARUN, U. A. R.,
Cairo Inst. of Oceanography and Fisheries (Egypt).
Salah El-Zarka, and H. M. El-Sedfy.
Bull Inst Oceanogr Fish, 1: 1-26, Illus, Maps, 1970.
Identifiers: Fish, Lakes, Mugil-Capito, Mugil-Cephalus, *Mugil-Saliens, *Lake Quarun, Solea-Vulgaris, United Arab Republic.

The salinity increase of lake Quarun directly affected the freshwater fishes which were of Nile Origin. To compensate for the loss of freshwater fishes, the lake was stocked with Mediterranean fishes including Solea vulgaris and Mugil spp. Several members of the family Mugilidae (Mugil cephalus, M. capito and M. saliens) were transplanted. The first lot of fry was planted in 1928 and stocking was continued each year thereafter. Of the mullet species, only M. saliens was able to spawn in the lake. M. saliens fry were found in Dec., 1961, near the inlet of Saeed drain and this was during a period when no fry had been stocked from Mex farm near Alexandria catch, length-weight relationship, spawning and sex ratio of M. saliens are given.--Copyright 1972, Biological Abstracts, Inc.
W72-14107

EVALUATION OF INTENSIVE FRESHWATER DRUM (APLODINOTUS GRUNNIENS) REMOVAL IN LAKE WINNEBAGO, WISCONSIN, 1955-1966,
Wisconsin Dept. of Natural Resources, Madison.
G. R. Priegel.
Tech Bull, 47. 1-28, Illus, 1971.
Identifiers: *Aplodinotus-Grunniens, Black crappie, *Drum fish, Lakes, Sauger, Walleye, *Lake Winnebago, Wisconsin, Yellow perch, White bass.

An intensive freshwater drum removal program was undertaken on Lake Winnebago to evaluate the effects of freshwater drum removal on the freshwater drum population and other fish species. There were benefits to the sport fishery that appeared to result from the freshwater drum removal program. After 1959 the catch of white bass and black crappie in nets definitely increased. Walleye, sauger and the yellow perch populations fluctuated in abundance but the catch in nets after 1959 increased, especially that of the sauger. There was no indication that commercial removal of freshwater drum was detrimental to any game or panfish population.--Copyright 1972, Biological Abstracts, Inc.
W72-14109

ASPECTS OF THE NUTRITIVE DYNAMICS AND TROPHIC RELATIONSHIPS OF THE BURBOT (LOTA LOTA LOTA L.) IN THE UPPER MURES RIVER, (IN RUMANIAN),
Babes-Bolyai Univ., Cluj (Rumania).
S. Gyurko, and Z. I. Nagy.
Stud Cercet Biol Ser Zool. 23 (4): 367-376. Illus. 1971. English summary.
Identifiers: *Burbot, Dynamics, *Lota-Lota-Lota, *Mures River, Nutritive relationships, River, Romania, Stock, Trophic level.

The qualitative and quantitative composition of the food of L. lota lota is presented in relation to season, year class and body length. Data analysis indicate that the burbot may be safely used to stock some of the Romanian lakes.--Copyright 1972, Biological Abstracts, Inc.
W72-14127

PATTERNS OF LAKESHORE USAGE AROUND LAKE BEMIDJI,
Bemidji State Coll., Minn.
For primary bibliographic entry see Field 05C.
W72-14131

INTRASPECIFIC COMPETITION IN LAKE--DWELLING TRICLADS: A LABORATORY STUDY,
University Coll. of North Wales, Bangor. Dept. of Zoology.
T. B. Reynoldson, and L. S. Bellamy.
Oikos. 22 (3): 315-328. Illus. 1971.
Identifiers: *Food competition, Dugesia-Polychroa, *Lakes, Polycelis-Nigra, Polycelis-Tenuis, *Triclads.

The population dynamics of Polycelis nigra, P. tenuis and Dugesia polychroa were studied in laboratory ecosystems provided with a constant supply of natural food and maintained under a temperature regime which followed that of an outdoor pond. The same phenomena, related to breeding, such as shrinkage of adults, mortality of small individuals and curtailment of egg production occurred in these populations as was observed earlier in field populations. Analysis of size-structure, population numbers and biomass suggested that the major changes were the result of intraspecific competition for food. Experiments to study the effect of varying the population density of triclads upon food uptake, under conditions of a constant food supply, showed that competition may occur although all the food is not utilized. This was attributed to the aggregation of triclads on individuals prey. Certain anomalies in the performance of some of the populations were con-

sidered to be partly due to chance events in this feeding behavior of triclads. While exocrene substances influenced the fecundity of triclad populations, this was a minor factor compared with intraspecific competition for food.--Copyright 1972, Biological Abstracts, Inc.
W72-14132

CLADOCERA STUDIES ON LAKE BALATON: IV. SUBFOSSIL REMAINS IN THE SEDIMENTS OF LAKE BALATON II,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
S. Olga.
Ann Inst Biol (Tihany) Hung Acad Sci, 37: 247-272, Illus, 1970, Hungarian and Russian summary.
Identifiers: Acroperus-Harpae, *Lake Balaton, Camptocercus-Rectirostris, *Cladocera, Eurycerus-Lamellatus, Fossils, *Hungary, Lakes, Leydigia, Pleuroxus, Sediment.

The frequency and ecological requirements of recent and subfossil Cladocera in Lake Balaton, Hungary, were investigated. Eurycercus lamellatus, Camptocercus rectirostris, Acroperus harpae, 2 spp. of Leydigia and 5 spp. of Pleuroxus are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-14160

GLASS EFFECT AND THE MICROBIAL PLANKTON-SESTON RELATION IN THE WATER OF LAKES BALATON AND BELSO,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 05C.
W72-14161

THE HORIZONTAL DISTRIBUTION OF ROTIFERA PLANKTON IN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 05C.
W72-14163

LITTORAL ONISCOIDS FROM THE THAU BASIN (MEDITERRANEAN LITTORAL POND): FAUNISTIC AND ECOLOGICAL STUDY (IN FRENCH),
Montpellier Univ. (France). Faculte des Sciences.
R. Chamboredon, J. G. Lagarrigue, and Jean-Paul Trilles.
Arch Zool Exp Gen, 111 (2): 181-211, Illus, Map, 1970, English and German summary.
Identifiers: Armadillidae, Armadillididae, *Isopod fauna, Ecological studies, Ligiidae, Littoral, Mediterranean littoral ponds, Oniscidae, Oniscoids, Ponds, Porcellionidae, *Thau Lake basin, Tylidae.

This work provides exact faunistical and zoological information concerning isopod fauna of Thau lake shores. This basin, a part of the long string of many Languedoc lakes, was studied due to its hypomarine condition. The survey during a full year discovered at least 17 oniscoid species (or sub-species) distributed within 6 families: Armadillidae, Armadillididae, Ligiidae, Oniscidae, Procellionidae and Tylidae.--Copyright 1972, Biological Abstracts, Inc.
W72-14166

FUNCTIONAL MODEL OF THE LAKE ECOLOGICAL SYSTEM (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 05C.
W72-14167

HARVEST, SURVIVAL, AND COST OF TWO DOMESTIC STRAINS OF TAGGED RAINBOW TROUT STOCKED IN LAKE BERRYESSA, CALIFORNIA,
California State Dept. of Fish and Game, Sacramento.
R. R. Rawstron.
Calif Fish Game. 58 (1): 44-49. 1972.
Identifiers: *Lake Berryessa, *California, Costs, Harvest, Lakes, *Rainbow trout, Strains, Survival, Tagged, Trout.

Tagged rainbow trout of the Coleman Kamloops strain and the Mt. Whitney strain were planted in Lake Berryessa, Napa County, California. The former was less vulnerable to shore anglers shortly after planting and had a more rapid limnetic distribution, equal mean annual harvest rates, a higher survival, and a lower cost to the angler's creel compared to the latter.--Copyright 1972, Biological Abstracts, Inc.
W72-14181

2I. Water in Plants

OLFACTION IN PARENT STREAM SELECTION BY THE ALEWIFE (ALOSA PSEUDOHARENGUS),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
B. E. Thunberg.
Anim Behav. Vol 19, No 2, p 217-225. 1971. Illus.
Identifiers: *Fish behavior, Alewives, *Aquatic environment, Alosa pseudoharengus, Olfaction, Selection, Streams.

The ability of A. pseudoharengus, to discriminate between water from its spawning pond and from neighboring ponds was studied. Fish were tested in a 2 choice selection tank with various water combinations. Single fish were placed in the tank and their time spent at each end was recorded. A control period was statistically compared to the test period. The alewives strongly preferred home water. Selection did not occur when the nares were plugged with cotton, but upon removal of the cotton, selection for home water reappeared. Evidence presented here for home stream selection on the basis of odor suggests that alewives may use this mechanism to return to their parent stream.--Copyright 1972, Biological Abstracts, Inc.
W72-13675

OSMOTIC ACCLIMATION IN THE RED RIVER PUPFISH, CYPRINODON RUBROFLUVIATILIS,
Mount Desert Island Biological Lab., Salisbury Cove, Me.
J. L. Renfro, and L. G. Hill.
Comp Biochemi Physiol A Comp Physiol. Vol 40, No. 3, p 711-714. 1971. Illus.
Identifiers: *Fish physiology, *Osmotic pressure, Acclimation, Cyprinodon rubrofluviatilis, Pupfish, Freshwater, Saline water.

The serum osmotic pressure in freshwater acclimated pupfish was 321 m-osmoles/kg-water. Saltwater acclimated fish had a serum osmotic pressure of 378 m-osmoles/kg-water. Abrupt transfer from freshwater to saltwater showed that the pupfish could acclimate to increased salinity within 8 hr. During acclimation to saltwater the serum osmotic pressure reached a peak, after 7 hr, of 512 m-osmoles/kg-water. It was concluded that C. rubrofluviatilis was a very efficient and tolerant osmoregulator.--Copyright 1972, Biological Abstracts, Inc.
W72-13680

DATA ON THE ECOLOGY AND GEOGRAPHICAL DISTRIBUTION OF THE TESTACEANS OF THE AREA OF THE FUTURE DAM LAKE AT IRON GATE,
S. Godeanu.
Stud Cercet Biol Ser Zool. Vol 23, No 5, p 479-486. 1971. Illus. English summary.
Identifiers: *Aquatic animals, Association, Dams, *Distribution, Ecology, Geography, Romania, Testaceans.

An analysis was made of the testacean fauna found in the Danube river, in the running waters of its left bank tributaries and in the permanent or temporary pools situated below the future dam lake. The testacean association is analyzed from an ecological and geographical point of view.--Copyright 1972, Biological Abstracts, Inc.
W72-13755

SEASONAL VARIATIONS IN THE AVIFAUNA COMPOSITION OF THE LAVOURS SWAMP (AIN),
Center of Ornithology in the Rhone Alps, Lyon (France).
P. Cordonnier.
Alauda. Vol 39, No 3, p 169-203, 1971. Illus. (English summary).
Identifiers: *Birds, *Environmental effects, Abundance, Carex-M, Communities, Composition, Fauna, France, Plants, Seasonal, Swamps, Variations.

The structure of the avian community was studied in a 2.5 ha marsh in relation to the seasonal variations and the distribution of plant communities. The density and biomass of breeding birds were calculated in 3 different biotopes by the quadrat method. Density increased from lowest vegetation (Carex) to forest. Various birds in the different plant communities depend on abundance and variety of food. Censuses by the Punctual Index Abundance (PIA) showed comparison of single species abundance in similar habitats. The annual cycle studied by PIA, can be divided in 5 'ornithological seasons'. Highest abundance was recorded in spring during migration. Lowest abundance was in January when the weather influence was strongest. It would be disastrous to the birds to convert this marsh for agricultural purposes.--Copyright 1972, Biological Abstracts, Inc.
W72-13799

THE ELEMENTS OF ENERGY BALANCE IN GRASS CARP (CTENOPHARYNGODONIDELLA VAL.): I,
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
Z. Fischer.
Pol Arch Hydrobiol. Vol 17, No 4, p 421-434. 1970. Illus.
Identifiers: Ctenopharyngodon Idella, Elements, Energy, *Grass carp, *Metabolism, Oxygen consumption.

Energy changes were investigated in grass carp bred on plant food. The 02 consumption, excretion of CO12 and N, value of food ration and the basic energy indicators K1 and K2 and also U-12 were determined.--Copyright 1972, Biological Abstracts, Inc.
W72-13815

SARCOSPHAERA EXIMIA (DUR. ET LEV.) R. MRE. IN THE PIENINY NATIONAL PARK,
B. Guminska.
Acta Mycol. Vol 4, No 1, p 131-146. 1968. Illus. Maps. English summary.
Identifiers: *Poland, *Sarcosphaera eximia, *Pieniny National Park.

Wet spring weather caused an abundance of S. eximia in the park. The fruitbodies were typical. They occurred in limestone soil in a fir forest. S. eximia is thought to be a rare species because it does not grow every year. In Poland it is known from 7 localities. In Pieniny National Park S. eximia was found at 6 places.--Copyright 1972, Biological Abstracts, Inc.
W72-13909

A DISTRIBUTIONAL STUDY OF MISSOURI FISHES,
Missouri Dept. of Conservation, Jefferson City.
W. L. Pflieger.
Univ Kansas Publ Mus Nat Hist. Vol 20, No 3, p 225-570. 1970. Map.
Identifiers: *Fish populations, Distribution, Environment, Fish, *Missouri.

The distribution of Missouri fishes is described. The patterns of fish distribution are interpreted in terms of environmental conditions and historical factors. For the state, 191 spp. are listed. Four fish faunal regions are recognized. Three of these (Ozark, lowland and prairie) correspond closely to major physiographic subdivisions of Missouri. The 4th faunal region (big river) includes the Missouri and Mississippi rivers and the downstream portions of their major tributaries. The faunal regions are separated by broad ecotones designated as an 'Ozark border' where fishes characteristic of different faunal regions meet and mix in complex fashion. Missouri fishes are classified into 4 primary and 3 secondary faunal groups. Primary faunal groups include species having their distribution centered in a single faunal region. Secondary faunal groups include species that are more widespread. Habitat modifications by man during the last 2 centuries have resulted in rapid and dramatic changes in the distribution of many fishes. Five spp. which occurred in the state 30 yr ago are no longer present. Numerous others are more restricted in distribution. Several are more abundant and widespread than formerly.--Copyright 1972, Biological Abstracts, Inc.
W72-13910

CONTROLLED-ENVIRONMENT VEGETABLE PRODUCTION: RESULTS OF TRIALS AT PUERTO PENASCO, MEXICO, 1968-1970,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 03F.
W72-13926

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 03F.
W72-14009

EFFECT OF SOIL MOISTURE ON THE PHASE CHARACTERS OF HATCHLINGS IN THE DESERT LOCUST, SCHISTOCERCA GREGARIA FORSK,
Field Station for the Investigation of Locusts, Bikaner (India).
S. C. Harjai, and H. L. Sikka.
Indian J Entomol, 2 (4): 298-302, 1970 (1971).
Identifiers: *Desert locust, *Locust hatchlings, Schistocerca-Gregaria, *Soil moisture.

The effect of incubating the desert locust eggs in soils of different moisture content was studied and it was found that 8% soil moisture at temperature 32.5 plus or minus 0.50 deg C was the optimum for development from the point of view of viability-cum-hatchability percentage. Soils with far lower or far higher levels of moisture had the common effect of prolonging the incubation. However, low moisture gave rise to solitary type hatchlings while the higher moisture gave rise to black hatchlings characteristic of gregarious breedings.--Copyright 1972, Biological Abstracts, Inc.
W72-14092

A SIMPLE MEANS OF DETACHING TREE SHOOTS UNDER WATER FOR PHYSIOLOGICAL STUDY,
Australian National Univ., Canberra. Dept. of Forestry.
G. B. Wood.
Aust For Res, 5 (2): 37-38, Illus, 1971.
Identifiers: *Photosynthesis, Physiological study, *Pinus-Radiata-G, *Tree shoots, Trees, Under water.

The technique appears suitable for studies in photosynthesis, but unsuitable for studying transpiration in Pinus radiata since the transpiration rate of seedlings was rapidly and substantially increased by the treatment (158 + 12% of initial value after 4 hr).--Copyright 1972, Biological Abstracts, Inc.
W72-14096

MOISTURE STRESS AND STEM DIAMETER IN YOUNG DOUGLAS-FIR,
Oregon State Univ., Corvallis. School of Forestry.
J. B. Zaerr.
For Sci, 17 (4): 466-469, Illus, 1971.
Identifiers: Daytime, *Stem diameter, *Douglas-Fir-G, *Moisture stress, Pseudotsuga-Menziessii-G.

The internal plant moisture stress (PMS) and stem diameter of 9 Douglas-fir (Pseudotsuga menziesii) trees were measured throughout the day on 2 clear days in Sept. The PMS and diameter curves were out of phase by several hr. PMS increased in the morning, remained constant for a while, then decreased in the afternoon; but diameters decreased until late afternoon and then increased.--Copyright 1972, Biological Abstracts, Inc.
W72-14098

THE KINETICS OF WATER ABSORPTION IN STRATIFYING AND NONSTRATIFYING NOBLE FIR (ABIES PROCERA REHD.) SEEDS,
British Columbia Forestry Service, Victoria; and Department of the Environment Victoria (British Columbia).
D. G. W. Edwards.
Can J For Res, 1 (4): 235-240, Illus, 1971, French summary.
Identifiers: Abies-Procera-G, *Absorption, Fir-G, Germination, Kinetics, *Noble fir, Seeds, Temperature.

Rate of water absorption by empty and filled noble fir seeds was faster for 25 deg C (nonstratifying) seeds than for 5 deg C (stratifying) seeds during the initial stages. After the first 3 days water uptake by empty seeds essentially ceased at 25 deg C, but absorption was continuing at 5 deg C after 28 days, water levels averaging nearly 60% higher than at 25 deg C. Water uptake by empty seeds was used to express absorption by the seedcoat of filled seeds. When germination was first seen at 25 deg C, the seedcoat contained 60% of all the water in the seed. Differences in absorption between stratifying and nonstratifying filled seeds were more obscure because of absorption by the internal tissues. At 25 deg C, water uptake by filed seeds followed the 3 generally recognized phases. The transfer of empty seeds from 25 to 5 deg C upset the moisture equilibrium established after 15 days at 25 deg C, but although water uptake resumed, the water levels after 45 days were not as high as for empty seeds exposed continuously to 5 deg C for 28 days. This was interpreted as indicating that the imbibant had undergone some change which modified the forces of hydration.--Copyright 1972, Biological Abstracts, Inc.
W72-14099

STUDIES OF MOISTURE STATUS AND STORAGE CONDITIONS OF SPRING-LIFTED, MUD-PACKED DOUGLAS-FIR SEEDLINGS,
British Columbia Univ., Vancouver. Dept. of Botany.
G. E. Mellor, R. A. Keller, and E. B. Tregunna.
Can J For Res, 1 (4): 223-227, Illus, 1971, French summary.
Identifiers: *Douglas-Fir-G, Growth, *Moisture status, Mud-packed conditions, Pseudotsuga-Menziesii-G, Roots, *Seedlings, Spring, Storage, Survival, Temperature.

Two-year-old (2-0) Douglas-fir (Pseudotsuga menziesii) seedlings were lifted in the spring and mud-packed. These seedlings were tested (a) for moisture status during and after mud-packing or (b) for the effects of various storage conditions. Moisture status measurements indicated that the mud-packing process placed a reversible moisture stress on the seedlings. When the seedlings were planted, however, the mud-packed seedlings displayed a higher moisture stress than bareroot or unlifted seedlings. There was no difference in moisture stress between bare-root or unlifted seedlings. Mud-packed seedlings, stored in the field for 19 days and subsequently planted, had higher survival and root growth than those having other storage conditions. The other storage conditions included higher and lower temperature than in the field and light versus dark. Treatment of the mud-packs with fertilizer and vermiculite had no effect on any of the parameters measured.--Copyright 1972, Biological Abstracts, Inc.
W72-14100

GROWTH OF KNOWN AGE MUSKELLUNGE (ESOX MASQUINONGY) IN WISCONSIN AND VALIDATION OF AGE AND GROWTH DETERMINATION METHODS,
Wisconsin Dept. of Natural Resources, Madison.
L. D. Johnson.
Tech Bull. 49. 1-24. Illus. 1971.
Identifiers: *Age determination, Esox-Masquinongy, Fin, *Growth determination, *Muskellunge, Scale, Validation, Wisconsin.

The presence of a large number of known age fish from 1955-1969 provided the opportunity to gather empirical growth data and to compare 2 widely used methods of determining age and growth. Through the use of either scale samples or fin sections, ages of muskellunge 1 through 9 could be fairly accurately determined. For fish between ages 9 and 11, the fin section method was the more accurate of the means of determining age. For making back calculations of growth, the scale sample method was found to be superior. On the basis of empirical and calculated data, differential muskellunge growth was found in the 3 lakes studied.--Copyright 1972, Biological Abstracts, Inc.
W72-14110

EGGS OF FLOODWATER MOSQUITOES: XIV. NORTHERN AEDES (DIPTERA: CULICIDAE),
Illinois Univ., Urbana. Dept. of Entomology.
W. R. Horsfall, and F. R. Voorhees.
Ann Entomol Soc Am. 65 (1): 123-126. Illus. 1972.
Identifiers: *Aedes, Culicidae, Diptera, *Eggs, *Electron scanning microscope, *Mosquitoes, Northern.

Whole eggs and segments of chorion of species of A. communis (De Geer), A. hexodontus Dyar, A. pionips Dyar, A. pullatus (Coquillett), A. dianteus Howard, Dyar, and Knab, A. punctor (Kirby), A. trichurus (Dyar), A. intrudens Dyar, A. excrucians (Walker), A. barri Rueger, A. fitchii (Felt and Young) and A. cinereus Meigen are illustrated by photographs obtained by scanning electron microscopy. Distinctive features are visible optically by stereomicroscopy in white light.--Copyright 1972, Biological Abstracts, Inc.
W72-14115

EFFICIENCY OF SUCROSE FLOTATION IN RECOVERING INSECT LARVAE FROM BENTHIC STREAM SAMPLES,
Chanute Technical Training Center, Chanute AFB, Ill.
W. M. Pask, and R. Costa.
Can Entomol. 103 (12): 1649-1652. 1971.
Identifiers: *Benthic streams, Chironomidae, Hemiptera, *Insect larvae, Samples, *Sucrose flotation, Trichoptera, Zygoptera, *Sandy Creek (NY).

Duplicate benthic stream samples were collected from three sites on Sandy Creek (Lake Ontario Watershed) in Western New York, 8 and 22 Sept., 1970. Samples taken on 8 Sept. were preserved in 10% formalin. Samples taken on 22 Sept. were not preserved. Insect specimens were removed from both sets of samples by flotation with a sucrose solution of 1.12 sp. gr. Preserved and unpreserved samples were compared for efficiency of recovery of insect larvae. Mean recovery for preserved samples was 90.78% compared with 83.03% for unpreserved samples. The range of recovery values for unpreserved samples (66.7%) was more than twice as great as that of preserved samples (29.5%). A paired t-test for means of all taxa showed no significant difference ($P < 0.001$) between recovery values for preserved and unpreserved samples. In fact, preservation may enhance the recovery of certain groups--Zygoptera, Hemiptera, Trichoptera, and Chironomidae. Apparently samples may be preserved without sacrificing recovery of any specific groups of insect larvae.--Copyright 1972, Biological Abstracts, Inc.
W72-14116

LODGEPOLE PINE-DWARF MISTLETOE XYLEM WATER POTENTIALS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
W. R. Mark, and C. P. P. Reid.
For Sci. 17 (4): 470-471. Illus. 1971.
Identifiers: Arceuthobium-Americanum-D, *Mistletoe-D, Pine-G, *Pinus-Contorta-G, *Xylem water potential.

The xylem water potentials of dwarf mistletoe (Arceuthobium americanum Nutt. ex. Engelm.) shoots and the lodgepole pine (Pinus contorta) branches on which they were growing were determined. A water potential gradient favorable to the dwarf mistletoe shoots indicates that the shoots are able to obtain water from their host even when the xylem of the latter is under considerable water stress.--Copyright 1972, Biological Abstracts, Inc.
W72-14119

IMPROVED THERMOCOUPLE PSYCHROMETER FOR THE MEASUREMENT OF PLANT AND SOIL WATER POTENTIAL: II. OPERATION AND CALIBRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 07B.
W72-14120

STROBILI DEVELOPMENT IN WESTERN WHITE PINE: PERIODICITY, PREDICTION, AND ASSOCIATION WITH WEATHER,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
G. E. Rhefeldt, A. R. Stage, and R. T. Bingham.
For Sci. 17 (4): 454-461. Illus. 1971.
Identifiers: Deficits, Development, Periodicity, Pine-G, Pinus-Monticola-G, Prediction, *Strobili development, Weather, *Western White Pine.

Variation in yearly counts of female strobili during various stages of development was studied from 18-yr records of 4 trees in northern Idaho. Spectral analyses indicated that periodicity in production of strobili by individual trees followed major cycles of 4 yr; cycles of 3 yr were of secondary importance. Cospectral analyses indicated that cycles of the 4 trees were in phase. Autoregression was used to develop models for predicting strobili production. Regressions involving lags of 4 yr in the dependent variable accounted for 47 and 41% of the variation in counts of immature and mature strobili, respectively. Association of strobili production with daily moisture stress indicated: water deficits during early summer of the year in which strobili matured were directly related to abortion of strobili; moisture stresses during early summer of the 1st and 2nd yr preceding emergence of strobili from the bud scales were associated with high strobili counts; and water deficits during late summer in the year preceding strobili emergence were detrimental to strobili development.--Copyright 1972, Biological Abstracts, Inc.
W72-14121

ALLELOPATHY AMONG THE AQUATIC PLANTS,
Polish Academy of Sciences, Warsaw. Dept. of Applied Limnology.
W. Szczepanska.
Pol Arch Hydrobio. 18 (1): 17-30. Illus. 1971. Polish summary.
Identifiers: *Allelopathy, *Aquatic plants, Carex-Hudsoni-M, Equisetum-Limosum-P, *Pharagmites-Communis-M, Schoenoplectus-Lacustris-M, Soils, Typa-Latifolia-M, Reed.

Pot experiments were carried out on the interrelations of aquatic plants. The decrease of reed (Phragmites communis) production was generally accompanied with the increase of the production of associated plant species, and inversely. The type of soil modified the growth of monospecies culture, and influenced the character of interrelations among the plants in mixed cultures. Other plants were Schoenoplectus lacustris, Equisetum limosum, Typha latifolia and Carex hudsoni.--Copyright 1972, Biological Abstracts, Inc.
W72-14130

STUDIES ON ANURAN WATER BALANCE: II. DESICCATION IN THE AUSTRALIAN FROG, NOTADEN BENNETTI,
University of New England, Armidale (Australia). Dept. of Zoology.
Harold Heatwole, Elizabeth Cameron, and Grahame J. W. Webb.
Herpetologica. 27 (4): 365-378. Illus. 1971.
Identifiers: *Australian frog, Adaptive behavior, Desiccation, Frogs, *Notaden-Bennetti, *Water balance (Anuran).

Rate of evaporative loss in N. bennetti is dependent upon amount of activity. Neither standard rate of loss nor vital limit show any adaptive differences in comparison to other species. However, N. bennetti is behaviorally adapted by dry habitats by selecting high humidities, reducing activity during desiccation, aggregating when moisture conditions are unfavorable, burrowing (emerging only when surface moisture is abundant), and not burrowing in extremely dry soils. The extent of desiccation influences the frequency of burrowing and aggregation. These responses are not modified by lighting conditions and do not seem to be greatly influenced by an internal activity rhythm.--Copyright 1972, Biological Abstracts, Inc.
W72-14133

WATER PROFILE FLUCTUATIONS RECORDED BENEATH SOME FORAGE PLANTS DURING THE DRY SEASON USING THE NEUTRON METHOD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre d-Adiopodoume.
For primary bibliographic entry see Field 07B.
W72-14138

USE OF ULTRAVIOLET LIGHT TO INCREASE THE AVAILABLITY OF AERIAL INSECTS TO CAGED BLUEGILL SUNFISH,
Southern Illinois Univ., Carbondale.
R. C. Heidinger.
Prog Fish-Cult. 33 (4): 187-192. Illus. 1971.
Identifiers: *Bluegill sunfish, Caged fish, Insects, *Lepomis-Macrochirus, *Ultraviolet light.

Fifteen-watt UV light bulbs were used in modified Pennsylvania light traps to attract food organisms to bluegill sunfish (Lepomis macrochirus Rafinesque) confined in wire cages. The growth rate as influenced by light trap position (therefore, cage position), pond location, and population density, was investigated. Bluegill sunfish stocked in illuminated cages at rates of 5 to 27 fish/m3 showed good growth and high survival. A cage illuminated by a 15-W UV and 25-W incandescent bulb supported 10.4 kg of fish in lowland areas, while a cage at upland areas supported 5.6 kg of fish. Two-fifths of the food organisms entered the cage through the water, and 3/5 entered through the air. During the summer, 187 g of aerial insects were eaten per day by a cage fish at the lowland area and 100 g of aerial insects per day at the upland areas. It was determined that for maximum efficiency, the light traps should be placed more than 3 but less than 15 m apart. There was no significant difference in the quantity of insects caught by a light trap located 3 m from shore and 9 m from shore.--Copyright 1972, Biological Abstracts, Inc.
W72-14140

NORTHERLY LOCALITIES FOR THREE AQUATIC PLANTS, LEMNA TRISULCA L., CERATOPHYLLUM DEMERSUM L., AND MYRIOPHYLLUM SPICATUM L.,
Stockholm Univ. (Sweden). Dept. of Zoology.
C. Holmquist.
Bot Not. 124 (3): 335-342. 1971.
Identifiers: *Alaska, *Aquatic plants, *Canada, Ceratophyllum-Demersum-D, Lemna-Trisulca-M, Localities, Myriophyllum-Specatum-D.

These aquatic plants were found north of their known distribution range on several localities in northern Alaska and northwestern Canada. The new records are accounted for geographically and ecologically. It is suggested that more records will be available once a more systematic search for aquatic plants in arctic areas is performed.--Copyright 1972, Biological Abstracts, Inc.
W72-14141

NOTES ON A RHODESIAN COLONY OF THE RED BISHOP,
P. F. Woodall.
Ostrich. 42 (3): 205-210. 1971.
Identifiers: Behavior, *Breeding birds, Euplectes-Orix, Feeding habits, *Red bishops, *Makabusi River (Rhodesia).

A colony of red bishops Euplectes orix was studied on the Makabusi River, Salisbury. Breeding was well synchronized but late, in association with low Nov. rainfall, and there was a higher percentage of small clutches (c/2) than usual. Nest sites, structure and dimensions are described, and observations are given on intra- and inter-specific behavior among the breeding birds. Territories were spaced at an average density of 1 every 325 m2. Observations on feeding and drinking habits are recorded.--Copyright 1972, Biological Abstracts, Inc.
W72-14142

OBSERVATIONS ON THE FOOD AND FEEDING BEHAVIOR OF THE COMMON BOMBAY CATFISH: TACHYSURUS SONA (HAM),
Central Inland Fisheries Research Inst., Barrackpore (India).
Vijai D. Singh, and M. S. Rege.
J Univ Bombay. 39 (66): 49-57. Illus. 1970.
Identifiers: Behavior, *Bombay catfish, *Feeding habits, Tachysurus-Sona, *Catfish.

T. sona is a predaceous carnivore, becoming 'piscivorous' on attaining a length of 243 mm. It can be inferred that the fish indiscriminately feeds on small sized fishes and crustaceans. The occurrence of sand and mud in the stomach may be due

to occasional bottom feeding.--Copyright 1972, Biological Abstracts, Inc.
W72-14143

ANALYSIS OF THE ENVIRONMENTAL FACTORS IN THE AREA OF DISTRIBUTION OF CHALARODON MADAGASCARIENSIS: THEIR BIOLOGICAL IMPLICATIONS,
Madagascar Univ., Tananarive. Lab. of Zoology.
Charles P. Blanc.
Ann Univ Madagascar Ser Sci Nat Math. 7. 279-306. Illus. 1970. English summary.
Identifiers: *Chalarondon-Madagascariensis, Climatic factors, Environmental factors, *Lizards, *Malagosy.

The detailed comments that were made on the distribution map of Chalarodon madagascariensis made it possible to define, in the climatological study, the factors limiting the range of this species. These are rainfall and sunning. The chalarodons live in the region of Malagasy where solar heat is strongest and rainfall lowest, and where hot climatological conditions range from subarid to semiarid (the maximum temperature is one of the highest in the island). They live in full sunlight. They are typically xerophilous and heliophilous lizards. They are adapted to life in sandy grounds, over which they move about most swiftly and in which they dig their holes. The manner in which sandy grounds are distributed accounts for the varying density within the area. The most characteristic vegetation is xerophilous bush, sparse enough to afford sufficient sunlight to the ground. These lizards do not undergo real hibernation, but only a marked slackening in their activity during winter in the southern hemisphere (dry and cool season). Lastly, this study of the factors of environment describes some aspects of their biology in relation to their ecology (cycles of activity, nutrition, etc.).--Copyright 1972, Biological Abstracts, Inc.
W72-14144

A GUIDE TO THE EXTERNAL SEXING OF SOME WEST AFRICAN FRESHWATER FISHES,
British Columbia Univ., Vancouver. Dept. of Zoology.
J. D. Reynolds.
Ghana J Sci. 11 (1): 3-11. Illus. 1971.
Identifiers: *Bagridae, *Characinidae, *Clariidae, West African fishes, *Polypteridae, *Schilbeidae, Sex.

Methods of sexing West African freshwater fishes using external structural characters were investigated. Literature references to successful external sexing of Characinidae were verified, and Polypteridae and Clariidae appear also to be sexable. New methods to sex siluroid fishes, chiefly of the families Schilbeidae and Bagridae are described. In most cases the external character is not obvious before the fish reaches sexual maturity.--Copyright 1972, Biological Abstracts, Inc.
W72-14145

NATURAL POPULATION DYNAMICS OF PHLEBOTOMINE SANDFLIES IN PANAMA,
Army Medical Research Unit, Panama, APO New York 09826.
B. N. Chaniotis, J. M. Neely, M. A. Correa, R. B. Tesh, and K. M. Johnson.
J Med Entomol. 8 (4): 339-352. Illus. Maps. 1971.
Identifiers: *Panama, Phlebotomine sandflies, *Sandflies.

The population dynamics of phlebotomine sandflies were studied in a Panamanian forest for 69 consecutive wk. Sandfly populations were characterized by high species diversity, spatial heterogeneity and temporal change. Thirty-seven spp. were identified among 60,455 specimens collected. Light traps set near the ground captured 38.7% of the flies collected, 12.5% were caught in arboreal light traps, and 48.8% were aspirated from resting sites on tree trunks and buttresses. Anthropophilic species comprised 31.2% of all specimens, with light traps attracting nearly 2 times as many near the ground as compared to the forest canopy. Collecting stations in 3 distinct biotopes showed identical species compostion but marked quantitative differences. Mature forest was a more productive sandfly habitat than secondary forest and, within mature forest, hilltop biotope was more productive than lowland (stream bed). Sandflies were perennial with marked seasonal fluctuations. Temporal density changes were related to amount and distributional pattern of rainfall which apparently acted by modifying the development conditions in the ground. Dryness of waterlogging of the forest floor, caused by scanty or excessive rainfall, was correlated with reduced adult density. Peak activity was attained during the 1st wk of Aug. with a 2nd peak during the 1st half of Jan. The maximum increase, over the low level in dry season, was about 5-fold for the general population and 8-fold for the anthropophilic species. Seasonal population changes for a number of principal and anthropophilic species are presented.--Copyright 1972, Biological Abstracts, Inc.
W72-14147

STUDIES ON THE MECHANISMS OF ACTION OF THE ANTITRANSPIRANT PHENYLMERCURIC ACETATE, AND ITS PENETRATION INTO THE MESOPHYLL,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
G. R. Squire, and M. B. Jones.
J Exp Bot. 22 (73): 980-991. Illus. 1971.
Identifiers: *Anti transpirants, Carbon dioxide, Cells, *Commelina-Communis-M, *Phenylmecuric acetate, Mesophyll, Penetration, Photosynthesis, Zea-Mays-M.

Experiments have examined the effect of phenylmercuric acetate (PMA) on the guard cells of Commelina communis. In one series, PMA was applied to the leaf surface; after different time intervals the epidermis was removed and the ability of the stomata to open was determined. In the other series, different concentrations of PMA were included in the medium used for incubating epidermal strips, with which ion-stimulated stomatal opening was assayed. At concentrations of 105 M and above the effect of PMA was severe and the structural integrity of the guard cells was affected; they were unable to accumulate neutral red. At concentrations around 106 M the guard cells were less affected and PMA brought about a transient stimulation of stomatal opening by releasing subsidiary-cell turgor pressure. A solution of 5 x 10-4 M PMA applied to leaves reduced by half the photosynthetic 14CO2 -incorporation into C. communis mesophyll. In Zea mays it increased the CO2 compensation point and also the resistance to diffusion in the gas phase, but there was a proportionately greater increase in the apparent liquid phase resistance. This direct inhibition of mesophyll photosynthesis undermines one of the major objectives of applying antitranspirants, and for this reason it is suggested that PMA is unsuitable for general application to crops.--Copyright 1972, Biological Abstracts, Inc.
W72-14149

PRESENT STATE OF CASTOR FIBER L. POPULATION IN THE UPPER AND MIDDLE FLOW OF THE UBORT RIVER AND PROSPECTS OF ITS ECONOMIC USE (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
G. M. Panov.
Vestn Zool, 5 (5): 81-82, 1971, English summary.
Identifiers: *Castor-Fiber, Cattle, Economic, Flow, Forage, Middle, *Ubort River, USSR, *Rodents.

The abundance of C. fiber in the upper and middle flow of the Ubort river increased owing to the growth of some beaver families that inhabited the river and migration of animals from the lower flow of the river. At present the Ubort river from Emilchino in the south to the boundary with the Byelorussian SSR in the north is populated with this valuable rodent. In autumn 1969 there were only 220-230 beavers. Further growth in their numbers is limited by the weak forage reserves and negative effect of cattle pasture in the littoral zone.--Copyright 1972, Biological Abstracts, Inc.
W72-14159

ADDITIONS TO THE LIST OF ODONATA OF THE DUTCH WADDEN ISLANDS, WITH AN ACCOUNT OF WATER QUALITY DATA OF LARVAL HABITATS, AND A REVIEW OF THE DRAGONFLY FAUNA OF THE DUTCH AND GERMAN NORTHSEA ISLANDS,
Rijksinstituut voor Veldbiologisch Onderzoek ten Behoeve van het Natuurbehoud, Zeist (Netherlands).
B. Kiauta.
Biol Jaarb, 36: 88-114, Illus, 1968.
Identifiers: Dragonfly, *Dutch Wadden Islands, Fauna, Islands, Larvae, North Sea, *Odonata, *Sympecma fusca.

Previously unpublished records are brought together of Odonata of the Dutch Wadden Islands. Among the species listed Sympecma fusca (van der Linden, 1823) is new to the fauna of the Northsea Islands, Lestes virens (Charpentier, 1825), Coenagrion puella (Linnaeus, 1758), and Ischnura pumilio (Charpentier, 1825) are new to the Dutch Wadden Islands, 2 are added to the list of Terschelling and 12 spp. are new for the fauna of Schiermonnikoog. For the first time records are published for the islands of Vlieland (6) and Ameland (2). Eighteen species are listed altogether.--Copyright 1972, Biological Abstracts, Inc.
W72-14162

SPREAD OF THE ORANGE LILY IN THE RIVER VALLEYS OF LITHUANIA,
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
Y. Y. Strazdaite, and Z. P. Lazdauskaite.
Liet Tsr Mokslu Akad Darb Ser B, 1. 61-67, Map, 1971, English summary.
Identifiers: Briza-Media-M, Ecology, *Lilium-Bulbiferum-M, Lily-M, *Lithuania, *Orange lily, River valleys, Trifolium-Pratense-D.

In natural environments the orange lily (Lilium bulbiferum L.) often grows in the wet river meadows of SW Lithuania and is cultivated all over the republic. The orange lily grows only in the communities Briza media--Trifolium pratense. Such successional communities allow the invasion of garden escapes.--Copyright 1972, Biological Abstracts, Inc.
W72-14168

COMPETITION AND ITS BEARING ON THE FRESHWATER FAUNAS,
Academia R. S. R., Bucharest. Institutul de Biologie.
P. Banarescu.
Rev Roum Biol Ser Zool. 16 (3): 153-164. Illus. 1971.
Identifiers: *Competition, Copepoda, Crabs, Crayfish, *Evolution, *Fauna, Invertebrates, Mussels, Ostariophysi.

The main dominant and competitive groups of freshwater animals are: Ostariophysi among fishes, crabs among Decapoda, Parabathynellidae among Syncarida, Unionaceae (except Hyriidae) among mussels, Diaptomidae among calanoid Copepoda and Streptocephalidae among Anostraca. South-East and East Asia were the main centers of evolution for these groups; North

America was a secondary center for crayfishes and mussels, South America a second center for Ostariophysi. Archaic groups, eliminated by competitive ones, survive mainly in southern continents, especially Africa for fishes and Australia for invertebrates. Some archaic and non-competitive groups lived once also in northern continents, while others seem to have dispersed through direct contact between southern continents.--Copyright 1972, Biological Abstracts, Inc.
W72-14176

DROUGHT RESISTANCE IN SUBALPINE NYMPHS OF SOMATOCHLORA SEMICIRCULARIS SOLYS (ODONATA: CORDULIIDAE),
Illinois Univ., Chicago. Dept. of Biological Sciences.
R. L. Willey, and H. O. Eiler.
Am Midl Nat. 87 (1): 215-221. Illus. 1972.
Identifiers: Aeschna-Interrupta-Interna, Corduliidae, *Drought, Libellula-Quadrimaculata, *Nymphs, Odonata, *Somatochlora-Semicircularis, Subalpine pools, Colorado, Irwin pool (Colo).

S. semicircularis inhabits subalpine pools and water meadows which frequently or regularly dry up in late Aug. and early Sept. Since the nymphs require 4 yr to mature, they must have the ability to survive these periods of drought. Somatochlora nymphs were found under rocks, moss mat, logs and deep in the bases of sedge clumps in Irwin Pond, Colorado, after it had dried up. In the laboratory, nymphs of Somatochlora die after losing the same relative amount of body water content under experimental desiccating conditions as do nymphs of Aeschna interrupta interna and Libellula quadrimaculata. However, it takes the nymphs of Somatochlora almost twice as long to reach this point. Low rate of transpiration in the nymph and early formation of the snow pack over the dry subalpine pond are believed to contribute to the survival of this dragonfly.--Copyright 1972, Biological Abstracts, Inc.
W72-14183

PSYCHROMETRIC APPARATUS FOR BOWEN-RATIO DETERMINATION OVER FORESTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 07B.
W72-14184

2J. Erosion and Sedimentation

A DEVICE FOR COLLECTING IN-SITU SAMPLES OF SUSPENDED SEDIMENT FOR MICROSCOPIC ANALYSIS,
Johns Hopkins University, Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05A.
W72-13693

PREHISTORIC NEAR-SURFACE SUBSIDENCE CRACKS IN WESTERN FRESHNO COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-13717

PERMEABILITY DISTRIBUTION IN A HOLOCENE DISTRIBUTARY CHANNEL-FILL NEAR LEERDAM (THE NETHERLANDS),
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
K. J. Weber, R. Eijpe, D. Leijnse, and C. Moens.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 53-62, 1972. 14 fig, 8 ref.

Descriptors: *Hydrogeology, *Alluvial channels, *Deltas, *Anisotropy, Stratigraphy, Permeability, Transmissivity, Piezometers, Cores, Sedimentary structures, Groundwater movement.

Channel-fill sand bodies are predominantly composed of a rather regular pattern of medium-scale festoon cross-bed sets, which are formed by the common river-bottom type of transverse-migrating sand ripples with curved crests, as a result of a rather strong unidirectional current. The festoons are elongated in the direction of the current and have a 'trough' or 'spoon'-shaped bottom which is initiated by a so-called bottom-set layer. The internal structure of the cross-bed sets, together with the systematic nature of their orientation, may cause an overall permeability anisotrophy in a channel-fill sand body. Experimental data on unconsolidated distributary channel-fills show that permeability anisotrophy is negligable in such sand bodies. (Knapp-USGS)
W72-13730

RAPID METHOD FOR DETECTION AND CHARACTERIZATION OF STEROIDS,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13781

ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES-PETROLOGY OF THE SAND FRACTION OF SEDIMENTS, NORTHERN NEW JERSEY TO SOUTHERN FLORIDA,
Woods Hole Oceanographic Institution, Mass.
J. D. Milliman.
Available from Sup Doc, GPO, Washington, DC 20402-Price $5.00 paper copy, including plates. Geological Survey Professional Paper 529-J, 1972. 40 p, 16 fig, 9 plate, 5 tab, 122 ref.

Descriptors: *Continental shelf, *United States, *Atlantic Ocean, *Petrology, *Sands, Sediments, Continental slope, Hydrologic data, Data collections, Sedimentology, Sediment transport, Maps, Geochemistry, Geology.

This study was part of the general investigation of the east coast (USA) continental shelf, slope, and upper rise undertaken by the Woods Hole Oceanographic Institution and the U.S. Geological Survey. Surface sediments on the continental margin from northern New Jersey to southern Florida can be divided into different sediment types on the basis of their texture and composition. Most of the continental shelf north of Cape Hatteras is covered with a relict low-carbonate felspathic sand. Shelf sediments south of Cape Hatteras are characterized by relatively high carbonate and low feldspar contents, the result of warm coastal waters and southern river sedimentation. Carbonate components include mollusks, coralline algae, barnacles, and oolite. Sediments immediately adjacent to large Piedmont rivers, however, tend to have relatively low carbonate and relatively high feldspar contents. The most impressive characteristic of the sediments of the continental margin is that most are relic or residual. Nine data maps are included under a separate cover. (Woodard-USGS)
W72-13830

TIDAL VARIATION OF THE SUSPENDED SEDIMENT SIZE DISTRIBUTION AT A STATION IN UPPER CHESAPEAKE BAY,
Maryland Fish and Wildlife Administration, Annapolis.
For primary bibliographic entry see Field 02L.
W72-13837

GEOLOGIC CROSS SECTIONS DERIVED FROM SEISMIC PROFILES AND SEDIMENT CORES FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
J. A. Lineback, D. L. Gross, and R. P. Meyer.
Illinois Geological Survey Environmental Geology Notes, No 54, August 1972. 43 p, 8 fig, 8 ref.

Descriptors: *Sedimentology, *Geology, *Lake Michigan, *Cross-sections, *Geomorphology, Sampling, Cores, Data collections, Pleistocene epoch, Analytical techniques, Sediment distribution, Profiles.
Identifiers: *Seismic profiles.

High-resolution seismic profiles and cores of bottom sediments were used in the construction of geologic cross sections of southern Lake Michigan. Major stratigraphic units of the Pleistocene and the surface of the underlying Paleozoic bedrock can readily be distinguished. Cross section in the northern part of southern Lake Michigan (near Milwaukee, Wisconsin) cross the Midlake High and show high relief on the bedrock surface, differentiate a thick glacial till, and indicate that in this area the Lake Michigan Formation is confined to low spots on the lake floor. A north-south cross section of the area shows a thick terminal moraine-like accumulation of till south of Milwaukee that pinches out southward. In the central part of the southern lake basin, the Lake Michigan Formation thins southward. The formation is thick along the eastern shore but absent in the southwestern corner of the lake. (Woodard-USGS)
W72-13844

SUSPENDED SEDIMENT DATA SUMMARY MARCH 1966-MAY 1967, UPPER CHESAPEAKE BAY (TOLCHESTER TO HAVRE DE GRACE),
Maryland Fish and Wildlife Administration, Annapolis.
For primary bibliographic entry see Field 02L.
W72-13849

TOPOGRAPHY AND RECENT SEDIMENTS OF THE LITTORAL ZONE OF SOVIET FAR EASTERN SEAS (OSOBENNOSTI FORMIROVANIYA REL'YEFA I SOVREMENNYKH OSADKOV PRIBREZHNOY ZONY DAL'-NEVOSTOCHNYKH MOREY SSSR).

Izdatel'stvo 'Nauka', Moscow, 1971. 184 p.

Descriptors: *Geology, *Geomorphology, *Topography, *Shores, *Coasts, Islands, Sediments, Sedimentation, Sediment distribution, Sediment sorting, Particle size, Aggradation, Abrasion, Mineralogy, Meteorology, Climatology, Orography, Littoral, Underwater, Sea level, Histograms.
Identifiers: *USSR, Chuckchee Sea, Sea of Okhotsk, Kamchatka, Kuril Islands, Shore processes, Shoreline development, Coastal features, Eustatic.

This three-part monograph examines the geomorphology and dynamics of the littoral zone of Far Eastern seas bordering the Soviet Union and the lithology of recent sediments deposited in the near-shore environment. Regions investigated include the coasts of the Chukot Peninsula, Kamchatka, and Kuril Islands and the shores of the Sea of Okhotsk and Peter the Great Bay at the south end of the Maritime Territory. Coastal evolution of each region is described in terms of the topographic features resulting from marine depostion or erosion. (Josefson-USGS)
W72-13860

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13962

WINNEBAGO-BEAN CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13966

SORPTION-DESORPTION REACTIONS OF MERCURY WITH SUSPENDED MATTER IN THE COLUMBIA RIVER,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-13972

DISTRIBUTION PATTERNS FOR SOME PARTICULATE AND DISSOLVED TRACE METALS WITHIN AN ACTIVE GLACIAL FJORD,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W72-13973

ADSORPTION-DESORPTION EQUILIBRIA OF SOME RADIONUCLIDES IN SEDIMENT-FRESHWATER AND SEDIMENT-SEAWATER SYSTEMS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05B.
W72-13974

TRANSPORT AND DEPLETION OF RADIONUCLIDES IN THE COLUMBIA RIVER,
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.
For primary bibliographic entry see Field 05B.
W72-13975

CONCENTRATIONS AND DISTRIBUTIONS OF LONG-LIVED FALLOUT RADIONUCLIDES IN OPEN OCEAN SEDIMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-13980

ANOMALOUS TH228/TH232 AND TH230/232 ACTIVITY RATIOS IN BACKWATER SEDIMENTS ALONG THE WEST COAST OF INDIA.
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 05B.
W72-13982

WEATHERING OF BASALTIC TEPHRA ON THE ISLAND OF HAWAII,
California Univ., Berkeley. Dept. of Geology and Geophysics.
R. L. Hay, and B. F. Jones.
Geological Society of America Bulletin, Vol 83, No 2, p 317-332, February 1972. 5 fig, 5 tab, 28 ref.

Descriptors: *Weathering, *Volcanoes, *Hawaii, *Basalts, Leaching, Igneous rocks, Water chemistry, Temperature, Rainfall, Precipitation (Atmospheric).
Identifiers: *Tephra, *Volcanic ash.

Three basaltic tephra deposits of Kilauea were studied in order to determine the nature and amount of weathering as a function of age and climate. The principal weathering products of glass are palagonite and clay. Montmorillonite and calcite are weathering products of the Pahala Ash in the drier areas; gibbsite has formed at rainier sites. Plagioclase, pyroxene, and olivine are weathered only in the Pahala Ash. Chemical changes on weathering of the tephra deposits vary as a function of climate. From comparative analysis of unaltered and altered solids, SiO2 and Na + K + Ca + Mg seem to be lost under heaviest rainfall in average proportions as high as 2:1; in the driest areas they have been leached in the ratio of about 1:3. In an area of intermediate rainfall, SiO2 and Na + K + Ca + Mg are lost in an average ratio of 3:2, as shown by chemical composition of both solids and interstitial waters. (Knapp-USGS)
W72-14014

NONANTECEDENT DEVELOPMENT OF TRUCKEE RIVER CANYON, NORTHERN CARSON RANGE, NEVADA AND CALIFORNIA,
Texas Univ., El Paso. Dept. of Geological Sciences.
E. M. P. Lovejoy.
Geological Society of America Bulletin, Vol 83, No 3, p 885-894, March 1972. 3 fig, 23 ref.

Descriptors: *Erosion, *Geomorphology, *Structural geology, *Canyons, Valleys, Terrain analysis, Topography, Water gaps, *Nevada, Drainage patterns (Geologic), California.
Identifiers: Carson Range (Nev), *Truckee River (Nev).

Truckee River crosses northern Carson Range in a gorge 3000 ft deep, passing east from Truckee Valley, elevation 6400 ft, to Truckee Meadows, elevation 4400 ft. A nonantecedent origin for this gorge is suggested, based on headward erosion in the easily eroded pyroclastic rocks which lie on the resistant Sierran basement intrusive rocks. Headward erosion together with stream capture enabled the Truckee River to extend west of the original range divide, where it incorporated drainage of the western flank. Erosion then continued into Truckee Valley, thus crossing the Carson Range nonantecedently. Therefore, Truckee River Canyon may not be evidence of postandesite uplift, either by warping or faulting, of the Carson Range. (Knapp-USGS)
W72-14015

INVERSE RELATION BETWEEN FORESHORE SLOPE AND MEAN GRAIN SIZE AS A FUNCTION OF THE HEAVY MINERAL CONTENT,
Wisconsin Univ., Milwaukee. Dept. of Geography.
R. N. Dubois.
Geological Society of America Bulletin, Vol 83, No 3, p 871-876, March 1972. 4 fig, 10 ref.

Descriptors: *Beaches, *Particle size, *Mineralogy, *Sands, *Sediment sorting, Sedimentation, Sediment distribution, Distribution patterns, Geomorphology, Slopes, Surf, Waves (Water).
Identifiers: *Heavy minerals, *Foreshore slope.

Along the sandy beach of Terry Andrae State Park on Lake Michigan, an inverse relationship exists between foreshore slope angle and mean grain size. Mean grain size decreases as the heavy mineral content increases. Grain size, wave steepness, and wave length affect the foreshore slope angle. The heavy mineral content in the mid-foreshore is proposed as an active variable that also influences the foreshore slope angle. (Knapp-USGS)
W72-14016

BROWN AND GRAY SANDS ON THE VIRGINIA SHELF: COLOR AS A FUNCTION OF GRAIN SIZE,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
D. J. P. Swift, and W. R. Boehmer.
Geological Society of America Bulletin, Vol 83, No 3, p 877-884, March 1972. 4 fig, 2 tab, 22 ref. DACW-72-69-C-0016 NSF Grant GA-13837.

Descriptors: *Sands, *Continental shelf, *Water chemistry, *Oxidation, *Iron, Color, *Virginia, Weathering, Permeability, Aeration, Water circulation, Surf, Waves (Water), Color reactions.
Identifiers: *Iron-stained sands.

Brown iron-staining on coarse shelf sands is evidence of subaerial weathering, either in the source area or at the depositional site. However, iron-staining can occur subaqueously, as well. A close correlation was found between grain size and color on the inner Virginia shelf, with finer sands being olive-gray, and coarser sands being brown. The sand-grain surfaces are in chemical equilibrium with their environment. The coarser sands are permeable, and are kept oxygenated by wave surge. The finer sands are relatively impermeable, and are reduced by interstitial organic matter. Brown iron-staining is not a definitive criteria for a relict origin or subaerial exposure of shelf sand. (Knapp-USGS)
W72-14017

MORPHOMETRIC ANALYSIS OF POLYGONAL KARST IN NEW GUINEA,
Trinity Coll., Dublin (Ireland).
P. W. Williams.
Geological Society of America Bulletin, Vol 83, No 3, p 761-796, March 1972. 19 fig, 4 tab, 78 ref.

Descriptors: *Karst, *Geomorphology, *Karst hydrology, *Topography, *Hydrogeology, Erosion, Structural geology, Terrain analysis, Sinks, Slopes, Valleys, Limestones.
Identifiers: *New Guinea, *Polygonal karst.

The morphometry of humid tropical karst was studied in eight districts in east New Guinea. Closed depressions completely pit the landscapes and, when delimited on the basis of their topographic divides, form a cellular network termed polygonal karst. The stream-sinks associated with the depressions have dispersion that tend to be uniform. Morphologic parameters have a well-defined and generally similar form of association in each of the sample districts. Statistical range tests permit the identification of three polygonal karsts: pinnacle, conic, and linear styles. The conic and linear styles correspond roughly to 'cone karst' and 'directed karst,' respectively. A proposed growth model for polygonal karst envisages scattered small depressions on an uplifted surface expanding and capturing smaller neighbors until the entire surface is occupied by adjoining polygonal depressions. The boundaries of the depressions are largely stabilized by competition, and growth of the depression is also limited by the permeability of karstified rock, with large depressions breaking into smaller units if a certain size is exceeded. Once a cellular polygonal karst is established, its geometry undergoes only minor modification through time, unless altered by an important environmental factor. (Knapp-USGS)
W72-14018

CHRONOLOGY OF A KETTLE-HOLE PEAT BOG, CHERRYFIELD, MAINE,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
D. M. Mickelson, and H. W. Borns, Jr.
Geological Society of America Bulletin, Vol 83, No 3, p 827-832, March 1972. 3 fig, 16 ref. NSF Grant GA-1157.

Descriptors: *Peat, *Bogs, *Maine, *Deltas, *Sedimentation, *Pleistocene epoch, Radioactive dating, Carbon radioisotopes, Sedimentation rates, Sedimentation, Sedimentology, Sea level, Paleohydrology.
Identifiers: Cherryfield (Maine).

Parts of coastal and central Maine underwent marine submergence between approximately 13,500 and 12,500 yrs ago. An ice-contact marine delta near Cherryfield, Maine, was formed during this time. Ten radiocarbon dates of basal peat sam-

ples from a kettle hole on the delta ranged from 5,310 plus or minus 100 yrs B.P. at a depth of 2.21 m to 9,170 plus or minus 160 yrs B.P. at a depth of 5.28 m. The radiocarbon dates indicate a time lag of approximately 2,000 yrs between the formation of the delta and the earliest deposition of organic matter in the kettle hole. (Knapp-USGS)
W72-14019

RIVER DISCHARGE INTO AN ICE-COVERED OCEAN AND RELATED SEDIMENT DISPERSAL, BEAUFORT SEA, COAST OF ALASKA,
Geological Survey, Menlo Park, Calif.
E. Reimnitz, and K. F. Bruder.
Geological Society of America Bulletin, Vol 83, No 3, p 861-866, March 1972. 7 fig, 6 ref.

Descriptors: *Sedimentation, *Deltas, *Sea ice, *Sediment transport, *Alaska, Ice breakup, Ice cover, Sediment load, Dispersion, Scour, Deposition (Sediments).
Identifiers: *Beaufort Sea.

Along the Beaufort Sea coast of Alaska in 1970 during the first few days following river breakup, the fast sea ice was inundated by fresh-water overflow for as far as 10 km from shore. The water drained through widely distributed drain holes in the ice, creating scour depressions in the sea bottom. Later the rivers flowed directly into growing open-water areas surrounding distributary mouths and thence seaward below the fast ice. The presence of the sea ice during the river flood greatly restricts the cross-sectional area available for the seaward flow out to at least the 2-m contour, where the bottom slope suddenly steepens. At the Colville Delta, the 2-m bench extends 5 to 8 km from shore and presumably represents an area of sediment by-passing. Only insignificant amounts of sediment are rafted away from arctic Alaska's deltas during the final breakup of the sea ice. (Knapp-USGS)
W72-14020

LONGITUDINAL PROFILES OF EPHEMERAL STREAMS IN SOUTHEASTERN ARIZONA,
Princeton Univ., N.J. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02E.
W72-14021

ALLUVIAL CUTOFF DATING FROM SUBSEQUENT GROWTH OF A MEANDER,
Iowa State Univ., Ames. Engineering Research Inst.
R. L. Handy.
Geological Society of America Bulletin, Vol 83, No 2, p 475-480, February 1972. 3 fig, 1 tab, 11 ref.

Descriptors: *Meanders, *Alluvial channels, *Cutoffs, *Channel morphology, *Stream erosion, Mapping, Surveys, Flood plains, Geomorphology, Discharge (Water), Sediment load, Scour, Erosion, *Iowa.
Identifiers: *Des Moines River (Iowa).

A meander in the Des Moines River grew rapidly following a channel cutoff in about 1880, after which the rate of growth slowed gradually as the channel approached the edge of the meander belt. A first-order rate equation describes the distance of the river from the edge of the meander belt at any time after cutoff. The initiating river cutoff occurred after a meander loop impinged on a pleistocene terrace and became stationary. Shortening of a river meander by a cutoff causes a local increase in gradient and renewed meander activity. (Knapp-USGS)
W72-14025

GROWTH OF A TALUS CONE IN THE WESTERN CHUGACH MOUNTAINS, ALASKA,
Geological Survey, Menlo Park, Calif.
S. H. B. Clark, H. L. Foster, and S. R. Bartsch.
Geological Society of America Bulletin, Vol 83, No 1, p 227-230, January 1972. 5 fig, 2 ref.

Descriptors: *Talus, *Mass wasting, *Earthquakes, *Alaska, *Rockslides, Erosion, Landslides, Sedimentation, Surveys.
Identifiers: *Chugach Mountains (Alaska).

A significant increase in the size of a talus cone near the terminus of Eklutna Glacier during the 6 yrs following the 1964 Alaska earthquake is shown by comparison of photographs taken in 1964 and 1970. Calculations from approximate measurements indicate that about 1.7 million cu yds of rock has been added to the cone since 1964. This growth has been the result of intermittent rockfalls which began after the 1964 earthquake and were continuing in 1970. Rockfalls in other places in the same area were initiated by the earthquake, but did not continue at a rate sufficient to produce measurable change in the talus. Observations on the ridge above the active talus cone suggest that the configuration of the cliff, fracturing and loosening of the rock at the time of the earthquake, and possible land movements resulted in a uniquely unstable area. The instability may be sufficient to account for the continuation of an unusually large number of rockfalls. (Knapp-USGS)
W72-14026

DEVELOPMENT OF THE GAUYA RIVER VALLEY (RAZVITIYE DOLINY REKI GAUYA),
All-Union Research Inst. of Marine Geology and Geophysics, Riga (USSR).
O. P. Aboltyn'sh.
'Zinatne', Riga, 1971. 108 p.

Descriptors: *Geology, *Geomorphology, *Topography, *Valleys, *Rivers, River basins, Terraces (Geologic), Surfaces, Water levels, Channels, Shores, Flood plains, Alluvium, Sedimentation, Aggradation, Erosion, Glaciation, Gelogic mapping, Correlation analysis.
Identifiers: *USSR, *Latvia, *Gauya River, *Terrace correlation, *Base level of erosion, Postglacial, Paleogeography, Tectonics.

The Gauya River, which rises in the Vidzeme Hills and flows in a winding course to the Gulf of Riga, is the second longest river in Latvia. The length of the river is 460 km, and the area of the drainage basin is 8,905 sq km. Average annual runoff is 2.4 cu km, with maximum discharge occurring in spring and fall months. The structure, morphology, and history of development of the river valley are investigated for correlation of terraces in the valley with shorelines of basins, which were the base levels of erosion during terrace formation. Attention is focused on the structure of alluvial floodplain terraces formed in the postglacial period by the river's hydrologic regime, water-level fluctuations of the Baltic, and tectonic conditions in the river basin. Present degradational and aggradational processes are represented by slow downcutting of the river, accompanied by valley widening. (Josefson-USGS)
W72-14034

PLATINUM MINERALS IN QUATERNARY SEDIMENTS BETWEEN THE ANABAR AND OLENEK RIVERS (PLATINOVYYE MINERALY CHETVERTICHNYKH OTOLOZHENIY ANABARO-OLENEKSKOGO MEZHDURECH'YA),
Akademiya Nauk SSSR, Yakutsk. Institut Geologii.
B. R. Shpunt.
Geologiya Rudnykh Mestorozhdeniy, Vol 12, No 2, p 123-126, March-April 1970. 2 fig, 1 tab, 3 ref.

Descriptors: *Sediments, *Sedimentology, *Mineralogy, *Metals, *Quaternary period, Rivers, River basins, Watersheds (Divides), Interfluves, Alluvium, Sands, Rocks, Erosion, Panning, Placer mining, X-ray analysis.
Identifiers: *USSR, *Yakutsk ASSR, *Platinum, Mineral properties, Pebbles.

The presence of platinum minerals in Quaternary sediments of the Buolkalakh, Khatygyn-Uelete, and Kangalas-Uele River basins in northwestern Yakutsk ASSR was established in field studies conducted both by the Yakutsk Geological Administration in 1966 and by the Scientific Research Institute of Arctic Geology in 1966-68. Characteristically low in heavy minerals, Middle-Upper Quaternary lacustrine-alluvial sediments between the Anabar and Olenek Rivers contain 40%-60% almandine, 25%-50% ilmenite, 4%-17% epidote, 5%-8% zircon, 1%-3% rutile, 0.5%-3% magnetite, and 0.5%-2% sphene. Maximum concentrations of platinum minerals, reaching weighable quantities, occur in the lowermost part of the sedimentary profile next to the base of ferruginized pebblestone. High concentrations of platinum minerals are generally associated with high concentrations of chromite, spinel, pyroxenes, magnetite, gold, diamonds, pyrope, and picroilmenite. Erosion of the Middle-Upper Quaternary platinum-bearing sediments correlates with the appearance of platinum minerals in the alluvium of the present-day drainage system. (Josefson-USGS)
W72-14035

NEW INVESTIGATIONS OF SHORE PROCESSES (NOVYYE ISSLEDOVANIYA BEREGOVYKH PROTSESSOV).
Akademiya Nauk SSSR, Moscow. Okeanograficheskaya Komissiya.

'Nauka', Moscow, 1971. 208 p.

Descriptors: *Shores, *Coasts, *Geomorphology, *Topography, *Sedimentation, Sediments, Erosion, Slopes, Beaches, Sand bars, Terraces (Geologic), Deltas, Estuaries, Tides, Winds, Currents (Water), Waves (Water), Littoral, Piers, Geologic time.
Identifiers: *USSR, *Baltic Sea, *White Sea, *Black Sea, *Shore processes, Shoreline development, Longshore currents, Wind waves, Postglacial, Paleogeography.

This collection contains 17 papers devoted primarily to recent investigations of the morphology and dynamics of shores along the Baltic, White, and Black Seas and of coastal regions of the United Arab Republic and Cuba. Individual topics include: (1) dynamics and morphology of shores of the Cheleken Peninsula off the west coast of the Turkmen Republic; (2) development of submerged coasts; (3) dynamics and structure of shores of the Chuckchee Sea; (4) growth of the shoreline of the Nile River Delta; (5) sedimentation in the White Sea in Late Postglacial time; (6) topography and bottom sediments of the northern coast of Cuba near the Sabana and Camaguey Archipelagoes; (7) topography of an underwater slope composed of shell material; (8) techniques and results of pier measurements of coastal currents; (9) topography and sediments in the littoral zone of the Isle of Pines in the northwestern Carribean; (10) investigations of the movement of Black Sea sediments parallel to the shores of the Georgian Republic; (11) manifestations of wind-wave refraction in the dynamics of marine shorelines; and (12) character of summer storm waves in the littoral zone of the eastern Baltic. (Josefson-USGS)
W72-14036

SOIL EROSION STUDIES IN THE PRESNOVSKII SOVKHOZ IN THE PAVLODAR OBLAST, (IN RUSSIAN),
T. K. Dosmukhamedov.
Tr Inst Pochvoved Akad Nauk Kaz SSSR. 29: 100-164. 1970.
Identifiers: Fallow, Pavlodar Oblast, Presnovskii-Sovkhoz, *Soil erosion, Strip cropping, USSR.

Effective practices for protection of soil against deflation are stripcropping (with strips of 100 m on weakly deflated and 50 M on moderately deflated

soils) and moldboardless plowing on moderately and weakly deflated soils, and solid regrassing on heavily deflated soils. Strip-sown fallow is also effective.--Copyright 1972, Biological Abstracts, Inc.
W72-14171

WATER EROSION OF SOILS ON THE RIGHT BANK OF THE SELENGA RIVER, (IN RUSSIAN),
A. D. Ivanov, and I. S. Malyshev.
Tr Buryat Inst Estestv Nauk Buryat Fil Sib Otd Akad Nauk SSSR. 8. 155-172.
Identifiers: Banks, Chernozem, *Soil erosion, Forest, *Selenga River, Soils, USSR.

Data are given on the genesis, distribution, nature of erosion processes and erosive flows in agricultural districts of the Buryat ASSR. The geomorphological and lithological aspects in the development of erosion by water are described. Soil erosion districts are delimited in the zone of prevailing water erosion of chernozem, chestnut and gray forest soils.--Copyright 1972, Biological Abstracts, Inc.
W72-14175

2K. Chemical Processes

WAX-BOUND LEAD DIOXIDE POTENTIOMETRIC ELECTRODE AND APPLICATIONS TO CHELOMETRIC TITRATION,
Wisconsin Univ., Milwaukee. Dept. of Chemistry, and Wisconsin Univ., Milwaukee. Lab. for Surface Studies.
For primary bibliographic entry see Field 05A.
W72-13676

GROUND - WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13715

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
G. A. Irwin, and W. R. Powers, III.
Geological Survey Open-file Report, April 17, 1972. 18 p, 5 fig, 5 tab, 9 ref.

Descriptors: *Water quality, *Chemical analysis, *Groundwater, *Surface waters, *California, Hydrogeology, Aquifers, Streams, Sampling, Data collections, Streamflow, Flow characteristics, Water wells, Dissolved solids, Sulfates, Coliforms, Pesticides, Nitrogen, Phosphorus.
Identifiers: *Santa Ana River Canyon (Calif).

From July through December 1970, a water-quality reconnaissance was made of a 6.6-mile reach of the lower Santa Ana River (Southern California) from the gage below Prado Dam to the Santa Ana Valley Irrigation District intake. Concentrations of dissolved solids in the river increased downstream an average of 17 milligrams per liter, or 2.1 percent. The most conspicuous ionic change was the sulfate concentration, which increased 8.0 percent downstream. Groundwater in Aliso and Gypsum Canyons contained concentrations of dissolved solids much higher than those of the river water; groundwater in Wardlow Wash contained concentrations of dissolved solids lower than those of the river water. Coliform bacteria and pesticide concentrations in the river exceeded recommended health and environmental standards. Concentrations of nitrogen and phosphorus, which are primary nutrients for autotrophic plant growth, were high in the river water; however, excessive plant growth was not observed. (Woodard-USGS)
W72-13720

CONTRIBUTION TO THE GEOCHEMISTRY OF GROUNDWATER IN NORTHERN GERMANY,
Geologisches Landesamt Hamburg (West Germany).
E. P. Lohnert.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 63-70, 1972. 5 fig, 17 ref.

Descriptors: *Saline water systems, *Geochemistry, *Hydrogeology, *Saline water, Water chemistry, Chlorides, Sulfates, Water supply.
Identifiers: *Germany.

Moderately saline groundwaters, usable for drinking and industrial purposes, occur in northern Germany at depths of approximately 500 meters below the surface. Apart from local saline water intrusions along the North Sea coast and rivers, the saline components of groundwater are derived from deep groundwaters which are related to salt bodies mainly of Zechstein age. Sulfate waters are found in the immediate vicinity of salt domes. Chloride salt waters and brines are also found further away from the salt bodies, and show indications of reduction and base-exchange. A chemical classification of groundwater is proposed. It uses the absolute as well as the relative contents of ions. (Knapp-USGS)
W72-13725

TUNABLE INFRARED LASER SPECTROSCOPY OF ATMOSPHERIC WATER VAPOR,
Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
For primary bibliographic entry see Field 02B.
W72-13732

WATER QUALITY OF STREAMS IN THE NESHAMINY CREEK BASIN, PENNSYLVANIA,
Geological Survey, Washington, D.C.
E. F. McCarren.
Available from GPO, Washington, DC 20402, Price-30 cents. Geological Survey Water-Supply Paper 1999-0, 1972. 33 p, 7 fig, 4 tab, 20 ref.

Descriptors: *Water resources development, *Watershed management, *Water quality, *Land development, *Pennsylvania, Streamflow, Hydrologic data, Basic data collections, Streams, Water demand, Urbanization, Water quality control, Chemical analysis, Water supply, Water utilization, Water analysis, Groundwater resources.
Identifiers: *Neshaminy Creek basin (Penn).

The Neshaminy Creek, a tributary of the Delaware River, drains 236.5 square miles of rural countryside in Bucks and Montgomery Counties in southeastern Pennsylvania. The perennial flow of fresh water in Neshaminy Creek is used for public supply and recreation. In the lower half of the drainage basin, the average discharge of the main stream exceeds 146 million gallons per day, part of which is regularly diverted and moderately treated for distribution to consumers living in the suburbs of Philadelphia. The unabated growth of nearby metropolitan areas and the multiplying needs for water and open space for water storage and recreation in southeastern Pennsylvania have become impelling forces that mark the Neshaminy valley watershed for continued development of its land and water resources. There is a wide variance in water quality between the West Branch and North Branch of the Neshaminy. However, there is no significant difference between the chemical composition of the Little Neshaminy Creek and the main strem before they come together at Rushland. Just beyond their confluence the main stream has drained more than half its total drainage area. The average flow of the stream at this location is about 85% of the average flow at Langhorne. (Woodard-USGS)
W72-13737

A TECHNIQUE FOR CURIE POINT PYROLYSIS GAS CHROMATOGRAPHY OF COMPLEX BIOLOGICAL SAMPLES,
Stichting voor Fundamenteel Onderzoek der Materie, Amsterdam (Netherlands). Istituut voor Atoom en Molecuulfysica.
For primary bibliographic entry see Field 05A.
W72-13761

GAS LIQUID CHROMATOGRAPHIC ANALYSIS OF HYDROCARBON MIXTURES. A REPORT ON THE WORK OF THE INTERNATIONAL CONFERENCE OF BENZOLE PRODUCERS,
International Conference of Benzole Producers, Paris (France).
For primary bibliographic entry see Field 05A.
W72-13771

MEASUREMENTS OF VERY LOW OXYGEN TENSIONS IN UNSTIRRED LIQUIDS,
Waterloo Univ. (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 05A.
W72-13785

PRECISION OF ELECTRICAL DETECTION MEASUREMENTS OF POWDERED SAMPLES IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13787

METHOD FOR DETERMINATION OF MERCURY IN BIOLOGICAL MATERIALS BY NEUTRON ACTIVATION ANALYSIS,
National Bureau of Standards, Washington, D.C. Activation Analysis Section.
For primary bibliographic entry see Field 05A.
W72-13788

DETERMINATION OF FLUORIDE IN VEGETATION USING THE SPECIFIC ION ELECTRODE,
Diamond Shamrock Chemical Co., Baltimore, Md. Chemetals Div.
For primary bibliographic entry see Field 05A.
W72-13789

EMISSION SPECTROMETRIC DETERMINATION OF TRACE AMOUNTS OF MERCURY,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13790

SEMIINTEGRAL ELECTROANALYSIS: THEORY AND VERIFICATION,
Trent Univ., Peterborough (Ontario).
M. Grenness, and K. B. Oldham.
Analytical Chemistry, Vol. 44, No. 7, p 1121-1129, June 1972. 9 fig, 6 tab, 12 ref.

Descriptors: *Electrodes, *Chemical analysis, Electrochemistry, Analytical techniques, Anions, Cations, Cadmium, Instrumentation, Computer programs, Mathematical studies, Analog computers, Kinetics.
Identifiers: *Electroreduction, Electroanalysis, Semiintegral electroanalysis, Mercury electrodes, Voltammetry.

The theory of a new analytical method, semiintegral electroanalysis, is described in detail and an experimental verification of the theory is presented. The theory describes the properties of m, the semiintegral of the faradaic current which flows when complete diffusion control follows a preexisting equilibrium. According to the predictions of the theory, m will be proportional to the concentration of the electroactive species, to the

square root of its diffusion coefficient, to the number of electrons involved, and to the area of the electrode. The theory has been verified. Studies using the reduction of cadmium and 02 at a mercury electrode demonstrate that the semiintegral electroanalysis method is valid for the measurement of concentrations and diffusion coefficients, and possess a number of novel and potentially attractive features. The advantages of the technique are attributed to the independence of the voltammetry from time or frequency. This leads to the independence of m (tau) in the form of the applied signal and permits a large series resistor in the circuit without impairing the analysis. An analog technique permitting direct measurement of m (t) is being developed, which will give semiintegral electroanalysis a marked advantage over other voltammetric methods. (Mortland-Battelle)
W72-13791

ANALYTICAL USES OF CHARGE-TRANSFER COMPLEXATION: SPECTROPHOTOMETRIC METHOD FOR IODIDE IN WATER,
Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05A.
W72-13792

SPECTROPHOTOMETRIC DETERMINATION OF TRACE QUANTITIES OF IRON (III) BY AN EXCHANGE REACTION WITH METAL ACETYLACETONATES,
Assiut Univ. (Egypt). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13793

VOLTAMMETRY IN METHANOL, ETHANOL, AND SULFOLANE AS SOLVENTS,
Pittsburgh Univ., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13794

VERSATILE COLORIMETRIC COULOMETER,
Honeywell Research Center, Hopkins, Minn.
W. D. Ellis, and D. T. Baker.
Analytical Chemistry, Vol. 44, No. 7, p 1330-1331, June 1972. 1 fig, 3 ref.

Descriptors: *Colorimetry, *Laboratory equipment, *Aqueous solutions, Separation techniques, Iodine, Chemical analysis, Ions, *Iodides, Halogens, Oxidation, Chemical reactions, Instrumentation, Optical properties, Measurement.
Identifiers: *Coulometer, Arsenite, Sensitivity, Absorbance, Detection limits.

The colorimetric coulometer based on the oxidation of the iodide ion to iodine is simpler, more sensitive and versatile than those previously described. The procedure for using this equipment involves adding 2.5 ml of a known concentration of KI into a cuvette containing a platinum working electrode and a nickel wire auxiliary electrode. The electrodes are placed out of the optical path with a constant current being passed through the cell for a specified time. The solution is stirred and the absorbance measured with a spectrophotometer at 287 nm. The electrochemical parameters are controlled with a NIL electrolab unit. For experiments on the timer version of the coulometer, a controlled, constant current was passed through a solution containing potassium iodide, sodium bicarbonate, and arsenite, and the signal monitored. The precision of the timer was 0.5 percent; the overall precision of the method was about 1.0 percent. The advantage of the cell described is that it requires no separate auxiliary electrode compartment and it can be used as a one-shop cell with stirring and readout at the end of an experiment or as a stirred cell in a spectrophotometer to continuously monitor the number of coulombs passed through the cell. The detectability of the coulometer was found to be 13.5 millicoulombs. (Snyder-Battelle)
W72-13802

MICRODETERMINATION OF CARBON, HYDROGEN, NITROGEN AND OXYGEN IN PETROLEUM COMPOUNDS WITH AN AUTOMATIC ELEMENTAL ANALYZER,
Sun Oil Co., Marcus, Hook, Pa.
For primary bibliographic entry see Field 05A.
W72-13805

TITRIMETRIC DETERMINATION OF TRACE SULFUR IN PETROLEUM USING A LEAD ION SELECTIVE ELECTRODE,
Sun Oil Co., Marcus Hook, Pa.
For primary bibliographic entry see Field 05A.
W72-13806

A COMPUTERIZED SYSTEM FOR STORING, RETRIEVING, AND CORRELATING NMR DATA,
Hercules Research Center, Wilmington, Del.
For primary bibliographic entry see Field 07C.
W72-13808

ANOMALOUS WATER,
Tyco Labs. Inc., Waltham, Mass.
For primary bibliographic entry see Field 01B.
W72-13842

INVESTIGATIONS OF ORGANIC MATTER IN GROUNDWATER OF OIL- AND GAS-BEARING REGIONS (METODICHESKIYE ISSLEDOVANIYA V OBLASTI IZUCHENIYA ORGANICHESKOGO VESHCHESTVA PODZEMNYKH VOD NEFTEGAZONOSNYKH OBLASTEY),
For primary bibliographic entry see Field 05B.
W72-13856

THE RIVER WEAR: INORGANIC CHEMISTRY RELEVANT TO A BIOLOGIST,
Durham Univ. (England).
M. Snow, and B. A. Whitton.
Vasculum, Vol. 56, No. 3, p 50-58, 1971. 3 fig, 1 tab, 17 ref.

Descriptors: *Baseline studies, *Water chemistry, *Water analysis, *Nutrients, *Surveys, Rivers, Water properties, Water quality, Nitrates, Nitrites, Silicates, Phosphates, Dissolved oxygen, Chlorides, Calcium, Magnesium, Zinc, Lead, Ammonia.
Identifiers: *River Wear, Inorganic ions, England.

The inorganic chemistry of the non-brackish reaches of the River Wear, Northeast England, is summarized, especially those ions important in plant growth, for comparison with other rivers. Analyses included magnesium, calcium, chloride, silicate, zinc, lead, ammonia, nitrate, nitrite and oxygen. From the biological point of view, the sharpest changes were the increase in nitrate and phosphate below Wadsworth sewage works, and an increase in hardness, especially that due to magnesium, below the River Gaunless. All nutrients increased in passing down the river, phosphate showing the largest increase and nitrate the second largest. (Svensson-Washington)
W72-13866

AMIDE-WATER INTERACTION ON MONTMORILLONITE SURFACE,
Ministry of Agriculture, Zagazig (Egypt). Soil Science Dept.
For primary bibliographic entry see Field 02G.
W72-13916

CARBONATE CHEMISTRY OF AQUIFER AND STREAM WATER IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W72-14004

THE GENESIS OF SELECTED HYDROCHEMICAL FACIES IN BATON ROUGE, LOUISIANA, GROUND WATERS,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W72-14008

WEATHERING OF BASALTIC TEPHRA ON THE ISLAND OF HAWAII,
California Univ., Berkeley. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02J.
W72-14014

BROWN AND GRAY SANDS ON THE VIRGINIA SHELF: COLOR AS A FUNCTION OF GRAIN SIZE,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 02J.
W72-14017

CHEMICAL FACTORS THAT INFLUENCE THE AVAILABILITY OF IRON AND MANGANESE IN AQUEOUS SYSTEMS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W72-14022

THE ANALYSIS OF TRACE ORGANICS IN FRESH WATER BY GAS CHROMATOGRAPHY -- MASS SPECTROSCOPY,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-14057

AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 01B.
W72-14060

PROPERTIES OF SEAWATER AND ITS CONCENTRATES AND RELATED SOLUTIONS AT TEMPERATURES UP TO 400 DEGREES F,
California Univ., Berkeley.
For primary bibliographic entry see Field 01B.
W72-14062

OPTIMIZATION OF DISSOLVED OXYGEN MEASUREMENTS,
Envirogenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05A.
W72-14066

A NEUTRON SCATTERING STUDY OF THE KINETICS OF DIFFUSION AND THE RELATION TO THE STRUCTURES OF IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
For primary bibliographic entry see Field 01B.
W72-14067

STATISTICAL STUDIES ON THE RELATION BETWEEN NITRIFICATION AND SOIL TEMPERATURE AND SOIL MOISTURE,
Deutscher Wetterdienst, Brunswick (West Germany).
For primary bibliographic entry see Field 02G.
W72-14200

2L. Estuaries

ESTURINE ECOSYSTEMS AND HIGH TEMPERATURES,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05C.
W72-13636

SAMPLING AND SPATIAL DISTRIBUTION OF BENTHONIC FORAMINIFERA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05A.
W72-13674

FRESH WATER WINNING AND SALT WATER ENCROACHMENT IN THE AMSTERDAM DUNE WATER CATCHMENT AREA,
Amsterdam Water Works (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13724

SALINITY TOLERANCES OF SOME COMMON PROSOBRANCHS,
Mount Allison Univ., Sackville (New Brunswick). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-13795

A STUDY OF LIGHT ATTENUATION IN MONTEREY BAY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-13798

ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES-PETROLOGY OF THE SAND FRACTION OF SEDIMENTS, NORTHERN NEW JERSEY TO SOUTHERN FLORIDA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-13830

TIDAL VARIATION OF THE SUSPENDED SEDIMENT SIZE DISTRIBUTION AT A STATION IN UPPER CHESAPEAKE BAY,
Maryland Fish and Wildlife Administration, Annapolis.
J. R. Schubel.
Available from NTIS, Springfield, Va 22151 as COM-72-10386, for $3.00 paper copy; $0.95 microfiche. Chesapeake Bay Institute Technical Report 63 (Reference 70-2), Johns Hopkins University, February 1970. 28 p, 8 fig, 5 tab, 4 ref.

Descriptors: *Sediment transport, *Suspended solids, *Particle size, *Tidal effects, *Chesapeake Bay, Estuaries, Suspended load, Sampling, Data collections, Currents (Water), Tidal waters, Sediment distribution.
Identifiers: *Suspended sediment, *Sediment size analysis.

Sedimentation size analyses were determined on suspended sediment samples collected over a tidal cycle at three depths in 0.5 m of water in the upper Chesapeake Bay. At the surface, the volume-weighted mean Stokes' diameter ranged from 2.9 to 3.7 microns and the concentration of suspended sediment varied from 11.2 to 14.6 mg/liter. At 8 m the mean Stokes' diameter, the standard deviation, and the concentration of suspended sediment were progressively shifted to larger values with increasing current speed and back to their slack water values with waning tidal currents. The mean Stokes' diameter ranged from 2.9 to 11.7 microns, the standard deviation from 5.2 to 14.5 microns, and the concentration of suspended sediment from 13.8 to 93.0 mg/liter. At 9 m the same pattern was observed, but the variations were greater. The mean Stokes' diameter ranged from 3.3 microns during slack water to 22.9 microns at maximum current. The standard deviation ranged from 5.0 to 24.5 microns and the concentration of suspended sediment from 19.5 to 201.1 mg/liter. The suspended particle population is comprised of two subpopulations--those particles in more or less continual suspension throughout the water column, and those particles alternately suspended and deposited by the waxing and waning of the tidal currents. (See also W72-13847 and W72-13849) (Woodard-USGS)
W72-13837

HYDROLOGY OF ALABAMA AREAS--COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY,
Alabama Marine Resources Lab., Dauphin Island.
For primary bibliographic entry see Field 05B.
W72-13840

SEA WATER INTRUSION: MORRO BAY AREA, SAN LUIS OBISPO COUNTY,
California State Dept. of Water Resources, Sacramento.
G. Torres, Jr.
California Department of Water Resources Bulletin No 63-6, February 1972. 104 p, 15 fig, 13 tab, 30 ref, 7 append.

Descriptors: *Saline water intrusion, *Aquifers, *Groundwater movement, *Coasts, *California, Hydrogeology, Water wells, Pumping, Drawdown, Groundwater recharge, Water pollution sources, Salinity, Hydrologic data, Data collections, Water quality control, Water resources development, Watershed management, Water level fluctuations, Water table.
Identifiers: *Morro Bay area (Calif).

Investigations were made to determine the nature and extent of sea water intrusion and to define the hydrogeologic parameters related to the intrusion and to define the hydrogeologic parameters related to the intrusion in aquifers of the Morro Bay area, California. The geology, hydrology, and water quality of the area were reviewed; the status of sea-water intrusion was determined; and the potential for further intrusion was evaluated. Because the quality of groundwater has been degraded by the intrusion of sea water, several wells have been abandoned along the coastal margin of Morro, Chorro, and Los Osos Ground Water Basins in the Morro Bay area of San Luis Obispo County. Increases in chloride-ion content in groundwater have occurred primarily in response to the lowering of water levels to below sea level during periods of intensive pumpage. In localized areas, other probable sources of degradation are the natural intrusion resulting from a decline in recharge at dry periods, downward percolation of ocean water in tidal areas, and the dissolution of evaporites by downward percolating waters. (Woodard-USGS)
W72-13846

SUSPENDED SEDIMENT DATA SUMMARY MARCH 1966-MAY 1967, UPPER CHESAPEAKE BAY (TOLCHESTER TO HAVRE DE GRACE),
Maryland Fish and Wildlife Administration, Annapolis.
J. R. Schubel, C. H. Morrow, and W. B. Cronin.
Available from NTIS, Springfield, Va 22151 as COM-72-10388, for $3.00 paper copy; $0.95 microfiche. Chesapeake Bay Institute Special Report 14 (Reference 68-11), Johns Hopkins University, November 1968. 60 p, 1 fig, 2 tab, 2 ref.

Descriptors: *Sediment transport, *Suspended solids, *Chesapeake Bay, *Suspended load, *Basic data collections, Sampling, Depth, Weather, Wind velocity, Salinity, Light penetration, Secchi disks, Reviews, Estuaries.
Identifiers: Combustible organic matter.

Twenty-four surveys were carried out measuring suspended sediment in the upper Chesapeake Bay during the period March 1966 through May 1967. The data collected on these cruises are summarized. The tables of data for each sampling site include location, date, time, weather, wind direction, wind speed, depth of sampling, water temperature, salinity, suspended sediment, combustible organic matter, and light penetration. (See also W72-13837 and W72-13847) (Woodard-USGS)
W72-13849

TOPOGRAPHY AND RECENT SEDIMENTS OF THE LITTORAL ZONE OF SOVIET FAR EASTERN SEAS (OSOBENNOSTI FORMIROVANIYA REL'YEFA I SOVREMENNYKH OSADKOV PRIBREZHNOY ZONY DAL'NEVOSTOCHNYKH MOREY SSSR).
For primary bibliographic entry see Field 02J.
W72-13860

APPARATUS FOR MEASURING PROPERTIES OF A FLUID BODY FROM AN AIRBORNE VEHICLE,
Buzzards Bay Corp., Marion, Mass. (Assignee).
For primary bibliographic entry see Field 07B.
W72-13876

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.
For primary bibliographic entry see Field 05A.
W72-13903

THERMAL EFFLUENTS FROM ELECTRICAL POWER GENERATION,
Fisheries Research Board of Canada, West Vancouver British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 05C.
W72-13905

A FRAMEWORK FOR IDENTIFICATION AND CONTROL OF RESOURCE DEGRADATION AND CONFLICT IN THE MULTIPLE USE OF THE COASTAL ZONE,
California Univ., Berkeley. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05G.
W72-13906

FISH AND WILDLIFE IN THE MARINE AND COASTAL ZONE, PART A, SUMMARY PLANNING INFORMATION, AND RECOMMENDATIONS,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 06G.
W72-13908

DDT RESIDUES IN EIGHT CALIFORNIA MARINE FISHES,
Philadelphia Community Coll., Pa.
For primary bibliographic entry see Field 05B.
W72-13946

WATER BANK PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.

For primary bibliographic entry see Field 06G.
W72-13959

ADSORPTION-DESORPTION EQUILIBRIA OF SOME RADIONUCLIDES IN SEDIMENT-FRESHWATER AND SEDIMENT-SEAWATER SYSTEMS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05B.
W72-13974

STUDIES ON THE BEHAVIOURS AND DISTRIBUTION OF RADIOACTIVE SUBSTANCES IN COASTAL AND ESTUARINE WATERS,
Japan Atomic Energy Research Inst., Osaka.
For primary bibliographic entry see Field 05B.
W72-13976

THE EVALUATION OF PUBLIC RADIATION EXPOSURE FROM THE CONTROLLED MARINE DISPOSAL OF RADIOACTIVE WASTE (WITH SPECIAL REFERENCE TO THE UNITED KINGDOM),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W72-13977

ANOMALOUS TH228/TH232 AND TH230/232 ACTIVITY RATIOS IN BACKWATER SEDIMENTS ALONG THE WEST COAST OF INDIA.
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 05B.
W72-13982

CHRONOLOGY OF A KETTLE-HOLE PEAT BOG, CHERRYFIELD, MAINE,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02J.
W72-14019

UNSTEADY FLOW OF GROUND WATER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02F.
W72-14053

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14064

THE SPARTINA TIDAL MARSHES OF THE ST. LAWRENCE ESTUARY AND THEIR IMPORTANCE TO AQUATIC BIRDS,
Canadian Wildlife Service, Sainte-Foy (Quebec).
A. Reed, and G. Moisan.
Nat Can. 98 (5): 905-922. Illus. Map. 1971. French summary.
Identifiers: Aquatic life, Birds, Brant, Ducks, Eiders, Estuarine environment, Food, Gulls, Heron, Marshes, *Spartina-M, *St. Lawrence estuary, *Tidal marshes.

Described are the major Spartina marshes found along the south shore of the St. Lawrence Estuary, Quebec. Their past and present use and abuse by man is discussed. An estimated 32% of the original 7800 acres of marsh has been diked-off for agricultural purposes. The ecology of the marshes is also discussed, placing particular emphasis on the ways by which this ecosystem is utilized by aquatic birds. A large population of black ducks inhabits the Spartina marshes during the spring and summer where it finds almost all of its breeding needs. Breeding populations of common eiders, herring gulls, great black-backed gulls, great blue herons, black-crowned night herons and several species of shorebirds, as well as migrating populations of Canada geese. Atlantic brant and other aquatic birds rely on this habitat as a source of food. It is concluded that potentially the St. Lawrence Spartina marshes' combined ecological, recreational, educational, aesthetic and touristic values are of greater importance than the agricultural values for which they are presently being exploited.--Copyright 1972, Biological Abstracts, Inc.
W72-14128

THE USE OF AERIAL PHOTOS IN PEDOLOGICAL CARTOGRAPHY OF THE AREA OF TRANSITION BETWEEN THE TROPICAL FOREST AND SAVANNA IN THE CENTRAL IVORY COAST,
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Fysiologische Scheikunde.
For primary bibliographic entry see Field 07B.
W72-14129

THE FISH FAUNA OF THE ESTUARINE AREA OF THE RHINE AND MEUSE RIVERS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 05B.
W72-14153

THE INFLUENCE OF ZALA RIVER ON THE BACTERIOLOGICAL CONDITION IN KESZTHELY-BAY (LAKE BALATON),
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 05C.
W72-14154

THE HYDROLOGICAL CONDITIONS OF AMBARO BAY (NORTHWESTERN MADAGASCAR): CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 05C.
W72-14182

THE MAIN PHYSICO-CHEMICAL CHARACTERISTICS OF SOILS OF THE VERTISAL AND SODIUM-CONTAINING TYPE IN THE ROCHEFORT MARSH AT ST-LAURENT-DE-LA-PREE (MARITIME CHARENTE, FRANCE),
Institut National de la Recherche Agronomique, Clermont-Ferrand (France). Station d'Agronomie.
For primary bibliographic entry see Field 02G.
W72-14190

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

AN EXAMPLE OF ECONOMIC PLATING WASTE TREATMENT BY REVERSE OSMOSIS,
Ontario Research Foundation, Sheridan Park. Dept. of Physical Chemistry.
For primary bibliographic entry see Field 05D.
W72-13687

REVERSE OSMOSIS SYSTEM,
Secretary of Agriculture, Washington, D.C.
E. Lowe, and E. L. Durkee.
U. S. Patent No 3552,574, 4 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 176, January 5, 1971.

Descriptors: *Patents, *Reverse osmosis, *Desalination, *Water softening, *Demineralization, *Membranes, Equipment, Separation techniques.

A diffusion cell contains a flat membrane and a shallow cavity. It provides for a pump for feeding liquid under super atmospheric pressure through the inlet and into the cavity where the liquid is moved against the membrane. The liquid which passes through the membrane is withdrawn separately from the substances which remain behind the membrane. (Sinha-OEIS)
W72-13879

VACUUM DISTILLATION PROCESS AND APPARATUS WITH DIRECT AIR CONTACT CONDENSING FOR DESALINATION OF WATER,
Aerovac Corp., Philadelphia, Pa. (Assignee)
J. J. Creskoff.
U. S. Patent No 3,553,084, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 293, January 5, 1971.

Descriptors: *Patents, *Desalination, *Distillation, *Condensation, *Aeration, Water supply, Vaporization, Potable water.

Heated water is converted into vapor and in a condensation chamber having a partial vacuum the vapor is converted into potable water. When the condensation chamber reaches a predetermined temperature, the vapor is condensed and aerated at the same time. (Sinha-OEIS)
W72-13882

ION EXCHANGE APPARATUS FOR TREATING LIQUIDS,
Maschinenfabrik Augsburg-Nuernberg A.G., Essen (West Germany).
G. Kunz.
U. S. Patent No 3,554,376, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 654, January 12, 1971.

Descriptors: *Patents, *Ion exchange, *Water softening, *Desalination, Sea water, Potable water, Water treatment, Separation techniques, Equipment, Demineralization.

An active column and combined regenerating and washing are interconnected by pipe systems which include counterpressure chambers. This allows spent ion exchange material to be recycled from the active column through the other columns and back to the active column with a balanced rate of flow. (Sinha-OEIS)
W72-13885

DESALINATION APPARATUS AND PROCESS OF MANUFACTURE USING IMPROVED, ACID GRAFTED NITROGENOUS MEMBRANES,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. (Assignee).
D. G. Pye.
U. S. Patent No 3,554,379, 7 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 654, January 12, 1971.

Descriptors: *Patents, *Desalination, *Membranes, Permselective membranes, Reverse osmosis, *Polymers, Water supply, Separation techniques.
Identifiers: *Nitrogenous membranes.

This is a process concerned with the improvement of acid grafted, linear nitrogenous polymeric membranes for use in reverse osmosis separation techniques. The membranes are treated so as to convert acid groups into less hydrophilic groups thereby to reduce the swelling tendency of the membranes. (Sinha-OEIS)

W72-13886

PROCESS FOR TREATING WATER WITH A POLYHALIDE RESIN USING A SEMIPERMEABLE MEMBRANE BARRIER,
Dow Chemical Co., Midland, Mich. (Assignee).
For primary bibliographic entry see Field 05F.
W72-13887

PROCESS AND APPARATUS FOR OBTAINING FRESH WATER FROM SALINE WATER,
Linde A.G., Hollriegelskreuth (West Germany) (assignee).
R. Becker.
U. S. Patent No 3,557,863, 6 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1469, January 26, 1971.

Descriptors: *Patents, *Desalination, Potable water, Seawater, Saline water, Freshwater, *Evaporation, *Condensation.

Saline water is introduced through a nozzle into a hot, high-pressure gaseous stream. The mixture is then led into an evaporation chamber where the vapor-gas mixture is withdrawn from the upper section and engine-expanded in one or more stages and finally fresh water is condensed out by cooling. Energy is produced as a byproduct by the expansion of the gas-vapor mixture without the use of heated metallic heat-exchange surfaces. (Sinha-OEIS)
W72-13892

DISTILLATION APPARATUS FOR DESALINISATION OF SALINE WATER TO RECOVER FRESH WATER AS CONDENSATE,
Auscoteng Ltd., Adelaide (Australia) (assignee).
N. L. Foley, and A. H. Cheney.
U. S. Patent No 3,558,436, 4 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1597-1598, January 26, 1971.

Descriptors: *Patents, *Desalination, Potable water, *Distillation, Separation techniques, Equipment, *Evaporation, *Condensation.

Evaporation takes place in an evaporator operating at ambient temperatures. The resulting vapor is condensed to form distilled water. Evaporation is effected in an atmosphere of reduced pressure sufficient to boil the water at or near ambient temperature. Pressure reduction can be achieved by pumps. Condensation takes place in the active zone and the condensate enters a falling conduit so that there is a constant flow. Air which is entrained in the water is drawn off from the active zone. (Sinha-OEIS)
W72-13897

WATER DESALTING PROCESS AND APPARATUS,
J. H. Anderson.
U. S. Patent No 3,558,439, 6 p, 14 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1598, January 26, 1971.

Descriptors: *Patents, *Desalination, Sea water, Freshwater, *Deaeration, *Evaporation, *Condensation, Distillation, Equipment, Treatment, Heat exchange.

Fresh water is obtained by deaerating and evaporating a stream of warm sea water and condensing the vapor. Deaeration is effected by exhausting the space above the warm water stream to the atmosphere by means of an air compressor. The water is thus subjected to a reduced pressure at which dissolved air comes out of solution. Evaporation occurs by subjecting the warm water to a vacuum, the latent heat of vaporization is supplied by the warm water itself. The low pressure water vapor is condensed by passing it in heat exchange relationship with a stream of relatively cold seawater. (Sinha-OEIS)

W72-13898

REVIEW OF CALIFORNIA'S REGIONAL WATER SUPPLY SYSTEMS AND POSSIBLE APPLICATIONS OF DESALTING,
Oak Ridge National Lab., Tenn. Nuclear Desalination Information Center.
For primary bibliographic entry see Field 03B.
W72-13917

PROPOSED HYBRID PROTOTYPE DESALTING PLANT FOR BROWNSVILLE, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Office of Saline Water, Washington, D.C.

Available from the National Technical Information Service as PB-206 256-D, $3.00 in paper copy. January 28, 1972. 34 p, 3 fig, 6 tab, 1 map.

Descriptors: *Texas, *Desalination processes, *Environmental effects, *Water supply, State governments, Legislation, Federal government, Local governments, Desalination plants, Water resources development, Sea water, Turbines, Natural gas, Research and development, Thermal water, Thermal pollution, Saline water, Salinity, Salt tolerance, *Rio Grande River.
Identifiers: *Environmental impact statement, *Brownsville (Tex).

The proposed project involves the design, construction, operation, and maintenance of an 8 million gallons per day prototype sea water desalination plant in cooperation with the Rio Grande Valley Municipal Water Authority and the city of Brownsville, Texas. Sea water will be withdrawn from the Brownsville Ship channel for use in the distillation plant and saline effluent water will be discharged into San Martin Lake. Unavoidable adverse environmental effects include gas emissions from boilers and turbines, noise from the operating plant, elevation of water temperature, concentrating of solids in the waste water, slightly increased water salinity from effluents, and the presence of copper and nickel and possibly other heavy metals in the waste stream. The consumption of 1.133 x 10 to the 9th power cu ft/year of natural gas is an irreversible commitment. The proposed project will establish the feasibility of a single purpose distillation plant for producing low cost fresh water from sea water. As such, there is no alternative. Comments on the proposed action were solicited from appropriate local and regional agencies. (Waldron-Florida)
W72-13958

V.T.E. DESALTING PLANT, ST. CROIX, U.S. VIRGIN ISLANDS ANALYSIS OF OPERATIONAL DATA,
Desalting Systems and Services, Inc., Fort Lauderdale, Fla.
R. E. Bailie, and O. J. Morin.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, price $1.00. Office of Saline Water Research and Development Progress Report No. 778, July 1972, 107 p, 17 fig, 4 append. OSW Contract 14-30-2743.

Descriptors: *Desalination, *Distillation, *Evaporator, *Operating experience, *Operating costs, *Virgin Islands, Pilot plants, Pre-treatment (Water).
Identifiers: *Vertical tube evaporators, *St. Croix (VI).

The operating history of the 1.0 mgd VTE evaporator, on St. Croix, U.S. Virgin Islands is reviewed. Ability of the plant to operate and meet design requirements is discussed. Analysis of maintenance and operating problems is presented. Discussions on improvements to materials, maintenance and operating procedures, instrumentation and water pretreatment is included. (OSW abstract)

W72-14058

POTENTIALS FOR DESALTING WATER IN THE TULAROSA BASIN, NEW MEXICO - A CASE STUDY,
New Mexico State Univ., University Park. Water Resources Research Inst.
H. R. Stucky, and W. C. Arnwine.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No. 776, August 1971, 46 p, 27 fig, 14 tab, 23 ref, 2 append. OSW Contract 14-01-001-1838.

Descriptors: *Cost analysis, Water utilization, Economic feasibility, *Desalination processes, Saline water, *New Mexico, *Potential water supply.
Identifiers: *Tularosa Basin (NM), *Saline groundwater.

Fresh surface and ground water supplies are limited in New Mexico and are now almost wholly allocated to specific uses. However, the State of New Mexico has large quantities of saline water, which until recently had not been considered a potentially usable resource. This study considered the potentials of desalting in the Tularosa Basin in South Central New Mexico where large bodies of saline water underlie the basin. Potential water supply was made, including cost of electrodialysis, reverse osmosis and vacuum freezing desalting processes. The study recommends desalting as a first possibility for supplementing the fresh water supply for the city of Alamogordo, Holloman Air Force Base, and White Sands National Monument. (OSW abstract)
W72-14059

AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 01B.
W72-14060

A TURBULENT FLOW THEORY OF ELECTRODIALYSIS,
Massachusetts Inst. of Tech., Cambridge, Mass.
R. F. Probstein, Ain A. Sonin, and Eitan Gur-Arie.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.50. Office of Saline Water Research and Development Progress Report No. 771, April 1972. 41 p, 3 fig, 18 ref. Grant No. 14-30-2749.

Descriptors: *Electrodialysis, *Desalination, *Desalination apparatus, *Laminar flow, *Turbulent flow.
Identifiers: *Parallel channel, *Transport equations, *Schmidt numbers, *Limiting current density.

A hydrodynamic theory is presented of desalination by electrodialysis in a parallel channel system with unobstructed fully developed turbulent flow. A set of turbulent transport equations is derived for the mean salt concentration and electric field. Estimates show both assumptions to lead to sensibly the same final results. From the equations and boundary conditions it is shown that there are five parameters which govern the system performance. Four are the same as for the corresponding laminar case, while the fifth measures the thickness of the concentration diffusion sublayer, the value of which is taken to be given by semi-empirical turbulent mass transfer results for high Schmidt numbers. The thickness of this diffusion layer is found to be the critical factor governing the salt removal rate. Comparison of the theory is made with the experimental results of Cowan and Brown on average limiting current density and the agreement is found to be satisfactory. (OSW abstract)
W72-14061

PROPERTIES OF SEAWATER AND ITS CONCENTRATES AND RELATED SOLUTIONS AT TEMPERATURES UP TO 400 DEGREES F,
California Univ., Berkeley.
For primary bibliographic entry see Field 01B.
W72-14062

EXPLORATORY STUDY OF BRINE DISPOSAL USING FLUID-BED EVAPORATION,
Allied Chemical Corp., Idaho Falls, Idaho.
For primary bibliographic entry see Field 05E.
W72-14063

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14064

DIRECT CONTACT DESULFATION LABORATORY AND PILOT PLANT DEVELOPMENT STUDY FOR SOFTENING OF SEA WATER,
G. P. Gelblum.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Report No. 735, October 1971. 104 p, 14 fig, 14 tab, 25 ref, 3 append. OSW Contract 14-30-2724.

Descriptors: *Sea water, *Water softening, By-products, *Carbon dioxide, Pilot plants, *Desalination, Scaling.
Identifiers: *Desulfation, *Direct contact desulfation, Acids, *Barium bicarbonate, Decalcification, Hard scale, Alkaline scale.

This report presents a novel and potentially attractive method to soften sea water by use of barium carbonate as the raw chemical in a closed cycle. The direct contact desulfation (DCD) process eliminates the need for ion exchange resins, previously used, with soluble barium salts and, therefore, offers a more direct and simple process that has the added advantage of possible removal of both calcium and sulfate ions instead of only the latter. Therefore, any degree of total softening is possible from complete removal of calcium and sulfate to lesser percentages of one or both ions. This DCD process also has the potential advantage over other sea water softening processes of cost reduction through sale of by-products, such as elemental sulfur or sulfuric acid, and caustic soda that are produced during the barium regeneration cycle. This aspect was not actually investigated under this contract, since well understood chemical engineering methods are involved. The report is a synopsis of the process and summary of the laboratory and pilot plant development work during a 4 months period. An economic study is not included. (OSW abstract)
W72-14065

OPTIMIZATION OF DISSOLVED OXYGEN MEASUREMENTS,
Envirogenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05A.
W72-14066

A NEUTRON SCATTERING STUDY OF THE KINETICS OF DIFFUSION AND THE RELATION TO THE STRUCTURES OF IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
For primary bibliographic entry see Field 01B.
W72-14067

PERFORMANCE CHARACTERISTICS OF ADVANCED EVAPORATOR TUBES FOR LONG-TUBE VERTICAL EVAPORATORS (AN ADDENDUM),
Oak Ridge National Lab. Nuclear Desalination Information Center.
L. G. Alexander, and H. W. Hoffman.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.75. Office of Saline Water Research and Development Progress Report No. 699, March 1971, 359 p. Contract 14-30-2535.

Descriptors: Boiling, *Dropwise condensation, *Condensation, *Evaporation, Wetting, Flow, Heat transfer, *Distillation processes, Evaporators, Experimental data, Foaming, Porous media.
Identifiers: Tubing (Metal), Doubly fluted tubes, Corrugated tubes, Porous-surfaced tubes, Foam evaporation.

This companion volume to OSW R and D No. 644, Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators, (See W71-11871), collects the data obtained in studies on the performance of evaporator tubes of several surface configurations. For each tube, the physical description and experiment summary is followed by an extended listing of the data and a graphical display of the results. (OSW abstract)
W72-14068

REVERSE OSMOSIS MEMBRANE MODULE (SPIRAL-WOUND CONCEPT),
Gulf Energy and Environmental Systems, Inc., San Diego, Calif.
S. S. Kremen, and A. B. Reidinger.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No. 676, April 1971. 83 p, 28 fig, 24 tab, 4 ref. OSW Contract 14-01-0001-1745.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, Membranes.
Identifiers: Module performance, Membrane materials.

Development work is reported on membrane supports and product channel components used in spiral-wound membrane modules for reverse osmosis. Various test modules 3 feet wide with membrane areas of 28 sq feet and 50 sq feet were fabricated and tested. One purpose was to develop synthetic fabrics for membrane supports as an alternate for the earlier use of glass heads. Successful module performance was obtained with the use of layers of fabric to provide combined membrane support and product flow channels. Preferred materials were dacron and nylon fabrics which were impregnated as required. (OSW abstract)
W72-14069

FREEZING PROCESS STUDIES,
Syracuse Univ. Research Inst., N.Y.
Jean-Eric Bajolle, Ashok Naimpally, Henry L. Mason, John Missirlis, and Philip A. Rice.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.50. Office of Saline Water Research and Development Progress Report No 658, June 1971. 43 p, 11 fig, 10 tab, 34 ref. Grant 14-30-2578.

Descriptors: *Desalination, *Freezing, Porous media, *Permeability, Mass transfer, Particle size.
Identifiers: *Butane, *Vacuum stripping, Isotropic porous media.

Two projects were completed: Vacuum Stripping of Butane in a Packed Column; and Particle Size Distribution Effects in Isotropic Porous Media. In the first of these, overall mass transfer coefficients for the vacuum stripping of butane in a column packed with 4 mm Berl Saddlers were measured at different flow rates and column pressures. The butane stripping process for pressures above the vapor pressure of water was found to be liquid phase controlled and the coefficients were found to be consistent with those predicted by existing correlations for liquid mass transfer coefficients in other systems. This confirmation of existing correlations should permit the design of vacuum stripping packed towers based on existing mass transfer data. In the second completed work, the size distribution of the particles making up the packed bed seemed to have no effect on the permeability beyond the plus or minus 10% expected experimental error if the Sauter mean diameter was used as the mean diameter in the Carman-Kozeny equation. Permeabilities were measured for binary mixtures of beads with size ratios of up to 8:1 and for binary mixtures of beads with a size ratio of 4:1 in various proportions. In addition, two new projects were started: a study of the vacuum spray flash chamber for removing dissolved butane, and the initiation of a study of direct contact vaporization heat transfer.
W72-14070

WATER TRANSPORT IN HYPERFILTRATION MEMBRANES,
Weizmann Inst. of Science, Rehovoth (Israel). Polymer Dept.
D. Vofsi, and O. Kedem.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $1.25. Office of Saline Water Research and Development Progress Report No 653, May 1971. 117 p. Contract 14-01-0001-961.

Descriptors: *Membranes, *Membrane processes, *Ion transport, *Separation techniques, Saline water, Osmosis, Reverse osmosis, *Desalination, Permselective membranes, Semipermeable membranes.
Identifiers: *Hyperfiltration, *Coupling phenomena, Polyelectrolytes, Polypeptide membranes, Water transport.

Three areas were investigated: (1) preparation of charged membranes; (2) hyperfiltration through porous charged membranes; and (3) the state and transport of water in some phosphate esters. In the first area, a number of films based on polyvinyl alcohol, crosslinked and modified to contain charged groups, crosslinked polyvinylamine, and modified cellulosics, containing charged groups, were studied. From these studies, it appears that effective polyelectrolyte films can be prepared on finely porous supports. In the second area, the rejections of mixed electrolyte solutions by charged membranes were calculated from a modified Teorell-Meyer-Sievers model taking into account the effect of Donnan equilibria and streaming potentials. As a practical example, the rejections in a mixture of copper chloride and hydrochloric acid filtered through a positive membrane were derived and found to be in reasonable agreement with the experimental results. In the third area, the structure of free water and bound water in a series of liquid organic phosphates, for use in ion-selective membranes, were investigated. The chemical shifts arising from NMR-proton spectroscopy in tributylphosphate (TBP)-H2O solutions, as a function of the mole fraction of the dissolved water, could be divided into three concentration ranges. Each of these ranges were interpreted in terms of specific phosphate-water species present. (OSW abstract)
W72-14072

INFLUENCE OF STRONGLY BOUND COUNTER-IONS ON PERMSELECTIVE MEMBRANES,
Negev Inst. for Arid Zone Research, Beersheva (Israel).
F. deKorosy, E. Zergerson, and M. Zevulum.
Available from the National Technical Information Service as PB-207 035, $6.00 in paper copy,

$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 380, Dec. 1968, 61 p, 15 fig, 8 tab. Grant No 14-01-0001-766.

Descriptors: *Electrodialysis, *Ion exchange, *Membranes, *Permselective membranes, Separation techniques, *Desalination processes, Ion transport, Electrochemistry, Diffusion, Ions.
Identifiers: *Counter-Ions, *Membrane poisoning, *Membrane fouling, Co-Ions, Membrane electrical resistance.

Membranes were found to show two extremes of behaviour. One group of membranes, with sites more uniformly dispersed in the matrix, changed resistance less during poisoning but the sign of their permselectivity changed more easily. The other extreme group, membranes in which the active groups are closely crowded near each other in the spaces between the material of the matrix, increase their resistance by several orders of magnitude, but need poisoning ions of higher valency and size to change the sign of their permselectivity. Various membranes were examined with various counter-ions. Size and valency of the counter-ions varied. The counter-ions were introduced into the membranes mostly by diffusion or by direct current at room temperature but a few experiments were tried with the aid of alternating current or at elevated temperature. Some membranes - those to which we later assigned a closed, crowded structure, - often equilibrated very slowly by diffusion, sometimes so slowly that real equilibrium was not attained within three months. The slowness manifested itself in attaining a final resistance value and was due to very slow adjustment of swelling or deswelling and not to the adjustment of internal composition. (OSW abstract)
W72-14073

OPERATION OF REVERSE OSMOSIS PILOT PLANTS,
Aerojet-General Corp., El Monte, Calif.
C. G. DeHaven, M. A. Jarvis, and C. R. Wunderlich.
Available from the National Technical Information Service as PB-207 663, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 356, August 1968. 184 p, 6 append. Contract 14-01-0001-1268.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, Sea water, *Pilot plants, Potable water, California.
Identifiers: *Cellulose acetate membranes, Flux decline, *Newport Beach, (Calif).

The purpose of the program was the scale-up of reverse osmosis from a laboratory process to an economical system for the production of potable water in large amounts. Three series of tests were conducted in two 18 inch cells at the Newport Beach, California seawater site. 'T-series' membranes (cellulose acetate membranes based on acetone as the polymer solvent) were utilized during the first tests. The highest 21-day flux (7.6 gfd) was obtained at 1500 psi operating pressure. The flux decline over the entire 90-day operating period of the 1500 psi test averaged about 1/20 gfd per day. During the second series of sea water tests, a new type of membrane usually referred to as the 'U-series' was tested. Formed from a blend of cellulose diacetate and triacetate and cast from a mixed solvent of acetone and dioxane, the U-series membranes were superior to the T-series both with respect to salt rejection and to resistance to compression. In the 18 inch cell these membranes produced potable water from seawater feed for 6 weeks at an average of 7.5 gfd. The third series of sea water tests was conducted to examine the feasibility of two-stage sea-water desalination. The longest continuous two-stage seawater desalination operation lasted for a period of 51 days. The product salt concentration during this period ranged from 230 ppm (on the 6th day) to 660 ppm (51st day). After 43 days of operation with an average flux of 7.1 gfd, the product was no longer in the potable water range (<500 ppm). (OSW abstract)
W72-14074

STUDY OF MEMBRANE-SOLUTION INTERFACES BY ELECTRO-CHEMICAL METHODS,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler.
Available from the National Technical Information Service as PB-207 369, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 353, August 1968. 112 p, 36 tab, 62 ref. Grant No 14-01-0001-652.

Descriptors: *Electrodialysis, *Membranes, *Electrochemistry, *Desalination, *Interfaces, Reverse osmosis, Pressure, Electrodes, Mass transfer.
Identifiers: *Membrane-solution IINTERFACES, *Current-voltage curves, *Polarization, Limiting current plateaus, Laser interferometry, Microelectrodes.

This is the first stage of a fundamental experimental study of mass-transfer at membrane-solution interfaces; the practical purpose of this investigation is the characterization of efficient spacers and turbulence promoters. Polarization at anion-exchange membranes in a laboratory cell by a 4-electrode method, limiting current plateaus were not observed. Addition of polystyrene sulfonate brought the current-voltage curves much closer to the shape of the polarographic plateaus predicted by solution of the Nernst-Planck equations. Current-voltage curves suggested that membrane heterogeneity may play an important part in polarization. Heterogeneities show up as dispersions of dielectric constant and frequency in the radio-frequency range. Laser interferometry and a method for the interferometric observation of the membrane-solution interfaces at low Reynolds numbers was developed. The results formed the basis for the design of a pilot-size unit for detailed mapping of polarization on a single plant-size (1.5 X 1.5 foot) membrane. Studies of modified cellulose acetate membranes for reverse osmosis were initiated by studying potential differences across a tubular reverse osmosis membrane as a function of pressure and circulation rate. The electrode at the low-pressure side of the membrane was always found to be positive with respect to the high-pressure electrode; after correction for the concentration difference the streaming potentials were found to be 8-10 millivolt per 100 psi when dilute sodium chloride solutions were used as feed. The potential differences increase with increasing circulation rate. Flow rate is proportional to pressure. Microelectrodes for membrane surface mapping were prepared and tested, viz. hybrid platinized platinum-silver/silver chloride electrodes and micro pH electrodes made of antimony. Theoretical work on reverse osmosis (jointly with O. Kedem) resulted in prediction of salt rejection as a function of production rate by extension of the Staverman-Katchalsky-Kedem equations, and in a mechanistic interpretation of the 'reflection factor' which expresses the degree of semipermeability of a membrane for reverse osmosis. (OSW abstract)
W72-14075

STUDY OF POLY (METHACRYLATES) AND POLY (URETHANES) AS REVERSE OSMOSIS MEMBRANES. EFFECT OF WATER CLUSTERING ON TRANSPORT PROPERTIES,
Massachusetts Inst. of Tech., Cambridge.
W. Vieth, A. S. Douglas, and R. Bloch.
Available from the National Technical Information Service as PB-207 662, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 352, August 1968. 62 p, 17 fig, 12 tab, 23 ref. Contract 14-01-0001-624.

Descriptors: *Reverse osmosis, *Membranes, *Permeability, Semipermeable membranes, Water of hydration, Ion transport, Osmosis, Permselective membranes, Desalination.
Identifiers: *Water transport properties, *Water clustering, *Water flux, Salt rejection, Polymethacrylate membranes, Polyurethane membranes, Asymmetric membranes.

The synthesis and transport properties of non-crosslinked copolymers from hydroxyethyl methacrylate (HEMA) and ethyl methacrylate (EMA) and membranes from poly (urethanes) were investigated. The studies of HEMA/EMA copolymers have shown that it is possible to control the permeability of the film by varying the HEMA/EMA ratio. Water and salt flux were calculated from the results of osmosis experiments. The mobility of water varies by several orders of magnitude between a high-flux cellulose acetate membrane and a low-flux HEMA/EMA membrane. The more hydrophilic polymers have the higher water transport as well as the higher salt flux. Studies of the mechanism of formation of the dense skin on cellulose acetate in the Loeb procedure and its trial application with HEMA/EMA membranes resulted in a new hypothesis governing the choice of solvent for binary casting solutions to make assymetric membranes. It is hypothesized that the dense layer is only obtained if the polymer is dissolved in an exceedingly good solvent. Otherwise, use of a poorer solvent will lead to a solution where the polymer solubility limit is rapidly exceeded; i. e., coagulation starts before formation of the skin, resulting in a porous surface layer. The study of poly (urethanes) led to the development of moderate flux, moderate rejection membranes. The data obtained show that the water flux at constant applied pressure increases rapidly with decreasing brine concentration. In an effort to confirm these hypotheses concerning membrane structure, attempts have been made to characterize the membrane in ways other than those employing reverse osmosis testing. The most fruitful methods have been the establishment of water vapor sorption isotherms and water vapor sorption transients. Analyses of the data resulting from transient sorption studies have been important because they have demonstrated that reverse osmosis transport properties can be described quite satisfactorily by consideration of purely diffusive flows, without recourse to postulation of accompanying pore-flow modes of transport. Using the Zimm-Lundberg clustering function, it is possible to calculate the average size of water clusters within the membranes from the sorption isotherms, using a 95% relative humidity reference level for purposes of comparison. The cluster sizes for poly (urethanes) are quite high, reaching values of 5 to 6, indicating strong interaction between water and polymer. (OSW abstract)
W72-14076

DISPOSAL OF BRINE BY SOLAR EVAPORATION,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 02D.
W72-14077

DRYING CELLULOSE ACETATE REVERSE OSMOSIS MEMBRANES,
Gulf General Atomic Co., San Diego, Calif.
K. D. Vos, and F. O. Burris, Jr.
Available from the National Technical Information Service as PB-207 661, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 348, November 1967. 20 p, 8 tab, 1 fig, 14 ref. Contract 14-01-0001-767.

Descriptors: *Membranes, *Reverse osmosis, *Membrane processes, Pressure, *Desalination.
Identifiers: Dry reverse osmosis membranes, *Cellulose acetate membranes, *Surface active agents, *Plasticizers.

Cellulose acetate reverse osmosis membranes, after being soaked in a surface active agent, have been dried at either ambient or elevated temperatures (110C). Upon being rewet, the membranes did not show any loss in desalination or physical properties as compared with the undried control membrane. All types of surface active agents (nonionic, anionic, cationic, and amphoteric) will function well. Because the dry membranes are somewhat brittle, glycerin and ethylene glycol have been used as plasticizers for the dry membrane. (OSW abstract)
W72-14078

BIOLOGICAL DEGRADATION OF CELLULOSE ACETATE REVERSE OSMOSIS MEMBRANES,
Aerojet-General Corp., El Monte, Calif.
P. A. Cantor, B. J. Mechalas, O. S. Schaeffler, and P. H. Allen, III.
Available from the National Technical Information Service as PB-207 948, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 340, June 1968. 45 p, 16 fig, 4 tab, 10 ref. Contract 14-01-0001-1307.

Descriptors: *Membranes, *Reverse osmosis, *Biodegradation, Saline water, Microorganisms, Semipermeable membranes, Degradation (Decomposition), Desalination analytical techniques.
Identifiers: *Cellulose acetate, *Membrane sterilization, Biological stability, Water flux, Salt rejection.

An investigation was carried out with the objective of relating losses in semipermeability of cellulose acetate reverse osmosis membranes to microbiological degradation. Three sources of potentially destructive organisms were cultured and enriched using cellulose acetate and the sole source of carbon. One source of microorganisms was a set of failed cellulose acetate membranes taken from low pressure reverse osmosis units operated on industrial tap water. The other two sources were independent of reverse osmosis, being a surface soil sample and a lake bottom mud. Freshly prepared, sterilized membranes were exposed to 26 microbial isolates. Reverse osmosis testing of the membranes shaken in broth revealed significant losses in salt rejection of certain samples after 2 months, while visual observation of plated membranes showed complete degradation of certain of the samples from each of the three sources of microorganisms. Examination of membranes stored in a suspected source of degradative microorganisms by the MIR-infrared technique showed losses of up to 50% of the acetyl content in two months. Reverse osmosis testing of the membranes revealed no salt rejecting capability remaining. Cellulose triacetate membranes have been shown to be resistant to biological attack under conditions identical to those causing degradation of diacetate membranes having a degree of substitution of 2.3 to 2.5. (OSW abstract)
W72-14079

CONTROL OF CONCENTRATION POLARIZATION IN REVERSE OSMOSIS DESALINATION OF WATER,
Amicon Corp., Lexington, Mass.
H. Strathmann.
Available from the National Technical Information Service as PB-207 368, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 336, April 1968. 97 p, 10 tab, 27 fig, 14 ref. Contract 14-01-0001-964.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, *Concentration polarization, *Laminar flow, *Turbulent flow.
Identifiers: *Thin channel flow cell, *Polyelectrolyte membrane, *Fotonic sensor, *Sodium chloride solutions.

The objective was to test experimentally predictions on concentration polarization provided by a theoretical analysis of P.L.T. Brian for laminar flow in thin channel systems. Concentration polarization data for sodium chloride solutions of various concentrations and cellulose acetate membranes were determined in a thin channel laminar flow cell at channel heights varying from 5 to 50 mils and with product water recovery rates from less than 1% to 80%. To simulate desalination with the high flux, highly retentive membranes which are likely to be developed in the near future, concentration polarization has been studied at a polyelectrolyte resin membrane with a water flux up to 80 gsfd at 100 psig effective pressure and tetrabutylammonium chloride solutions of various concentrations. For these investigations, a thin channel cell was constructed with a channel height variable between 2 and 20 mils. The channel height was controlled by a fotonic sensor system with an accuracy of plus or minus 5%. The experimental results obtained in different systems with product water fluxes between 1 and 80 gsfd and recovery rates of less than 1% to 80% have been critically compared with theoretically computed data. Good agreement between experimental and theoretical data has been established in nearly all cases and the advantages of a thin channel reverse osmosis desalination device, as predicted by P.L.T. Brian, have been demonstrated. (OSW abstract)
W72-14080

APPLICATION OF INORGANIC ION EXCHANGE MEMBRANES TO ELECTRODIALYSIS,
IIT Research Inst. Chicago, Ill.
K. S. Rajan.
Available from the National Technical Information Service as PB-207 660, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 328, April 1968. 100 p, 14 tab, 52 fig. Contract 14-01-0001-1099.

Descriptors: *Electrodialysis, *Ion exchange, *Membranes, *Desalination, Inorganic compounds, Demineralization, Electrochemistry, Anion exchange, Cation exchange.
Identifiers: Inorganic membrane electrodialysis, *Hydraulic flow rate, *Liquid flow pattern, Polarization, Zirconium phosphate, Thorium hydrous oxide.

Effects of some important parameters on the performance characteristics of inorganic membrane electrodialysis units were investigated. The variables included: (1) hydraulic liquid flow rate, (2) ratios of throughput rates of concentrating and diluting streams, and (3) liquid flow pattern. Zirconium acid phosphate and thorium hydrous oxide membranes were used as the cation- and anion-exchange membranes, respectively, in the multicompartment cells. The stabilities and performance characteristics of IITRI inorganic and a typical commercial organic membrane stacks were investigated in separate long-term (220 hr) electrodialysis experiments by employing current reversal technique. Both the units maintained steady performance at the preset values of 30 to 35% salt removal and 90 to 95% current efficiency. The effects of the presence of dodecylbenzene sulfonate and iron on the electrodialysis of chloride brines were investigated. Although the overall ohmic resistance of the inorganic membrane unit was somewhat larger than that of typical organic membrane units, the former showed steadier performance at the preset conditions of salt removal and hydraulic liquid flow. Basic properties such as ion-exchange capacity, moisture content, tensile and burst strengths, electrical resistance, transference numbers, salt leak coefficients and bi-ionic potentials were evaluated for the zirconium phosphate and the thorium hydrous oxide membranes. (OSW abstract)
W72-14081

HYDRAULIC DESIGN OPTIMIZATION OF THE ELECTRODIALYSIS PROCESS,
Process Research, Inc., Cambridge, Mass.
J. D. Smith.
Available from the National Technical Information Service as PB-207 659, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 325, (1968). 136 p, 42 fig, 14 tab, 33 ref. Contract 14-01-0001-963.

Descriptors: *Desalination, *Electrodialysis, *Design, *Operating costs.
Identifiers: *Electrodialysis spacers, Limiting current density, Membrane resistance.

The objectives were to expand the conventional electrodialysis design expressions and use the improved expressions to determine the research and development areas having the greatest potential for process improvement. After the development of a mathematical expression which encompassed the various important parameters, an experimental program was developed to permit the formulation of the hydraulic performances of electrodialysis spacers and to develop functional relationships between the limiting current density and the geometry of electrodialysis spacers. Finally, the analytical phase of the work was concerned with the effects on the optimal electrodialysis design and minimum cost of changes in the various operational, technological and economic parameters. The following conclusions were drawn: (1) Electrodialysis spacers, under almost any circumstances, should be thinner than those presently used (approx. 0.1 cm). (2) Within the present economic structure of the electrodialysis process, improved spacer design would result in the greatest immediate cost reduction. (3) After the improvement of spacer design, reduction in the unit costs of membranes, or in costs proportional to membrane area, would offer the most significant cost reduction. (4) The third significant cost reduction possibility would be reduced D. C. energy costs. (5) A reduction in membrane resistance would result in a corresponding reduction in the minimum cost. (OSW abstract)
W72-14082

TRANSPORT PROCESSES IN HYPERFILTRATION MEMBRANES I,
Weizmann Inst. of Science, Rehovoth (Israel). Polymer Dept.
D. Vofsi, and O. Kedem.
Available from the National Technical Information Service as PB-207 947, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 324, May 1968. 41 p, 17 fig, 6 tab, 6 ref. Contract 14-01-0001-961.

Descriptors: *Membranes, *Ion transport, *Reverse osmosis, Porosity, *Desalination.
Identifiers: *Hyperfiltration, *Charged membranes, *Polyelectrolytes, *Negative salt rejection, Cellulose acetate membranes, Model membranes, Reflection coefficient, Counter-Ion, Co-Ion, Mosaic membranes.

Research on hyperfiltration is reported in three separate parts. Part I is concerned with theoretical studies of hyperfiltration in charged membranes and negative salt rejection in mosaic membranes. Salt rejection, R, in charged membranes was evaluated according to the fixed charge model as described by Teorell-Meyer-Sievers. The limiting salt rejection at high flow rates, R, is given by the reflection coefficient corresponding to the salt

concentration in the feed solution: R = o'. Concentration profiles at high flow rates confirm this conclusion. The reflection coefficient, o', is completely determined by the ratio between membrane charge and feed concentration, the valencies of the ions and the transport number of the counter-ion in free solution. R was calculated for a wide region of relative charge densities, and several transport numbers corresponding to some common electrolytes. High transport number of the co-ion decreases R. The divalent counter-ions salt rejection is lower, as a consequence of the different ion distribution. Negative values for R are obtained in a considerable part of the region. High salt rejection is obtained for divalent co-ions. Part II involves preparation and testing of loose, charged membranes. The results of these experimental measurements show that it is possible to obtain synthetic polyelectrolyte membrane with rather high flux and considerable salt rejection. In Part III studies were made of the porosity of the skin and support in asymmetric cellulose acetate membranes. From the data obtained, calculations of the skin thickness gave a value of 1000 - 2000A. (OSW abstract)
W72-14083

RESEARCH ON ION TRANSPORT ACROSS MICROBIAL MEMBRANES,
TRW Systems Group, Redondo Beach, Calif.
N. L. Gale, and B. H. Goldner.
Available from the National Technical Information Service as PB-207 658, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 323, April 1968. 50 p, 13 tab, 9 fig, 16 ref. Contract 14-01-0001-636.

Descriptors: *Ion transport, *Membranes, *Biological membranes, Ion exchange, Ions, Microorganisms, Cation exchange, Bacteria, *Desalination.
Identifiers: *Cell membranes, *Active transport, *Microbial membranes, Cells, Light scattering, Sodium transport, Potassium transport.

Comparisons of growth characteristics, cation content, and rate of cation transport have been made under a variety of conditions with the two microorganisms, Serratia marcescens and S. marinoruba. The transport of cations was determined by observing the changes in the amount of light scattered by resting cell suspensions in which the ionic strength of the external solution was adjusted so as to be hypertonic to the interior of the cell. With the proper physical environment and in the presence of compounds capable of being transported into the cells, deplasmolysis and the resultant decrease in scattered light were observed. This approach was supplemented by the quantitative determination of selected intracellular cations by atomic absorption spectrometry in cells prior to and following the addition of hypertonic and hypotonic salt solutions. It was found that the choice of growth medium and the method of washing and preparing the resting cells played important roles in determining the amount of intracellular salts remaining within the cells, and consequently in the cells' behavior as observed by the light scattering technique. Both microorganisms tend to accumulate K+ during growth and to exclude Na+ against concentration gradients. The amount of K+ accumulated within the cells is increased, particularly in S. marinorubra, as the ionic strength is raised in the medium in which the organisms are grown. (OSW abstract)
W72-14084

CONTINUING DEVELOPMENT OF A GENERAL MECHANISTIC THEORY OF MEMBRANE PHENOMENA AND CONTINUING EXPERIMENTAL AND THEORETICAL STUDIES OF ION-EXCHANGE POLARIZATION PHENOMENA,
Polytechnic Inst. of Brooklyn, N.Y.
H. P. Gregor.
Available from the National Technical Information Service as PB-207 657, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 322, April 1968. 164 p, 44 tab, 30 fig, 41 ref. Contract 14-01-0001-757.

Descriptors: *Ion exchange, *Membranes, *Electrodialysis, Diffusion, *Desalination.
Identifiers: *Polarization, *Transport phenomena, *Ion exchange membranes, Selectivity coefficients, Transport number, Anion exchange membranes, Cation exchange membranes, Sandwich membranes.

This report is made up of five sections, each with its own table of contents and bibliography. These are: (I) Transport Processes in Ion-Exchange Membranes; (II) Polarization Phenomena in Ion-Exchange Membranes; (III) Acid and Base Production by Electrodialysis Across Bipolar Ion-Exchange Membranes - Utilization for Prevention of Pollution; (IV) Selectivity Coefficients of Aliphatic Polyethyleneimine-Epichlorohydrin Anion-Exchange Resins Toward Univalent Anions; and (V) Ion-Exchange Membranes - Correlation Between Structure and Function. (OSW abstract)
W72-14085

A STUDY OF THE DISPOSAL OF THE EFFLUENT FROM A LARGE DESALINATION PLANT,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 05B.
W72-14086

REVERSE OSMOSIS MEMBRANE MODULE (SPIRAL WOUND CONCEPT),
Gulf General Atomic Co., San Diego, Calif.
T. L. Larson, S. S. Kremen, L. Nusbaum, and A. B. Riedinger.
Available from the National Technical Information Service as PB-207 946, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 313, August 1968. 68 p, 18 fig, 16 tab, 2 ref. Contract 14-01-0001-1245.

Descriptors: *Desalination, *Reverse osmosis, Pre-treatment (Water), Storage.
Identifiers: *Spiral wound module, Cleaning, Sterilization.

The program covered the areas of module development, pre-treatment and module cleaning, sterilization and storage, and parametric studies. A melamine-reinforced Dacron tricot backing material was developed which appears to be superior toglass beads up to 1000 psi. An adhesive was developed which eliminates the problems of water sorption, high pH, etc. which were characteristic of the adhesive used previously. Early problems with weak reinforcing strips were overcome by using Kapton or polypropylene films attached to the product water side of the membrane at the fold with a water-impervious pressure-sensitive adhesive. The polypropylene film has been tested in modules for more than 2000 hours at pressures up to 1000 psi with satisfactory performance. Various means of minimizing fouling, involving iron, magnesium, carbonate, sulfate and organic materials were evaluated in addition to cleaning and flushing procedures. It was found that reduction of the pH to the range 5 to 6 markedly reduced iron oxidation and precipitation for the San Diego tap water tested. Cyanamer P35 appeared to be the best precipitation inhibitor tested for calcium sulfate. The sterilization of feed water with dosages as low as 10 mg/l of chlorine in the feed water resulted in product water with no coliform organisms and a zero plate count on incubation in standard media. Testing indicated that microbial growth was controlled by storage of modules in a 1000 ppm CuSO4 solution. (OSW abstract)
W72-14087

TRANSPORT PROPERTY REQUIREMENTS OF MEMBRANES FOR USE IN PRESSURE DIALYSIS DESALINATION,
Office of Saline Water, Washington, D.C.
H. E. Podall.
Available from the National Technical Information Service as PB-207 945, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 304, June 1968. 41 p, 7 fig, 7 tab, 8 ref.

Descriptors: *Membranes, *Dialysis, *Pressure, *Ion transport, *Demineralization, Ion transport, Permeability, *Desalination, Osmosis.
Identifiers: *Pressure dialysis, *Phenomenological coefficients, *Water recovery, Hydraulic permeability, Flux, Negative osmosis, Solute permeability.

The transport property requirements of membranes for use in the novel 'pressure dialysis' process are defined in terms of the phenomenological coefficients, Lp, w' and o derived by application of irreversible thermodynamics to this process. The phenomenological coefficients are, in turn, quantitatively related to various process and performance parameters and are enumerated for selected brackish or saline polluted concentrations where this process is considered best applicable. (OSW abstract)
W72-14088

3B. Water Yield Improvement

TECHNIQUES OF STATISTICAL EVALUATION OF RUNOFF RESULTS OF PRECIPITATION MODIFICATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13841

PROBLEMS IN THE HEAT AND WATER REGIME OF AGRICULTURAL LANDS (VOPROSY TEPLOVOGO I VODNOGO REZHIMA SEL'SKOKHOZYAYSTVENNYKH POLEY).
For primary bibliographic entry see Field 03F.
W72-13858

METHOD FOR PREVENTING WATER LOSS FROM RESERVOIRS AND CHANNELS,
Witco Chemical Corp., New York. (Assignee).
For primary bibliographic entry see Field 04A.
W72-13889

TEST OF RUNOFF INCREASE DUE TO PRECIPITATION MANAGEMENT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, and F. Saheli.
Completion Report, December 1971, 43 p. 11 tab, 20 ref.

Descriptors: *Statistical methods, *Testing, *Runoff, *Water harvesting, *Precipitation (Atmospheric), Water management (Applied), Hydrologic properties, Weight, Constraints, Stations, Control, Methodology, Colorado, Rainfall-runoff relationships, Water yield improvement.
Identifiers: *Colorado River Basin Pilot Project.

Classical problems exist in determining the effect of precipitation increment studies on runoff increase. A new test for detection of hydrologic change due to precipitation management is developed and compared to classical tests. The test is a target-control conditional Student's t-test applied to a new test variable. The variable is a linear combination of runoff variables with unknown weights. A proper choice of weights, compatible with hydrologic constraints, maximized the

power of the test. The power of the test is increased by a factor of two when applied to the Colorado River Basin Pilot Project as expressed in years needed for detection. Chance of detecting precipitation increase in runoff is better than one in two if precipitation increase is 10% on the average for this region over a 5-year period, or 17 in 20 at precipitation increase of 15%. The value of grouping runoff stations in the target and control areas is shown from a theoretical point of view. The new technique yields a power of classical tests from a practical point of view. (Popkin-Arizona)
W72-13912

REVIEW OF CALIFORNIA'S REGIONAL WATER SUPPLY SYSTEMS AND POSSIBLE APPLICATIONS OF DESALTING,
Oak Ridge National Lab., Tenn. Nuclear Desalination Information Center.
W. E. Thompson.
June 1972, 98 p. 56 fig, 16 tab, 30 ref. AEC Contract W-7405-eng-26.

Descriptors: *Water supply, *Desalination, *Application methods, *Water storage, *California, Water conveyance, Construction, Aqueducts, Colorado River Aqueduct, Reservoirs, Central Valley Project, Irrigation, Water rates, Costs, Water requirements, Water distribution (Applied), Sea water, Economics, Brines, Geothermal studies, Salinity, Colorado River.
Identifiers: All-American Canal, Sierra Nevada, California State Water Project, Imperial Valley, Gulf of California.

Development of water storage and conveyance facilities in California started with construction of major aqueducts in the early 1900's. Aqueduct systems currently supply half the water used. The Colorado River supplies 4 billion gallons per day (Bgd) by the All-American Canal and 1 Bgd through the Colorado River Aqueduct. Aqueducts from Sierra Nevada reservoirs supply 430,300 and 325 Mgd to various areas. The Bureau of Reclamation's Central Valley Project supplies 4,700 Mgd and will ultimately supply 9,500 Mgd for irrigation. Irrigation water rates range from 1 to 2 cents per 1000 gal. The 1973-completed California State Water Project will be capable of delivering 3,800 Mgd. It will meet southern California's water requirements through 1990 with rates of 14 to 25 cents per 1000 gal. for untreated water. The State Water Project will deliver water to central California at rates of 4 to 10 cents per 1000 gal. Sea water desalting may be economically competitive by 1990 on the southern California coast. Desalting of geothermal brines in the Imperial Valley or of sea water from the Gulf of California may be attractive for overcoming salinity problems of the Colorado River and for providing additional water. (Popkin-Arizona)
W72-13917

DECLARING WAR....ON MESQUITE,
Texas Agricultural EXTENSION Service, College Station.
G. O. Hoffman, and B. J. Ragsdale.
The Ranch Magazine, Vol 51, No 7, April 1971, p 13, 18, 25. 1 fig, 1 ref.

Descriptors: Brush control, *Weed control, *Water conservation, *Herbicides, *Mechanical control, *Chemcontrol, Mesquite, Soil moisture, Nutrients, Phreatophytes, Forages, Cattle, Range grasses, Weeds, Texas, Chemicals.

Mesquite invading areas of grass-bare soil, robs 56 million acres of Texas rangelands of precious moisture and plant nutrients. More forage for livestock can be produced when mesquite is controlled chemically and mechanically. In order to kill mesquite, which uses four times more water to produce a pound of plant than native grasses use to produce a pound of nutritious forage, the bark on its root crown must be eliminated. Resistant weeds which replace mesquite must be controlled. Mechanical mesquite control includes hand grubbing, rolling choppers, root cutters, anchor chains, bulldozers, shredders, tree or stinger dozers, and root plows. Chemical control includes Kerosene, diesel oil and herbicides. These methods are outlined. (Popkin-Arizona)
W72-13925

DEVELOPMENT OF FOREST MANAGEMENT PRACTICES FOR INCREASING SNOWPACK WATER YIELD,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02C.
W72-13995

USE OF FOREST ATTRIBUTES IN SNOWPACK INVENTORY - PREDICTION RELATIONSHIPS FOR ARIZONA PONDEROSA PINE,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02C.
W72-13996

3C. Use of Water of Impaired Quality

SULFURIC ACID: ITS POTENTIAL FOR IMPROVING IRRIGATION WATER QUALITY,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
For primary bibliographic entry see Field 05G.
W72-13920

SOIL WATER REGIME IN ECONOMIC EVALUATION OF SALINITY IN IRRIGATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
E. Bresler, and D. Yaron.
Water Resources Research, Vol 8, No 4, p 791-800, August 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Soil water, *Irrigation, *Salinity, *Irrigation efficiency, *Irrigation water, Water quality, Water quantity, Irrigation practices, Economics, Evaluation, Estimating, Computer models, Statistical models, Optimization, Systems analysis.
Identifiers: Soil water suction.

In regions with a Mediterranean climate and a semiannual alternation of rainy and irrigation seasons, it seems more efficient to control salinity by regulating the soil water regime, as an alternative to control by leaching. The soil can be leached during the rainy season by rain and/or irrigation and the total water suction can be controlled during the crop-growing irrigation season by altering the water regime. Presented is an approach for the short-run determination of the economically optimal quantity-quality combination of the irrigation water during the irrigation season, when the soil water regime and the soil salt status are changed simultaneously. A field irrigation, water requirement experiment and computer and statistical models are used to estimate the functional relationships between the total water suction and the man-controlled variables: quantity and quality of irrigation water and frequency of irrigation. Data from the irrigation experiment show that situations exist in which increasing the quantity of irrigation water, shortening the time interval between irrigations, and increasing the depth of wetting lead to increasing salt concentration in the soil solution while at the same time decreasing the total and average soil water suctions. (Bell-Cornell)
W72-13932

ORIGIN OF SALINE SOILS AND THEIR REGIME, VOLUME 2,
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
V. A. Kovda.
Available from the National Technical Information Service as TT-70-50170, $3.00 in paper copy, $01.95 in microfiche. US Dept of Agriculture, by Israel Program for Scientific Translations, Jerusalem, 1971. 311 p. (*Translation of Proiskhozhdenis i rezhim zasolennykh pochv, Izdatel'stvo Akademii Nauk SSR, Moskva-Leningrad, 1947).

Descriptors: *Saline soils, *Salinity, *Salt balance, *Salt tolerance, *Land reclamation, Farm management, Irrigation, Drainage, Plant growth, Plant morphology, Plant physiology, Fertilization, Seed treatment, Water balance, Groundwater, Valleys, Deltas, Terraces (Geologic), Grasslands, Deserts.
Identifiers: *USSR, *Oases, *Oasis agriculture, *Alluvial plains, *Subaerial, Topdressing.

This monograph is concerned with the classification of irrigated oases in the USSR, the effects of salinity on plants, and the measures employed to control salinity of soils under irrigation. Depending on age, geological structure, and geomorphology of the region, irrigated oases are divided into two principal groups: (1) oases on alluvial plains, comprising a system of level terraces of different age; and (2) oases in river deltas. Irrigated oases on alluvial plains may occur in fairly narrow intermountain valleys, such as Fergana, Zeravshan, Araks, or Vakhsh, or on extensive plains adjoining ancient plateaus or mountain divides, such as the left bank area of the Volga, or the area along the Dnieper. Oases in river deltas are classified as oases in marine deltas adjoining present-day seas and as oases in dry, continental subaerial deltas. (Josefson-USGS)
W72-14041

EMERGENCE, EARLY GROWTH, AND SALINITY OF FIVE VEGETABLE CROPS GERMINATED BY SPRINKLE AND TRICKLE IRRIGATION IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
For primary bibliographic entry see Field 03F.
W72-14106

EFFECT OF SALINE WATERS ON THE GERMINATION OF WATERMELON (CITRULLUS VULGARIS SCHRAD. EX ECKL. ET ZEYH.),
Rajasthan Univ., Jaipur (India). Agricultural Chemistry Section.
U. S. Pokharna, K. Mirchandani, and S. P. Seth.
Indian J Agric Sci. 41 (3): 210-215. 1971.
Identifiers: Alkali, Citrullus-Vulgaris-D, *Germination, *Saline water, Salts, Tolerance, *Watermelon-D.

Ten cultivars of C. vulgaris, viz. 'Sugerbaby,' 'Improved Kleckly Sweet,' 'Meetha,' 'Durgapura Keshar,' 'Cream,' 'Congo,' 'Charleston Gray,' 'New Hampshire,' 'Durgapura Basanti' and 'Ashaiyamato,' were studied for their tolerance to salt and alkali at the germination stage. These were treated with 35 types of waters of different electrical conductivity (EC) and Na-adsorption ratio (SAR) under laboratory conditions. The effects of these waters on germination varied with cultivar. 'Cream' and 'Sugarbaby' showed the maximum salt tolerance, followed by 'Durgapura Keshar' and 'Congo' whereas the others had medium salt tolerance. 'Cream' and 'Ashaiyamato' were the best alkali-tolerant cultivars.--Copyright 1972, Biological Abstracts, Inc.
W72-14126

3D. Conservation in Domestic and Municipal Use

WATER QUALITY OF STREAMS IN THE NESHAMINY CREEK BASIN, PENNSYLVANIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W72-13737

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.
For primary bibliographic entry see Field 06A.
W72-13929

PROCEDURES FOR ESTIMATING THE HYDROLOGIC IMPACT OF URBANIZATION,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W72-14002

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 06D.
W72-14028

3E. Conservation in Industry

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.
For primary bibliographic entry see Field 06D.
W72-13740

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.

Available from the National Technical Information Service as PB-200 436-D, $6.00 in paper copy. June 1971. 599 p, 44 fig, 10 map, 8 photo, 17 tab, ref, append.

Descriptors: *Rocky Mountain Region, *Environmental effects, *Oil shales, *Leases, Natural resources, Oil industry, Water pollution sources, Exploitation, Energy conversion, Federal government, Federal jurisdiction, Legal aspects, Energy. Identifiers: *Environmental impact statement.

The growing pace of domestic fuel consumption has made the development and location of new sources of energy supply of paramount concern. Oil shale is a major undeveloped energy resource and rich deposits are located in the Rocky Mountains. The Department of Interior's program for prototype oil shale leasing in public lands is outlined. A total of 30,720 acres of land is possibly involved. The proposed program will include continuous assessment of the environmental consequences of oil shale development. A pre-implementation base will first be established from which to measure periodic assessment. Environmental studies on a regional level were initiated in 1970 by the Department of Interior in conjunction with state governors. Guidelines of these studies are listed and discussed. Detailed environmental studies will be made of each site selected for leasing. These studies will include sample core drilling; assessment of aquatic, plant, and animal resources; assessment of scenic resources; and analysis of mine wastes to be produced. Unacceptable sites will be eliminated. Following leasing the actual impact will be compared with the projected impact. Failure to meet projected environmental impacts may result in lease cancellation. (Grant-Florida)
W72-13969

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 06D.
W72-14028

3F. Conservation in Agriculture

SPRINKLER IRRIGATION SYSTEM SOLVES WASTE WATER PROBLEMS.
For primary bibliographic entry see Field 05D.
W72-13691

PROCEEDINGS OF THE LAND SPREADING CONFERENCE AT ORLANDO, FLORIDA ON JULY 15, 1971.
East Central Florida Regional Planning Council, Winter Park.
For primary bibliographic entry see Field 05D.
W72-13704

SOIL SUITABILITY FOR SPRAY IRRIGATION,
Soil Conservation Service, Cocoa,Beach, Fla.
For primary bibliographic entry see Field 05D.
W72-13706

PLANTS AND WASTEWATER RENOVATION,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 05D.
W72-13707

SKELETON WEED (CHONDRILLA JUNCEA) IN THE VICTORIAN MALLEE: V. CHEMICAL FALLOWING,
Victorian Wheat Research Inst., Horsham (Australia).
G. J. Wells.
Aust J Esp Agr Anim Husb. Vol 11, No 50, p 320-327, 1971. Illus.
Identifiers: *Crop production, Aminotrizzole, Australia, Chondrilla juncea D, *Fallowing, Fenac, *Herbicides, Mallee, Moisture, Nitrates, Picloram, Simazine, Soils, Weed D, Wheat M.

Skeleton weed is difficult to control on cultivated fallows during the summer and experiments were commenced in 1963 on the use of short-term residual herbicides for chemically fallowing infested land for wheatgrowing. Rates and times of application of simazine mixtures, a picloram/2,4-D mixture, an atrazine/amitrole mixture, and fenac were tested. Compared with cultivated fallows, chemical fallowing increased wheat yields in 4 years out of 6. The yield responses were associated with increased soil nitrate and soil moisture at sowing, reflecting the improved weed control by herbicides, particularly during the summer period. The effects of toxic residues from simazine and atrazine on the wheat crop were influenced by rate and time of application, rainfall during the fallow period, and soil type.--Copyright 1972, Biological Abstracts, Inc.
W72-13708

ENGINEERING DESIGN CRITERIA FOR SPRAY IRRIGATION,
Bishop (William), Talahassee, Fla.
For primary bibliographic entry see Field 05D.
W72-13709

ACTUAL SPRAY FIELD OPERATIONS,
For primary bibliographic entry see Field 05D.
W72-13710

WASTEWATER RENOVATION AT TALLAHASSEE - EXPERIMENTAL STUDIES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W72-13711

SOME ASPECTS OF EFFLUENT LAND-SPREADING,
Dawkins and Associates, Inc., Orlando, Fla.
For primary bibliographic entry see Field 05D.
W72-13712

AN ANALYSIS OF THE RAINFALL VARIATIONS IN COUNTY LEITRIM AND THEIR INFLUENCE ON AGRICULTURAL PRODUCTION,
Foras Taluntais, Drumboylan (Ireland).
J. Mulqueen.
Ir J Agric Res. Vol 10, No 2, p 223-238. 1971. Illus.
Identifiers: *Rainfall, *Crop production, Agriculture, Growth, Herbage, Ireland, Live..ock, Moisture, Soils, Variation.

The areal and seasonal distribution of rainfall in County Leitrim during 1931-60 was analyzed and frequency analyses were carried out on the amount of rainfall and the number of raindays during 1947-67 at Ballinamore. The mean annual rainfall was above the national average in over 2/3 of the county and was highest in the mountainous areas. April, May and June were the driest months of the growing season. There was a wide range in the amount of rainfall and in the number of raindays for any given month at Ballinamore. Potential evapotranspiration for any given month was fairly uniform from year to year. It was shown that high rainfall during the growing season results in a high soil moisture content in soils with impeded drainage. Wet growing seasons result in increased poaching, reduced machine efficiency, reduced herbage growth on grassland and increased management problems with livestock. Because of the high frequency of raindays (rainfall > or = 0.2 mm/day) during the haymaking season, it is difficult to make good quality hay at Ballinamore. A wide range in the rainfall amount and in the number of raindays makes farming more difficult to plan on soils with impeded drainage unless effective drainage is provided.--Copyright 1972, Biological Abstracts, Inc.
W72-13713

THE USE OF GEOHYDROLOGY IN SOLVING WATER MANAGEMENT PROBLEMS IN AGRICULTURE,
Institute for Land and Water Management Research Wageningen (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13726

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 06B.
W72-13823

PROBLEMS IN THE HEAT AND WATER REGIME OF AGRICULTURAL LANDS (VOPROSY TEPLOVOGO I VODNOGO REZHIMA SEL'SKOKHOZYAYSTVENNYKH POLEY).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut, Trudy No 102, Moscow, 1971. 139 p.

Descriptors: *Heat balnace, *Water balance, *Land, *Agriculture, Agroclimatology, Meteorology, Precipitation (Atmospheric), Radiation, Temperature, Evaporation, Crops, Crop

response, Crop production, Plant physiloogy, Photosynthesis, Soil moisture, Moisture deficit, Water storage, Irrigation, Grasslands.
Identifiers: *USSR, *Ukraine, *Agrometeorology, Phytometry, Grapes.

Designed for hydrometeorologists and agriculturists, this collection of 13 papers presents information on the water relations and temperature of field soils in different parts of the Ukraine. Methods are given for calculating solar radiation absorbed by crops and water storage in soil planted to winter wheat. Other topics examined include: (1) measurement of the physiological responses of witner wheat and corn to environmental factors; (2 control of evaporation losses from soil through chemical alteration of soil-moisture characteristics; and (3) cultivation of winter wheat in semiarid regions of the Ukraine. Special emphasis is placed on climate and soil-moisture availability as they affect photosynthesis and productivity of sugar beets and yield and sugar content of grapes. (Jesefson-USGS)
W72-13858

LET YOUR IRRIGATION SYSTEM DO ALL THE WORK,
G. E. McConnell.
American Fruit Grower, Vol 91, No 5, May 1971, p 16-18. 6 fig.

Descriptors: *Subsurface irrigation, *Irrigation systems, *Crop production, *Frost prevention, *Pesticides, Fertilizers, Spatial distribution, Sprinkler irrigation, Water wells, Pumps, Lateral conveyance structures, Chemicals, Hazards, Fruit crops, Water conservation.

An integrated underground irrigation system can be used to irrigate, protect crops from frost, and apply pesticides and fertilizers. Design and construction of a permanent watering system are presented. Triangular spacing of sprinklers gave the best coverage. The system is feasible for any intensively used land whose irrigation is economical. The installed cost of the underground system was less than half the cost of a traditional portable aluminum pipe system. Water well pumps were selected because of flat performance curves. A commercial air compressor cleans all laterals easily. Different chemicals and fertilizers have been applied by this system which also reduces frost hazard. (Popkin-Arizona)
W72-13911

SALT RIVER PROJECT 1971 ANNUAL REPORT.
Salt River Project, Phoenix, Ariz. Agricultural Improvement and Power District.
For primary bibliographic entry see Field 04A.
W72-13913

MAN--THE DESERT FARMER,
Arizona State Museum, Tucson.
J. E. Ayres.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings, Arizona Section-American Water Resources Association and the Hydrology Section-Arizona Academy of Science, April 22-23, Tempe, Vol 1, p 373-379, 1971. 5 ref.

Descriptors: *History, *Arid lands, *Arizona, *Irrigation practices, *Soil properties, Soil environment, Soil texture, Saline soils, Arroyos, River basins, Microenvironment, Crops, Agriculture, Irrigation canals, Irrigation systems, Environmental effects.
Identifiers: *Archaeology, *Prehistoric water exploitation.

The pre-Columbian Hohokam Indians occupied the major river drainages of Central Arizona, and have been the subject of much intense archaeological research. Evidence indicates that the Hohokam began using river water for crop irrigation about 300 B.C., and modified and improved their irrigation systems over time, until the maximum extent of these systems was achieved about 900 A. D. Two types of water control seem to have been utilized: (1) the direct exploitation of rivers through the use of irrigation canals, (2) indirect use through controlled runoff within microdrainages at higher elevations before it reached the rivers. At first, probably only those parcels of land with optimal soils and drainage were used, but apparently population increases fostered by agriculture itself, combined with increasing social and political complexity, necessitated more and more exploitation of marginal lands. Eventually soil problems increased, imposing severe limitations on agriculture. These involved salt and alkali accumulation due to inadequate drainage, soil density and water logging. Additionally, the extension of cropping required the clearing of natural vegetation, which resulted in increased erosion and decreased available native food resources for periods when crops failed. The culture vanished completely about 1450 A. D., probably mainly because of their manner of river exploitation for irrigation. More recent archaeological studies are concentrating not only on river use but also on river abuse. (Casey-Arizona)
W72-13919

WHEELER-DEALING: JACKPOT IN HAY,
T. Capener.
Western Livestock Journal, Vol 49, No 15, February 1971, p 32-33. 3 fig.

Descriptors: *Irrigated land, *Hay, *Crop production, *Sprinkler irrigation, *Carrying capacity, Nevada, Feeding rates, Rotations, Droughts, Farm management, Land clearing, Burning, Water resources development, Water management (Applied), Water control, Fertilization, Planting management, Revegetation.

In 6 years, the J. K. Wheeler ranch in Jackpot, Nevada has doubled in the number of irrigated acres and increased hay production and carrying capacity by efficient wheel-moved sprinklers, fencing, and feeding rotation. Irrigated acres in the drought-ridden ranch increased from 400 to 800 acres. Hay production increased from less than a ton per acre to between 3 and 5 tons on 2-1/2 cuttings in 90 to 100 growing days. Carrying capacity on the 6500 acre ranch is now at 1000 head of cattle, compared to 350 cattle 6 years ago. Major improvements included: clearing, burning and levelling dried-up river bottom land; gaining control of existing water and developing new water; fertilizing, planting and replanting all 800 acres; and beginning a flexible hay-making program that allows the crop to be baled or made into haylage. The sprinkler irrigation system is explained. (Popkin-Arizona)
W72-13921

WATER AND SOME NUTRIENTS LOSSES BY DEEP PERCOLATION AS INFLUENCED BY THE DEPTH OF WATER TABLE,
Ministry of Agriculture, Cairo (Egypt). Soils Dept.
For primary bibliographic entry see Field 02G.
W72-13923

EFFECTS OF ENVIRONMENTAL CONDITIONS AND THE COADMINISTRATION OF GROWTH RETARDANTS ON THE RESPONSE OF SUGARCANE TO FOLIAR TREATMENT WITH GIBBERELLIN,
Tate and Lyle Ltd., Keston (England). Research Lab.
R. A. Yates.
Agron J. Vol 64, No 1, p 31-35. 1972. Illus.
Identifiers: *Crop production, *Plant growth regulators, Coadministration, Dalapon, Environment, Gibberellin, Growth, Moisture, Retardants, Saccharum M spp, Soils, Sucrose, Sugarcane M, Temperature, Treatment, Uracil.

Poor yields of sucrose from sugarcane are often associated with low sucrose:cane ratios, particularly when climatic conditions tend to favor stem elongation rather than sucrose accumulation. Plant growth regulators may be used to modigy environmental effects on the growth of sugarcane and thus alter the balance between utilization and storage of sucrose. The influence of temperature, soil moisture, and the coadministration of plant growth retardants on the response of sugarcane to treatment with gibberellic acid was investigated. Single foliar applications of GA to commercial sugarcane varieties (interspecific hybrids of Saccharum) stimulated stem elongation for from 2-6 wk, but this response was not reflected in higher cane yields unless the plants were harvested within 6 wk of treatment. A second application of GA at 4 wk prolonged the growth response. In the field low temperatures were associated with the more prolonged growth responses, which were of smaller amplitude. Moisture stress had no apparent effect on GA response. No corrections were evident between environmental conditions or application rates and the duration of growth responses in greenhouse trials, but the amplitude increased with application rate within the range of 25-200 ppm. Three-5 immature or semimature internodes were affected. In field trials under warm conditions a period of growth retardation followed the initial GA-induced growth stimulation. This did not occur in greenhouse trials. Stem-sugar concentrations fell during the growth-stimulation phase, but recovered as growth rates reduced. Attempts were made to accentuate this recovery, and so to increase the accumulation of sugars, by coadministration of growth retardants with GA. Dalapon had a delayed effect on cane growth, slightly curtailing the duration of the GA response, and suppressing growth thereafter. The phase of growth suppression was accompanied by increased stem sugar concentration in greenhouse-, but not in field-trials. Sodium silicate (at up to 200 ppm) had no significant effect on growth or sugar accumulation and did not modify the response to GA. Treatment with azauracil (at up to 400 ppm) strongly inhibited cane growth and increased stem-sugar concentrations, but showed no significant interaction with GA.--Copyright 1972, Biological Abstracts, Inc.
W72-13924

CONTROLLED-ENVIRONMENT VEGETABLE PRODUCTION: RESULTS OF TRIALS AT PUERTO PENASCO, MEXICO, 1968-1970,
Arizona Univ., Tucson. Environmental Research Lab.
M. H. Jensen, and H. M. Eisa.
1972. 118 P, 5 FIG, 66 TABLES.

Descriptors: *Greenhouses, *Environmental effects, *Soil-water -plant relationships, *Mexico, Nutrient requirements, *Crop response, *Vegetable crops, Plant growth, Growth chambers, Coasts, Deserts, Heat exchangers, Desalination apparatus, Humidity, Mist irrigation.
Identifiers: *Waste heat, Gulf of California.

Many of the world's presently uninhabited deserts could be made productive, even attractive for settlement, if such necessities as food were present. Fresh vegetables often are scarce in many existing desert communities. When available, they usually are poor in quality or very expensive. To grow them, there must be water for irrigation and a conducive environment. Temperatures in most arid areas are adequate for agriculture during most of the year, but sandstorms and insect invasions often preclude horticultural production, and providing water for open-field irrigation may be costly. Experiments are being conducted by the Universities of Arizona and Sonora in growing vegetables in the desert in controlled-environment, air-inflated plastic greenhouses. Waste heat for desalting seawater is captured from diesel-electric generator sets. The fresh water then is used to irrigate crops inside the structures. Crops are grown directly in the beach sand. A prototype

unit is in operation in Puerto Penasco, Sonora, Mexico, on the east coast of the Gulf of California. The report of the 1968-1970 trials describes the greenhouse structure and environment, the use of beach sand as a growing medium, planting procedures and nutrient solutions, irrigation systems, pollination, pest and disease control, and fertilizers used for the vengetables and fruits grown.
W72-13926

SOIL WATER REGIME IN ECONOMIC EVALUATION OF SALINITY IN IRRIGATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 03C.
W72-13932

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.
For primary bibliographic entry see Field 05G.
W72-13953

AUTHORIZED CHINA MEADOWS DAM AND RESERVOIR LYMAN PROJECT, WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Salt Lake City, Utah. Region 4.
For primary bibliographic entry see Field 08D.
W72-13963

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
N. J. Rosenburg.
Available from the National Technical Information Service as COM-72-10455, $3.00 in paper copy, $0.95 in microfiche. Nebraska Agricultural Experiment Station Horticulture and Forestry Progress Report No 91, February 1972. 61 p, 29 fig, 3 tab, 14 ref, 3 append. NOAA Grant E-293-68 (G).

Descriptors: *Agronomy, *Soil water, *Photosynthesis, *Evapotranspiration, *Experimental farms, Crops, Crop response, Analytical techniques, Soybeans, Measurement, Instrumentation, Plant growth, Soil-water-plant relationships, Weather, Canopy.

Methods are described for simultaneously determining photosynthesis and evapotranspiration and thus the water use efficiency (CO_2 fixed/unit of water consumed) in fields of growing crops. Water use efficiency can be determined for periods as short as 15 min. The methods depend upon the assumption that the exchange coefficients for water vapor and CO_2 are identical. Recent coefficients for water vapor are determined by lysimetric and energy balance methods, both of which give comparable results. CO_2 concentrations and gradients were measured over soybean and grass fields early and late in the 1969 growing season. IT WAS POSSIBLE TO DISTINGUISH DIFFERENCES IN THE CO_2 concentration in air near canopy top. CO_2 concentration was lowest over soybeans. The methods developed were used to distinguish differences in water use efficiency caused by a reflectant applied to a maturing soybean crop. Reduction in water use efficiency was noted on a very cloudy day shortly after application of the treatment. Later, no effect of treatment was noted. Instrumentation in development for measuring the below-canopy sources of CO_2 produced by soil, root and plant respiration is described. (Woodard-USGS)
W72-14009

SPRINKLE AND TRICKLE IRRIGATION OF GREEN PEPPER IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
D. Goldberg, and M. Shmueli.
Hortscience. 6 (6Sec.1): 559-562. Illus. 1971.
Identifiers: *Arid zones, Capsicum-Annuum-D, Chloride, Development, Green peppers, Growth, Irrigation, Leaf, *Pepper-D, Root, *Sprinkle irrigation, *Trickle irrigation, Yield, Zone.

Pepper plants (Capsicum annuum L. cv. 'California Wonder') were sprinkle and trickle irrigated, each at 2 different frequencies, during the growing season from Sept. to April. Yield, leaf growth, and root development were all greater with trickle than with sprinkle irrigation. Frequency of water application had a slight, but non-significant effect. Yield tended to decrease when the plants were sprinkle irrigated daily. With trickle irrigation, the infrequent interval, every 5 days, tended to reduce the yield. Leaf chloride content was considerably greater under sprinkling, especially at the frequent interval.--Copyright 1972, Biological Abstracts, Inc.
W72-14089

SPRINKLE, FURROW AND TRICKLE IRRIGATION OF MUSKMELON IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
M. Shmueli, and D. Goldberg.
Hortscience. 6 (6 Sec. 1): 557-559, Illus, 1971.
Identifiers: Arid zones, Chlorides, Cucumis-Melo-D, *Furrow irrigation, Growth, Irrigation, *Muskmelon-D, Salts, Soils, *Sprinkle irrigation, *Trickle irrigation, Yield, Zone.

In a comparison of sprinkle, furrow and trickle irrigation applied during the growing season from Aug. to Dec. to muskmelon (Cucumis melo L. cv. 'Haogen-2'), vegetative growth was found more rapid and yields were earlier and higher with the trickle method. No yield differences were detected between sprinkle and furrow irrigation. Salt accumulation on the leaves was greater with sprinkling than with the other 2 methods which do not wet the foliage. The chloride concentration in the leaves was also high throughout the entire growing season with sprinkle irrigation. Soil chloride content during the growing season varied according to the method of irrigation.--Copyright 1972, Biological Abstracts, Inc.
W72-14090

INVESTIGATIONS ON RAINY SEASON POTATO IN THE PLATEAU REGION OF CHOTANAGPUR,
Agricultural Research Inst., Ranchi (India).
R. Tiwari, M. S. S. Rao, and S. C. Mandal.
Ranchi Univ J Agric Res, 4: 39-46, Illus, 1969.
Identifiers: *Chotanagpur (India), Fertilizers, Nutrition, Plateaus, *Potato-D, Rainy season, Crop yield.

Varietal X manurial trials showed that the new cultivar 'Kufri Chandramukhi' significantly excelled 'Kufri Kuber' in yield when cultivated as a rainy season crop. The use of 60 kg-75 kg/ha of P_2O_5 increased the yield significantly. The 1st wk of July onwards was the optimum time for sowing. Planting whole tubers at ground level gave better yields as compared to sowing at other depths.--Copyright 1972, Biological Abstracts, Inc.
W72-14091

A DEVICE FOR MEASURING AND RECORDING THE AMOUNT AND DURATION OF FREE WATER ON VEGETATION IN THE FIELD,
Agricultural Research Service, Orlando, Fla. Entomology Research Div.
C. W. Mc Coy, A. J. Hill, and G. E. Horanic.
J Econ Entomol, 65 (1): 135-138, Illus, 1972.
Identifiers: *Citrus-D, Duration, *Foliage, *Measurement, Recording, Vegetation.

A portable electronic apparatus was constructed to measure the quantity of moisture and its duration on citrus foliage. It consists of a sensor and recorder in a balanced circuit independently powered with direct current. Current flowing through the sensor was recorded as an impulse on a recording chart. The more moisture on the sensor, within limits, the lower the electrical resistance and the higher the scale deflection. Duration of moisture was determined as the time between the 1st and last impulses and from the chart speed. A single sensor situated beyond the tree canopy and elevated to about 4 ft above ground simulated overall leaf conditions most closely. Sensors performed adequately for 6 mo., but generally were changed after 4 mo.--Copyright 1972, Biological Abstracts, Inc.
W72-14094

THE EFFECT OF FRUITING UPON TRANSPIRATION RATE AND STOMATAL OPENING IN APPLE LEAVES,
P. Hansen.
Physiol Plant, 25 (2): 181-183, 1971.
Identifiers: *Apple-D, *Fruiting, Leaves, Malus-Domestica-D, Microscopy, Nitrogen, Potassium, *Stomatal opening, *Transpiration.

The uptake of water by apple trees (Malus domestica 'Golden Delicious') was measured in a pot experiment and was found to be much greater in apple trees carrying many fruits than in comparable specimens without fruits. The main reason seemed to be differences in the transpiration rates of the leaves. This was corroborated by microscopic investigations which showed a higher degree of stomatal opening in the fruiting trees. In some cases minor reductions in water uptake per tree were caused by reducing the supplies of K and N.--Copyright 1972, Biological Abstracts, Inc.
W72-14097

FERTILIZER TECHNOLOGY AND USE.

2nd Edition, 611p, Illus, Olson, R. A. (Ed.), Soil Science of America, Inc.: Madison, Wis., 1971, Pr. $10.00.
Identifiers: Book, *Crops, *Fertilizer technology, Water pollution control.

This book contains 18 papers on fertilizer technology and the current applications in this field. Among the new technologies introduced in this volume are development and current status of the fertilizer solutions industry; advanced modes of transport including pipeline distribution of fertilizers; development and role of delayed release fertilizer materials; and formulation and marketing of fertilizer-pesticide combinations. New chapters include a coverage of crop quality in relation to fertilizer use; the predication of crop nutrient requirements through soil and foliar analyses; the behavior of fertilizers in acid, alkaline and flooded soils; the beneficial use of the tremendous quantities of waste products emanating from modern society as fertilizer supplements by undergoing depollution in soil; and a scientific treatise on the potential role of fertilizers as pollutants. These innovations should be of interest to the student of fertilizer technology as well as the industry representative interested in the sale of chemical fertilizers. A glossary of common and scientific names of plants, diseases and insects referred to in this book is followed by a subject index which ends the book.--Copyright 1972, Biological Abstracts, Inc.
W72-14101

THE QUALITY OF 'RED DELICIOUS' APPLES AS AFFECTED BY OVERTREE SPRINKLER IRRIGATION,
North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
C. R. Unrath.
J Am Soc Hort Sci, 97 (1): 58-61, 1972.

Identifiers: *Apples-D, Bitter-Pit, *Color, Fruit, Irrigation, Shape, Size, Solids, *Sprinkler irrigation.

The trees were spot-picked weekly, based on acceptable color to meet grade standards. Harvesting was completed one week earlier on trees receiving overtree sprinkler irrigation as compared to those with undertree or no irrigation. Fruit from trees which received overtree irrigation had greater surface coloration and nearly twice as much surface area with good solid red color as fruit which received undertree or no irrigation. Overtree irrigation improved fruit size and shape during 1969 but not 1970; increased soluble solids, and reduced cork spot and bitter pit in 1970. Lower firmness of overtree irrigated apples in 1969 was attributed to their greater size. Irrigation (over and undertree) had no influence upon internal breakdown measured after 4 mo. of storage at 32 deg F.--Copyright 1972, Biological Abstracts, Inc.
W72-14103

THE EFFECT OF DISTANCE FROM THE TRICKLERS ON SOIL SALINITY AND GROWTH AND YIELD OF SWEET CORN IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
D. Goldberg, and M. Shmueli.
Hortscience, 6 (6 Sec. 1): 565-567, Illus, 1971.
Identifiers: Arid zones, *Corn-M, Growth, Moisture, *Soil salinity, Tension, *Tricklers, Yield.

The effect of the distance between crop row and tricklers on growth and yield of sweet corn, and on soil moisture and salinity was studied. The maximum yield was obtained when the nozzles were located 5-25 cm from the plants. Less vigorous vegetative development resulted when the tricklers were at a distance of 50 cm. The salt concentration in the 0 to 30-cm soil layer increased with distance from the trickle line. Soil water tension was almost constant throughout the irrigation cycle at distances of 5-35 cm, it was lower at 0 cm from the tricklers, and markedly higher at 50 cm from the irrigation line.--Copyright 1972, Biological Abstracts, Inc.
W72-14105

EMERGENCE, EARLY GROWTH, AND SALINITY OF FIVE VEGETABLE CROPS GERMINATED BY SPRINKLE AND TRICKLE IRRIGATION IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
M. Shmueli, and D. Goldberg.
Hortscience, 6 (6 Sec. 1): 563-565, Illus, 1971.
Identifiers: Arid zone, Crops, Cucumber-D, *Germination, Growth, Irrigation, Muskmelon-D, Onion-M, Pepper-D, Salinity, Salts, *Sprinkle irrigation, Tomato-D, *Trickle irrigation, Vegetables.

Field experiments were conducted to test the emergence, early growth, and salt build-up in soil and leaves with 5 vegetable crops germinated by sprinkle and trickle irrigation using saline water. In some of the crops (cucumber, tomato, pepper) trickle irrigation shortened the time until emergence and the stand was more uniform. Other crops (muskmelon, onion) responded in a similar manner to both irrigation methods. Seedling development was good with both methods. Trickling produced a higher salt concentration in the 0 to 3-cm soil layer of the crop row, although this had no apparent effect on emergence, seedling weight, or chloride content of the leaves.--Copyright 1972, Biological Abstracts, Inc.
W72-14106

EFFECT OF MOISTURE STRESS AND INDOLEBUTYRIC ACID ON ROOTING OF STEM CUTTINGS OF POMEGRANATE (PUNICA GRANATUM L.),
Udaipur Univ. (India).
K. S. Chauhan, and Jayendra Singh.
Indian J Agric Sci. 41 (4): 293-296. 1971.
Identifiers: Growth, *Moisture stress, *Pomegranate-D, Punica-Granatum-D, Rooting, Soil, Stem cuttings, *Indolebutyric acid.

The highest percentage of survival (90%) and the maximum number of primary roots/cutting occurred in cuttings planted at a moisture level of 20.14% and treated with 50 ppm IBA. Overall best results were obtained when cuttings were treated with IBA at 50 ppm and planted at a moisture level of 15.95%.--Copyright 1972, Biological Abstracts, Inc.
W72-14123

CELL SIZE IN RUSSET BURBANK POTATO TUBERS WITH VARIOUS LEVELS OF NITROGEN AND SOIL MOISTURE TENSIONS,
Western Region Research Lab., Berkeley, Calif.
R. M. Reeve, H. Timm, and M. L. Weaver.
Am Potato J. 48 (12): 450-456. Illus. 1971.
Identifiers: Cell size, Moisture, *Nitrogen, Parenchyma, Potato-D, Russet-Burbank, *Soil moisture, Starch, Storage, Potato tubers.

Russet Burbank potatoes were grown at levels of added N of 0, 135, and 270 kg/ha and soil moisture tensions (SMT) of 0.5 and 1.0 atm. With all combinations, there was a consistent gradient of larger to smaller starch-storage parenchyma cells from stem end to bud end of mature tubers. Stem and bud ends of tubers grown at a SMT of 0.5 atm with N had smaller cortical and pith (innermost medullary or water-core) cells than did ends of tubers grown without N. Perimedullary tissues of bud ends of tubers receiving N likewise contained smaller cells than did corresponding tissues of tubers grown without N. No pronounced differences in cell size were found in tissues from the midsections. In bud-end tissue of tubers grown at a SMT of 1.0 atm, there were no consistent differences in cell size with respect to N levels. However, pith, perimedullary, and cortical tissues of the midsections and stem ends of tubers receiving N had smaller cells than did corresponding tissues from tubers without N. The different patterns of cell size in tubers grown at different SMT indicate that the effects of N may be influenced by soil moisture.--Copyright 1972, Biological Abstracts, Inc.
W72-14124

THE EFFECT OF LIGHT AND HUMIDITY ON ABSORPTION AND DEGRADATION OF DIPHENAMID IN TOMATOES,
Missouri Univ., Columbia. Dept. of Plant Pathology.
D. P. Schultz, and B. G. Tweedy.
J Agric Food Chem. 20 (1): 10-13. Illus. 1972.
Identifiers: *Absorption, *Degradation, *Diphenamid, Herbicides, Humidity, Light, Lycopersicon-Esculentum-D, *Tomatoes-D.

The effect of various light and relative humidity regimes on the absorption and degradation of N,N-dimethyl-2,2-diphenylacetamide (diphenamid) by tomatoes (Lycopersicon esculentum Mill.) was studied by extracting plants which were grown for 24, 48, and 120 hr in a nutrient solution containing 14C-diphenamid. Plants grown under low light, low humidity conditions absorbed more diphenamid than those grown under high light, high humidity. Extracts of plants grown under high light, high humidity conditions contained a lower percentage of diphenamid and a higher concentration of a glucose-diphenamid complex than those grown under low light, low humidity conditions. The concentration of diphenamid increased in the shoots of plants grown under low light, low humidity but remained constant in plants grown under high light, high humidity. The concentration of the glucose-diphenamid complex in shoot extracts was nearly the same at all harvest periods and in all treatments.--Copyright 1972, Biological Abstracts, Inc.
W72-14125

EFFECTS OF CULTURAL PRACTICES AND FERTILIZERS ON SUGAR BEET QUALITY,
Broom's Barn Experiment Station, Bury St. Edmonds (England).
For primary bibliographic entry see Field 05C.
W72-14139

STUDIES ON THE MECHANISMS OF ACTION OF THE ANTITRANSPIRANT PHENYLMERCURIC ACETATE, AND ITS PENETRATION INTO THE MESOPHYLL,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W72-14149

CROPPING PATTERN IN RELATION TO WELL IRRIGATION,
Ranchi Univ. (India).
K. N. P. Verma, D. K. Singh, and Randhir Sinha.
Ranchi Univ J Agric Res, 4: 31-34, Illus, 1969.
Identifiers: *Cropping patterns, Irrigation, Vegetables, Wheat-M, *Well irrigation.

The provision of irrigation from even a minor source such as a well makes it possible to shift cropping pattern from traditional subsistence nature to market oriented one. Cropping pattern both on irrigated and unirrigated farms was mainly food crop dominated, however, on irrigated farms area under cash crops, such as, vegetables shared as much as 31% of gross cropped area as against only 3% on unirrigated farms. On an average the intensity of cropping was 1 1/2 times higher on irrigated farms. The analysis of cropping pattern of the same farm holdings at 2 time periods, one before and the other after the construction of irrigation well (s), revealed that with the construction of irrigation well (s), new crops like vegetables (21%) and wheat (3%) entered the cropping pattern. The intensity of cropping also increased on each size group of farm and on an average it rose from 101.32 to 127.15%.--Copyright 1972, Biological Abstracts, Inc.
W72-14150

EFFECT OF IRRIGATING WHEAT CROP AT DIFFERENT STAGES,
Maize Research Station, Chhindwara (India).
K. K. Mandloi, and P. S. Kushwaha.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J, 4 (1/2): 93-94, 1970.
Identifiers: Crops, *Irrigation, *Wheat-M, *Tilling.

During periods of water shortage, it is better to irrigate the wheat crop at the stage of tilling rather than heading.--Copyright 1972, Biological Abstracts, Inc.
W72-14151

A NOTE ON THE RESPONSE OF THE RICE VARIETIES TO VARYING WATER LEVELS,
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
P. D. Khare, K. K. Sharma, and M. N. Shrivastava.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J, 4 (1/2): 105, 1970 (1971).
Identifiers: *Rice-M, *Water levels, Irrigation, Crops.

Fluctuation in yield under different water levels was higher in 'Taichung (Native)-1' and minimum in 'Nurin-1' cultivar. 'Taichung (Native)-1' recorded a sudden increase in yield under 5 cm

over saturated treatment and decreased afterwards.-aCopyright 1972, Biological Abstracts, Inc.
W72-14152

EFFECT OF SOIL-MOISTURE STRESS ON THE LIPID QUALITY OF MATURED WHEAT GRAINS,
Punjab Agricultural Univ., Ludhiana (India).
O. S. Singh, P. S. Sukhija, M. L. Nagpal, and I. S. Bhatia.
Indian J Agric Sci, 41 (4): 300-304, 1971.
Identifiers: Grains, *Lipid quality, *Soil moisture stress, Triticum-Aestivum-M, *Wheat-M.

Two high-yielding dwarf wheat (Triticum aestivum L.) cultivars 'S 308' and 'Kalyan Sona 227' were subjected to a soil-moisture tension equivalent to 12 atmospheres at the tillering, early boot, late boot and the late dough stages. The stress at the tillering and early boot stages mostly decreased the lipid content per grain. However, the ratio of polar:non-polar lipids remained unaffected regardless of the growth state at which water stress was applied. Triglyceride fraction of the non-polar lipids decreased considerably in the order of the late dough stage < tillering < early boot and late boot stage. At the late boot stage there was a larger amount of lower fatty acids and palmitic acid both in the total lipids and the glyceride fraction.--Copyright 1972, Biological Abstracts, Inc.
W72-14155

REACTION OF SOIL FUNGI AND OTHER MICROORGANISMS TO VARIOUS LEVELS OF NITROGEN FERTILIZATION AND IRRIGATION OF COCKSFOOT (DACTYLIS GLOMERATA L.). (IN POLISH),
For primary bibliographic entry see Field 05C.
W72-14158

DETERMINATION OF THE RESERVE OF AVAILABLE PHOSPHATES IN IRRIGATED SOILS (IN RUSSIAN),
For primary bibliographic entry see Field 05B.
W72-14169

EROSION CONTROL PRACTICES IN PRIMARY CULTIVATION OF SOIL ON SLOPES OF THE CARPATHIANS, (IN RUSSIAN),
For primary bibliographic entry see Field 04D.
W72-14170

SOIL EROSION STUDIES IN THE PRESNOVSKII SOVKHOZ IN THE PAVLODAR OBLAST, (IN RUSSIAN),
For primary bibliographic entry see Field 02J.
W72-14171

PROBLEMS OF INTERACTION OF MINERAL FERTILIZERS AND IRRIGATION ON CERTAIN TYPES OF HUNGARIAN SOILS, (IN RUSSIAN),
B. Dobretseni.
Identifiers: *Fertilizers, *Hungary, Irrigation, *Minerals, Soil types.

At the current level of supply of mineral fertilizers on rich irrigated soils, it is inexpedient to apply large doses of fertilizers at the expense of less fertile soils. The latter should be given large doses of mineral fertilizers under irrigation.--Copyright 1972, Biological Abstracts, Inc.
W72-14172

IMPROVEMENT OF SOILS BY CULTIVATION IN THE NON-CHERNOZEM ZONE, (IN RUSSIAN).

Moskovskii rabochii: Moscow. 1970. 175 p. Illus.
Identifiers: Book, *Cultivation, *Fertility, Legume-D, *Nonchernozem soils, USSR.

The following topics were studied: the theoretical principles of deepening the arable layer of sod podzolic soils and improving its fertility, the methods for its improvement by cultivation, crop rotations, manuring, liming, the role of legumes in improvement of fertility, the cultivation and technical practices and regulation of the water regime of soils.--Copyright 1972, Biological Abstracts, Inc.
W72-14180

CERTAIN FEATURES OF RESPIRATORY METABOLISM OF PLANTS UNDER CONDITIONS OF AN INCREASING WATER DEFICIENCY, (IN RUSSIAN)
Kazan State Univ., (USSR).
L. K. Gordon, and A. A. Bichurina.
Dokl Akad Nauk SSSR Ser Biol. 192 (6): 1384-1386. 1970.
Identifiers: Water deficiency, *Glycolysis, *Respiratory metabolism, *Pentose phosphate, Phosphorus, Plants, Water, *Wheat-M.

Studies concerning the relation of individual respiratory pathways, glycolytic and pentose phosphate, in wheat plants showed that under moderate soil drought conditions the proportion of glycolysis in the overall respiratory balance increases. In severe drought the proportion of glycolysis drops and the pentose phosphate pathway predominates. The decrease on the part of glycolysis can apparently be related with a P shortage, which is usually observed when there is a marked water deficiency. P deficiency is one of the main factors limiting the glycolytic process.--Copyright 1972, Biological Abstracts, Inc.
W72-14195

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A STATISTICAL ANALYSIS OF BASE-FLOW FLOOD DISCHARGE DATA,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 02E.
W72-13700

REVIEW OF GEOHYDROLOGICAL ACTIVITIES IN THE NETHERLANDS SINCE WORLD WAR II, IN PARTICULAR OF THE GOVERNMENT INSTITUTE FOR WATER SUPPLY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
For primary bibliographic entry see Field 02F.
W72-13721

BURIED CHANNEL AQUIFERS AND PRESENT OPEN DRAINAGE SYSTEM OF EAST GELDERLAND, THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 02F.
W72-13722

RIPRAPPED BASINS FOR CULVERT OUTFALLS,
Colorado State Univ., Fort Collins; and Idaho Univ., Moscow.
For primary bibliographic entry see Field 08A.
W72-13751

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
For primary bibliographic entry see Field 02A.
W72-13824

FLOOD PLAIN INFORMATION, TALKEETNA RIVER-SUSITNA RIVER-CHULITNA RIVER, TALKEETNA, ALASKA.
Corps of Engineers, Anchorage, Alaska.

Flood Plain Report, June 1972. 28 p, 11 fig, 10 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Alaska, Regional flood, Flood forecasting, Flood control, Historic floods, Peak discharge, Flood profiles, Flood protection, Hydrologic data, Streamflow.
Identifiers: *Talkeetna (Alaska), Standard flood, Intermediate Regional flood.

Flooding from streams in the Talkeetna, Alaska area is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. The flood plain within the village of Talkeetna is occupied by residential and commercial developments. The railroad, highway, streets and utility lines, in addition to homes and businesses, are subject to flooding. This flood plain is only partially developed. Floods have occurred in September 1942 and August 1971. The 1942 flood is the highest of record (approximately 6 ft above flood stage) and is the only one that caused any significant damage. The Intermediate Regional flood rise is 8.3 ft above flood stage, and the Standard Project flood is 10.9 ft above flood stage. (Woodard-USGS)
W72-13836

TECHNIQUES OF STATISTICAL EVALUATION OF RUNOFF RESULTS OF PRECIPITATION MODIFICATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13841

CHANNEL NETWORK OF A BASIN AND FORMATION OF RUNOFF (RUSLOVAYA SET' BASSEYNA I PROTSESS FORMIROVANIYA STOKA VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W72-13853

HYDROLOGIC INVESTIGATIONS, COMPUTATIONS, AND FORECASTS (VOPROSY GIDROLOGICHESKIKH ISSLEDOVANIY, RASCHETOV I PROGNOZOV).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut, Trudy No 97, Moscow, 1970. 160 p.

Descriptors: *Hydrology, *Hydrologic aspects, *Hydrologic data, *Forecasting, *Runoff forecasting, Rainfall-runoff relationships, Meteorology, Hydrographs, Inflow, Discharge (Water), Storms, Floods, Snowmelt, Ice, Rivers, River basins, Watersheds (Basins), Reservoirs, Grasslands, Mudflows.
Identifiers: *USSR, *European USSR, *Ukraine, *Moldavia, Carpathian Mountains, Danube River, Nomograms, Isohyetal lines.

Of interest to hydrologists, planners, planners, and water management specialists, this collection of 12 papers analyzes space-time characteristics of rainfall and runoff, and problems encountered in the computation and forecast of total, maximum, and daily runoff of storm and snowmelt floods on a number of rivers in the Ukraine and Moldavia. Formation of annual runoff in the southwestern Ukraine and Modlavia is examined in connection with calculation of average annual streamflow of ungaged rivers of the region. Ice formation on lower reaches of the Danube, storm precipitation in the steppe zone of the European USSR, and catastrophic mudflows in the Ivano-Frankovk and L'vov Oblasts in the Carpathians in early June 1969 are also described. (Josefson-USGS)
W72-13854

FORMATION, CALCULATION, AND REGULATION OF STREAMFLOW (FORMIROVANIYE, RASCHETY I REGULIROVANIYE RECHNOGO STOKA).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut, Trudy No 100, Moscow, 1971. 176 p.

Descriptors: *Streamflow, *Runoff, *Regulations, Meteorology, Precipitation (Atmospheric), Snow, Ice, Storms, Surface waters, Reservoirs, Rivers, Flood data, Flood profiles, Groundwater, Discharge (Water), Hydrographs, Sedimentation, Erosion, Irrigated land, Spring.
Identifiers: *USSR, *European USSR, *Ukraine, *Moldavia, Dnieper River, Storm precipitation.

Of interest to hydrologists and workers in planning organizations and water management institutes, this collection of 15 papers provides information on the formation and regulation of spring and storm runoff on rivers in the Ukraine and Moldavia. Procedures used to compute spring flood-wave movement in reservoirs on the Dnieper River are described in connection with the 75-year flood which occurred on the Lower Dnieper between Kiev and Kakhovka in March-April 1970. Preparation of operational forecasts of daily discharges of the Dnieper near Kiev is described together with techniques for calculating maximum spring runoff on small rivers in Moldavia. Flood data obtained from devastating floods in the Dniester, Prut, Seret, and Tisa River basins in June 1969 and May 1970 are analyzed to define and interpret flood profiles. Also examined are storm precipitation patterns in irrigated regions in the southern part of the European USSR and reservoir sedimentation in Moldavia. (Josefson-USGS)
W72-13857

METHOD FOR PREVENTING WATER LOSS FROM RESERVOIRS AND CHANNELS,
Witco Chemical Corp., New York. (Assignee).
H. Goldstein, H. T. Ingram, and R. J. Kufrin.
U. S. Patent No 3,555,828, 3 p, 10 ref; Official Gazette of the United States Patent Office, Vol 882, No 3, p 991, January 19, 1971.

Descriptors: *Patents, Reservoirs, Channels, *Water loss, *Seepage control, *Reservoir leakage, *Elastomers, *Polymers, Water yield improvement.

A liquid elastomeric polymer coating is applied over the soil bed of the reservoir or channel. The coating is cured to form a conforming, continuous, thin, cohesive water-impermeable membrane which inhibits water loss due to seepage. Two examples of the method are described. (Sinha-OEIS)
W72-13889

SALT RIVER PROJECT 1971 ANNUAL REPORT.
Salt River Project, Phoenix, Ariz. Agricultural Improvement and Power District.
1971, Annual Report, 32 p. 8 tab, 39 fig.

Descriptors: *Multiple-purpose projects, *Multiple-purpose reservoirs, *Water utilization, *Electric power production, *Water management (Applied), Annual, Arid lands, Arizona, Electric power, Federal Reclamation Law, Agriculture, Watershed management, Water rights, Irrigation, Water storage, Reservoirs, Groundwater, Water supply, Power plants, Demand, Computer programs, Model studies, Mathematical models, Environmental effects, Operating costs, Economics, Income.
Identifiers: *Salt River Project.

The Salt River Project provides electricity to a 2,900 square-mile area in 3 Arizona counties, and is the first multi-purpose project authorized under the Federal Reclamation Act. The agricultural improvement district has an affilitated association which participates in the management of 13,000 square miles of the Salt and Verde watersheds, administering 250,000 acres for water rights, irrigation transmission and distribution to the Project's water for agricultural, municipal, and industrial use. This report summarizes the Project's 1971 progress with regard to using electric revenues to support its water and irrigation operations. Water storage in the six reservoirs went from 1,090,552 to 1,014,578 acre feet (af) throughout the year. Water use totalled 1,207,201 af, as 723,493 from surface reservoirs and 483,708 af from aquifers. Forecasting was simulated by a computer-based mathematical model. Electrical demands will increase by 27% by 1976. New generating plants will be needed. Development is meeting environmental concern. A detailed economic analysis is presented. (Popkin-Arizona)
W72-13913

SEEDBED PREPARATION AND SEEDING METHODS TO ESTABLISH GRASSED WATERWAYS,
Agricultural Research Service, Sidney, Mont.
F. H. Siddoway, and R. H. Ford.
Journal of Soil and Water Conservation, Vol 26, No 2, March-April 1971, p 73-76. 2 fig, 3 tab, 2 ref.

Descriptors: *Seeds, *Grasses, *Channels, *Stability, *Soil conservation, Stabilization, Watershed management, Soil types, Dry farming, Great Plains, Experimental farms, Fertilizers, Probability, Plant growth, Crop production, Mulching, Spring, Autumn, Weeds, Arid lands.

Grassed waterways, which stabilize soils, is one of several conservation practices used in dry-land farming in the north central Great Plains. Experiments were conducted to determine if practical and relatively rapid methods of waterway stabilization could be developed to minimize the need for reshaping. The experimental design was a randomized split plot, replicated three times, with six grass establishment methods and two fertilizer rates. Treatment differences did not produce a better than 5% level of probability in terms of resultant seedling stand, vigor and plant production. Mulched waterways were fairly stable on both spring- and fall-seeded plots where satisfactory grass stands were established. Fertilization enhanced grass growth for seedling and the following year. Weed growth from fertilization produced greater stability. Grass successfully competed with weeds. There was no demonstrable advantage to seeding either in spring or fall. (Popkin-Arizona)
W72-13914

POLITICS AND THE COLORADO RIVER,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 06E.
W72-13915

THE SOILS OF THE WOODED DISTRICT OF THE SOUTHEASTERN MORNE DEPARTMENT: SOIL FORMATION AND GENERAL DATA ON WATER MANAGEMENT,
Institut National de la Recherche Agronomique, Paris (France).
For primary bibliographic entry see Field 02G.
W72-13918

MAN--THE DESERT FARMER,
Arizona State Museum, Tucson.
For primary bibliographic entry see Field 03F.
W72-13919

FUTURE WATER USE MODEL OF UTAH VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
T. L. Huntzinger.
M.S. Thesis, December 1971. 206 p, 22 tab, 21 fig, 34 ref, computer programs. OWRR B-043-COLO (2).

Descriptors: *Water utilization, *Model studies, *Water management (Applied), *Alternative planning, *Water supply, Inter-basin transfers, Population, Urbanization, Industrial water, Water storage, Water conveyance, Water distribution (Applied), Forecasting, Water shortage, Colorado, Water demand.
Identifiers: *Utah Valley, Utah Lake.

The Utah Lake drainage area, along the western base of the Wasatch Mountains, is the site of Utah's most rapid population growth, industrial and urban expansion. There is no means of distributing excess water in the area. The Central Utah Project will provide additional water storage and conveyance to allow increased interbasin transfers and to distribute existing and imported water supplies. A model is presented of the water use and supply system in the area using water years 1945 to 1965 as a base; future water demands are estimated to the year 2020. The model accounts for changes in the water supply; shortages and surpluses under present and future conditions are determined. Various water management alternatives are evaluated. Computer listings, tables figures and references are abundantly presented (Popkin-Arizona)
W72-13928

DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 06A.
W72-13933

ENGINEERING AND ECONOMIC EVALUATION OF THE RELIABILITY OF WATER SUPPLY,
Mekoroth Water Co., Tel-Aviv (Israel). Research Div.
For primary bibliographic entry see Field 06D.
W72-13936

SANDUSKY HARBOR, ERIE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-13950

RED RIVER WATERWAY AND RED RIVER WATERWAY EMERGENCY BANK PROTECTION, MISSISSIPPI RIVER TO VICINITY OF INDEX, ARKANSAS, LOUISIANA, ARKANSAS, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 08A.
W72-13952

DIKED DISPOSAL AREA PROGRAM, DULUTH-SUPERIOR HARBOR, ST. LOUIS COUNTY, MINNESOTA AND DOUGLAS COUNTY, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-13954

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 08D.
W72-13955

LANEPORT, NORTH FORK AND SOUTH FORK LAKES, SAN GABRIEL RIVER, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-13956

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-13957

KINGSTREE BRANCH FLOOD CONTROL PROJECT, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.

Available from the National Technical Information Service as PB-206 101-D, $3.00 in paper copy. July 16, 1971. 35 p, 1 map, 2 tab.

Descriptors: *South Carolina, *Channel improvement, *Environmental effects, *Flood control, Land use, Non-structural alternatives, Canals, Dredging, Right-of-way, Flood damage, Community development, Flood plain zoning, Fisheries, Fish reproduction, Fish conservation, Reproduction.
Identifiers: *Environmental impact statement, *Kingstree Branch Project (SC).

The proposed project involves construction of a flood control project consisting of depth and width improvements to the existing canal at Kingstree, South Carolina. The construction and maintenance of the proposed project will have a long-term benefit with respect to flood damage. Measures will be taken to protect fish spawning grounds in the stream. Adjacent landowners will be required to furnish a portion of their property for construction and right-of-way purposes. Adverse environmental effects are limited to noise, dust, and inconvenience during project construction. Alternatives to the proposed plan which were studied included flood plain management, levees, reservoirs and alternative channel improvement schemes. The reduction in flood levels will enhance the long-term productivity of the adjacent lands by allowing them to be used to their fullest extent. Besides labor and material, the project contemplates no irretrievable commitment of resources. Comment was solicited and received from appropriate federal and state agencies. (Waldron-Florida)
W72-13960

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 791-D, $3.00 in paper copy. November 19, 1971. 12 p, 1 map, 4 illus, 2 dwg.

Descriptors: *Ohio, *Channel improvement, *Environmental effects, *Dredging, Coastal engineering, Turbidity, Sediment accumulations, Soil disposal fields, Water pollution sources, Navigable waters, Harbors, Lake Erie, Operation and maintenance, Breakwaters, Spoil banks, Alternate planning, Water pollution.
Identifiers: *Environmental impact statement, *Fairport Harbor (Ohio).

The work under consideration is the maintenance of completed channels and structures in the deep-draft navigation project for Fairport Harbor, Ohio. The project involves the maintenance of breakwaters and the dredging of about 400,000 cubic yards of sediment annually and dumping the material into Lake Erie. Dredging will cause short-term increases in turbidity and sedimentation in both dredging and disposal areas. The project will accelerate the introduction of polluted sediment into Lake Erie. Temporary turbidity is expected during working periods. Alternatives are either the discontinuance of maintenance or the construction of enclosed disposal areas. Dredging and maintenance are continuing activities with both short-term and long-term aspects which are not in conflict. The project contemplates no irretrievable commitment of resources. Comment has been solicited from interested federal, state and local agencies. (Waldron-Florida)
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 787-D, $3.00 in paper copy. November 9, 1971. 10 p, 5 map, 1 dwg.

Descriptors: *Ohio, *Channel improvement, *Environmental effects, *Breakwaters, Operation and maintenance, Dredging, Coastal engineering, Turbidity, Sediment accumulations, Soil disposal fields, Water pollution sources, Navigable waters, Harbors, Lake Erie, Spoil banks, Water pollution.
Identifiers: *Environmental impact statement, *Lorain Harbor (Ohio).

The work under consideration is the maintenance of completed channels and structures in the deep-draft navigation project for Lorain Harbor, Ohio. The project calls for the maintenance of breakwaters and the dredging of about 300,000 cubic yards of sediment annually and dumping in Lake Erie. Dredging will cause short-term increases in turbidity and sedimentation, both in dredging and disposal areas. The disposal of dredged material will cause adverse effects to the extent that polluted material is placed in Lake Erie at a more rapid rate than would result from natural processes. Alternatives are either discontinuance of maintenance or provisions for an enclosed disposal area. Dredging and maintenance are continuing activities with both short-term and long-term aspects which are not in conflict. No irretrievable commitment of resources is involved. (Waldron-Florida)
W72-13962

LITTLE RIVER INLET, NORTH CAROLINA AND SOUTH CAROLINA, NAVIGATION IMPROVEMENTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.

Available from the National Technical Information Service as PB-206 056-D, $3.00 in paper copy. December 30, 1971. 24 p, 1 map, 2 tab.

Descriptors: *North Carolina, *Environmental effects, *Navigation, *Channel improvement, Coastal engineering, Commercial fishing, Recreation, Project purposes, Project benefits, Sand, Turbidity, Inlets (Waterways), Jetties, Dikes, Coasts, Beaches, Atlantic Ocean.
Identifiers: *Environmental impact statement, *Little River Inlet (NC), Coastal waters.

The project consists of channel improvement; dredging a deeper, more stable channel; and construction of jetties and sand transition dikes in order to improve navigability of the Little River Inlet along the North Carolina-South Carolina border opening to the Atlantic Ocean. Dredged material will be utilized in building the dikes and for nourishment of adjacent beaches. Difficulties with navigation at present stem from inadequate depths and rapid channel alignment shifts. Approximately 1,141,000 cubic yards of material will be dredged. The major environmental impact will be that of latering the hydrology of the Inlet to improve navigation, with benefits to commercial fishing and recreation boating. A minor adverse impact upon the marine life and fish habitat will take place as a result of turbidity from the dredging. The only alternatives considered were no project and dredging by itself, which proved uneconomical and physically unfeasible. Included are comments from interested agencies and a general map of the inlet and the project. (Brackins-Florida)
W72-13964

AQUATIC PLANT CONTROL PROGRAM, HUDSON AND MOHAWK RIVERS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-200 003-F, $3.00 in paper copy. August 2, 1971. 17 p.

Descriptors: *Spraying, *Hudson River, *Weed control, *Vegetation effects, Recreation, Velocity, *New York, Weeds, Application methods, Fish management, Mosquitoes, Nutrients, River flow, Aquatic environment, Administrative agencies, Vectors (Biological), Public health.
Identifiers: *Environmental impact statement, *Hudson and Mohawk Rivers (New York), *Waterchestnut.

The authorized project provides for work leading to the control and progressive eradication of waterchestnut in and from the waters within the Hudson and Mohawk Rivers by hand-pulling and hand and boat-spraying. The control of waterchestnut would increase recreation activity, maintain adequate water velocities for in-take systems, control mosquito and blackfly problems and increase fish production. As the dying waterchestnut plants start to deteriorate there is a nutrient release into the water, and tremendous duckweed blooms form. Usually the tide pulls the duckweed out of the bays into the open river, creating long green streaks that are quite noticeable. The only successful alternative to the use of boat or hand-sprayed 2,4-D is pulling the weeds by hand and removing them from the water. The program might have favorable biological effects by freeing fish passages and food sources for waterfowl. Other than material and labor costs there does not appear to be any irreversible or irretrievable commitment of resources over a period of time. (Waldron-Florida)
W72-13967

STUART GULCH DAM, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 08D.
W72-13968

DYNAMICS OF FLOOD FREQUENCY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02E.
W72-14003

CALIFORNIA HIGH WATER, 1969-1970,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 02E.
W72-14013

HYDROLOGIC COMPUTATIONS AND FORECASTS (VOPROSY GIDROLOGICHESKIKH RASCHETOV I PROGNOZOV).

Gosudarstvennyy Gidrologicheskiy Institut, Trudy No 193, Leningrad, 1971. 136 p.

Descriptors: *Hydrology, *Hydrologic aspects, *Hydrologic data, *Forecasting, *Runoff forecasting, Discharge (Water), Floods, Reservoirs, Rivers, River basins, Deltas, Channels, Water levels, Water balance, Precipitation, intensity, Snow cover, Hydrographs, Correlation analysis, Regression analysis, Analytical techniques.
Identifiers: *USSR, *Neva River, Hydrometric stations.

This collection of 10 papers contains the results of investigations carried out in recent years by the Department of Hydrologic Forecasts of Leningrad State Hydrologic Institute. Hydrologic computations are described in connection with calculations of maximum water levels of the Neva River flowing from the southwest corner of Lake Ladoga into the Gulf of Finland. The accuracy of long-range forecasts of annual and spring-flood runoff is examined together with techniques for short-range forecasts of various items in the water balance. (Josefson-USGS)
W72-14038

DELAYED YIELD AND UNSATURATED FLOW ABOVE A FALLING WATER TABLE,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02G.
W72-14052

UNSTEADY FLOW OF GROUND WATER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02F.
W72-14053

HYDROGEOLOGICAL STUDIES IN THE CAPTATION AREA OF THE LOISACH RIVER BETWEEN GARMISCH-PARTENKIRCHEN AND ESCHENLOHE/OBB,
Bayerische Akademie der Wissenschaften, Munich (West Germany).
For primary bibliographic entry see Field 02E.
W72-14148

STUDIES ON THE COURSE OF LITTER DECOMPOSITION IN A HUNGARIAN QUERCETUM-PETRAEAE-CERRIS FOREST STAND,
Eotvos Lorand Univ., Budapest (Hungary). Inst. for Systematic Zoology.
G. Gere.
Pedobiologia, 11 (5): 369-375, 1971.
Identifiers: Alder-D, Ash-D, Beech-D, *Decomposition, Forest litter, *Hungary, Oak-D, Quercetum-Petraea-Cerris.

A study is reported of litter decomposition in a forest near Budapest, Hungary. After the fall of leaves, the dropped material was weighed, then covered with wire netting, and weighed again at intervals. The weight of the material diminished by 20% in the 1st yr, and the remaining material lost 40% of its weight in the 2nd yr. At the end of the 3rd yr very little was left. The comparatively rapid litter decomposition under Hungarian conditions is attributed to the constant moisture content of the soil. Ordinarily oak and beech leaves decompose quite slowly, while alder and ash leaves rot rapidly.--Copyright 1972, Biological Abstracts, Inc.
W72-14165

4B. Groundwater Management

GROUND WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13715

GEOHYDROLOGICAL INVESTIGATIONS WITH A VIEW TO GROUNDWATER CATCHMENT--A CASE HISTORY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
J. M. G. Van Damme.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 11-34, 1972. 24 fig, 4 tab, 15 ref.

Descriptors: *Hydrogeology, *Water yield, Drawdown, Water quality, Analog models, Mathematical models, Transmissivity, Glacial drift.
Identifiers: *Netherlands.

Geohydrological procedures for the establishment of a pumping station in the Netherlands, for the well field at Beerschoten (provincie of Utrecht, The Netherlands), are reviewed. The area concerned is located on the western slope of ice-pushed hills forming the Utrecht Ridge. The subsoil consists predominantly of Pleistocene sandy deposits of fluviatile origin, with local layers. The groundwater requires only a simple treatment. The transmissivity of the aquifer from which the water will be withdrawn amounts to 3500 sq m/day. On the basis of subsequent studies carried out by means of a mathematical method and electrical model tests, the consequences of the withdrawal for the groundwater table were predicted. The practical sustained yield in this area depends only on the drawdown due to the withdrawal and on the decrease of underground flow to drainage ditches. (Knapp-USGS)
W72-13723

FRESH WATER WINNING AND SALT WATER ENCROACHMENT IN THE AMSTERDAM DUNE WATER CATCHMENT AREA,
Amsterdam Water Works (Netherlands).
A. J. Roebert.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 35-44, 1972. 6 fig, 4 tab, 9 ref.

Descriptors: *Artificial recharge, *Water pollution control, *Withdrawal, *Saline water intrusion, *Hydrogeology, Water resources development, Water yield, Aquifer characteristics, Groundwater movement, Water supply, Path of pollutants.
Identifiers: Amsterdam (The Netherlands).

In the Amsterdam dune-water catchment area, a fresh-water lens of some 40 to 90 m thickness is resting on salt water in the lower aquifer. Water extraction from the lower aquifer has disturbed the fresh-water/salt-water interface, extending it into a zone of dispersed, brackish water. For many years, the extraction area has been overdrawn. With the introduction, in 1957, of artificial recharge through infiltration of Rhine water into the upper aquifer, water extraction from the lower aquifer with upconing of brackish water, was virtually stopped. The lower aquifer, however, still holds a vast stock of fresh water, which, if developed by a system of intermittent extraction, could substantially contribute to the water supply of the greater Amsterdam area. (Knapp-USGS)
W72-13724

THE USE OF GEOHYDROLOGY IN SOLVING WATER MANAGEMENT PROBLEMS IN AGRICULTURE,
Institute for Land and Water Management Research Wageningen (Netherlands).
J. Wesseling, and H. J. Colenbrander.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 71-84, 1972. 15 fig, 30 ref.

Descriptors: *Hydrogeology, *Water resources development, *Reviews, *Water management (Applied), Drainage engineering, Irrigation water, Agriculture, Agricultural watersheds.
Identifiers: *Netherlands.

For the study of water management problems in agriculture, often the same hydrologic parameters and calculation techniques are applicable as for civil engineering studies and water supply studies. Therefore, arbitrary subdivision of hydrology into agro-hydrology, geohydrology, and others does not always make sense. Groundwater flow in drained areas is determined to a large extent by hydrological conditions. For estimating net subsurface flow, two methods are discussed: the indirect method, in which transmissivity of the underlying aquifer and the vertical resistance of the covering layer are determined; and direct methods in which data on piezometric head or discharge data from pumping plants are used. In the higher parts of the Netherlands the hydrologic aspects are closely related to the conservation of water for agricultural purposes and the extraction of groundwater for domestic and industrial use. (Knapp-USGS)
W72-13726

RECENT DEVELOPMENTS OF PHYSICAL INVESTIGATIONS IN BOREHOLES AND WELLS,
Waterloopkundig Laboratorium, Delft (Netherlands).
F. Walter.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 121-130, 1972. 7 fig, 1 tab, 6 ref.

Descriptors: *Borehole geophysics, *Hydrogeology, *Reviews, Radioactive well logging, Electrical well logging, Subsurface investigations, Monitoring.
Identifiers: *Netherlands.

Well logging methods and physical borehole investigations have come into use for geohydrological reconnaissance in The Netherlands in recent years. In open uncased boreholes the following features are logged: spontaneous potential, resistivity, natural gamma radiation, and diameter. Interpretation methods are reviewed briefly. Reference is made to investigation methods in observation and discharging wells. Permanent electrode systems can be used for monitoring groundwater salinity. (Knapp-USGS)
W72-13727

TEST-OBSERVATION WELL NEAR DAVENPORT, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
D. A. Myers.
Geological Survey Open-file Report, 1972. 23 p, 3 fig, 4 tab, 3 ref.

Descriptors: *Test wells, *Observation wells, *Aquifer characteristics, *Hydrologic data, *Washington, Pumping, Water yield, Specific capacity, Drawdown, Logging (Recording), Hydraulic gradient, Groundwater movement, Water levels, Water resources development, Irrigation.
Identifiers: *Davenport (Wash.).

The 750-foot test-observation well drilled near Davenport, Wash., provides information on aquifer characteristics in the area. The well was drilled by air-rotary methods and penetrates eight aquifer zones (A through H); the upper 75 feet of

the well is cased, and the remainder of the hole is open in basalt. Test pumping during drilling showed that the well had specific capacities of (1) 4.8 gpm per foot of drawdown when at the 255-foot depth and open to aquifers A through D, (2) 5.6 gpm per foot of drawdown when at the 640-foot depth and open to aquifers A through G, and (3) 76.5 gpm per foot of drawdown when at the full 750-foot depth and open to all eight aquifers. Most of the water available to the well is from the deepest aquifer (zone H). Borehole geophysical logging supplemented the driller's log of the well and provided information on natural gamma radiation, water temperature and resistivity, and borehole diameter. In the completed well each aquifer is isolated by cement seals, and piezometer pipes installed to zones B through H allow a basis for defining the vertical hydraulic gradient, groundwater movement and chemical quality in the area. (Woodard-USGS)
W72-13733

ELECTRIC ANALOG STUDIES OF FLOW TO WELLS IN THE PUNJAB AQUIFER OF WEST PAKISTAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-13735

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.
For primary bibliographic entry see Field 06D.
W72-13740

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 06B.
W72-13823

NONSTEADY FLOW IN A RECHARGE WELL--UNCONFINED AQUIFER SYSTEM,
California Univ., Los Angeles.
For primary bibliographic entry see Field 02F.
W72-13828

GENERAL GROUND-WATER QUALITY IN FRESH-WATER AQUIFERS OF DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13832

GEOLOGY AND GROUND WATER, UNIVERSITY OF DELAWARE, NEWARK, DELAWARE,
Delaware Geological Survey, Newark.
K. D. Woodruff, J. C. Miller, R. R. Jordan, N. Spoljaric, and T. E. Pickett.
Report of Investigations No 18, May 1972. 40 p, 11 fig, 2 tab, 17 ref.

Descriptors: *Groundwater resources, *Hycrogeology, *Aquifers, *Water wells, *Delaware, Geology, Aquifer characteristics, Water yield, Water quality, Chemical analysis, Water resources development, Water levels, Pumping, Drawdown, Transmissivity, Specific capacity, Hydrologic data.

The results of an intensive groundwater study on University of Delaware lands in the Newark area revealed additional sources of available groundwater. Geophysical techniques, air-photo interpretation, studies of existing data, field mapping, test drilling, and pump tests were used as the bases for guiding additional well development. The study, conducted by the Delaware Geological Survey, was a cooperative effort between the University of Delaware and the City of Newark in response to mutual water supply problems. A potential groundwater yield of about 500 gpm (gallons per minute) was discovered on the University Laird Tract in the Piedmont Province. Groundwater available from other locations in the Coastal Plain portion of the study area may total about 175 gpm. However, careful well development and proper well spacing will be necessary to obtain optimum yields. (See also W72-13832 and W72-13834) (Woodard-USGS)
W72-13833

NITRATE CONTAMINATION OF THE WATER--TABLE AQUIFER IN DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13834

GROUND-WATER GEOLOGY OF THE DELAWARE ATLANTIC SEASHORE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 02F.
W72-13835

GROUND-WATER OUTFLOW FROM CHINO BASIN, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-13838

EXPERIMENTAL INJECTION OF TERTIARY--TREATED SEWAGE IN A DEEP WELL AT BAY PARK, LONG ISLAND, N. Y.--A SUMMARY OF EARLY RESULTS,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 05B.
W72-13839

SEA WATER INTRUSION: MORRO BAY AREA, SAN LUIS OBISPO COUNTY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 02L.
W72-13846

GROUND-WATER OCCURRENCE IN THE MARYLAND PIEDMONT,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 02F.
W72-13848

WATER LAW--GROUNDWATER RIGHTS IN MISSOURI--A NEED FOR CLARIFICATION (HIGDAY V. NICKOLAUS),
For primary bibliographic entry see Field 06E.
W72-13939

U234/U238 DISEQUILIBRIUM IN GROUNDWATERS OF CENTRAL TEXAS,
Rice Univ., Houston, Tex. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W72-13971

AN INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 06D.
W72-13993

GROUNDWATER RESOURCES OF SALINE COUNTY, MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-14011

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1972,
Geological Survey, Salt Lake City, Utah.
C. T. Sumsion.
Utah Division of Water Resources Cooperative Investigations Report No 10, 1972. 73 p, 37 fig, 2 tab, 8 ref.

Descriptors: *Groundwater resources, *Hydrologic data, *Basic data collections, *Utah, Aquifer characteristics, Water wells, Water utilization, Water supply, Water yield, Withdrawal, Groundwater recharge, Water table, Water level fluctuations, Water quality, Precipitation (Atmospheric), Hydrogeology.

The estimated withdrawal of water from wells in Utah in 1971 was 710,000 acre-feet, or about 30,000 acre-feet more than for 1970. In 1971, precipitation was above normal in 6 of the State's 7 divisions. Precipitation in the north-central division was 3.85 inches above normal and 0.29 inch above normal in the south-central division; these two divisions include most of the major areas of groundwater development in the State. The southeast division suffered a deficiency of 0.30 inch during 1971. From February-March 1971 to February-March 1972, groundwater levels generally declined in southwestern Utah because more groundwater was withdrawn for irrigation, and rose in northern Utah where more surface water was available for irrigation. Conditions in the central part of the State were variable, and no consistent pattern of water-level change is evident. Groundwater development and changes in groundwater conditions in the major areas of groundwater development are summarized. (Woodard-USGS)
W72-14023

RECORDS OF WELLS IN HARRIS COUNTY, TEXAS, 1892-1972,
Geological Survey, Austin, Tex.
R. K. Gabrysch, W. L. Naftel, G. D. McAdoo, and C. W. Bonnet.
Geological Survey Open-file Report (Texas District), 1972. 170 p, 11 fig, 7 ref.

Descriptors: *Well data, *Groundwater resources, *Basic data collections, *Logging (Recording), *Texas, Surveys, Aquifers, Water levels, Water utilization.
Identifiers: *Harris County (Tex), *Well inventory.

Records are presented for 2,635 wells in Harris County, Texas, as part of the well inventory from 1929 to 1972. In addition to the tables of well data, maps are included which show the location and water use for each well. (Woodard-USGS)
W72-14027

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 06D.
W72-14028

DEVELOPMENT OF GROUND WATER IN THE EL PASO DISTRICT, TEXAS, 1963-70,
Geological Survey, El Paso, Tex.
For primary bibliographic entry see Field 02F.
W72-14029

POTENTIALS FOR DESALTING WATER IN THE TULAROSA BASIN, NEW MEXICO - A CASE STUDY,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 03A.
W72-14059

EFFECT OF PUMPING FRESHWATERS INTO OIL STRATA OF THE PERM PRIKAMJE ON THE DISTRIBUTION OF MICROFLORA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 05C.
W72-14135

CROPPING PATTERN IN RELATION TO WELL IRRIGATION,
Ranchi Univ. (India).
For primary bibliographic entry see Field 03F.
W72-14150

4C. Effects on Water of Man's Non-Water Activities

EFFECTS OF LAND USE ON MUNICIPAL WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
T. E. Maki, and W. L. Hafley.
Available from the National Technical Information Service as PB-211 862, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 71, July 1972, (UNC-WRRI-72-71). 224 p, 66 fig, 15 tab, 60 ref. OWRR B-010-NC (3).

Descriptors: *Land use, *Watershed management, *Water yield, *Water quality, *Water supply, Small watersheds, Water conservation, Water pollution sources, *North Carolina.
Identifiers: *Durham, *North Carolina, *Lake Michie watershed (NC), Durham (NC).

A study of the Lake Michie Watershed, the source of water for the municipality of Durham, North Carolina, is reported. The study was concerned with evaluating the effects of land use on water quality, quantity, and timing of flow during the 43-year period since the establishment of the lake. The characteristic composition of the soils and the vegetative cover and their influence on the hydrology of the basin are discussed. Through the interpretation of aerial photographs, Agricultural Census Data and other historic documents, the nature of land use changes within the watershed have been traced. An interpretation of the influence of these land use changes is offered. Current status of the watershed is detailed and recommendations presented for improving the quality of the water and the general hydrologic characteristics of the watershed. The study highlights the problems encountered by a Water Resources Department that must manage water availability on a watershed where it is not the major land owner.
W72-13759

PROCEDURES FOR ESTIMATING THE HYDROLOGIC IMPACT OF URBANIZATION,
Regional Science Research Inst., Philadelphia, Pa.
T. R. Hammer.
Regional Science Research Institute Contract Report to OWRR, September 1971. 33 p, 3 fig. OWRR Contract C-2174 (3406) (1).

Descriptors: *Rainfall-runoff relationships, *Urban hydrology, *Urbanization, *Storm runoff, Storm drains, Infiltration, Urban runoff, Storm water, Urban drainage, Suburban areas, *Pennsylvania.
Identifiers: *Philadelphia (Penn).

The results of a recent study of the hydrologic impact of urbanization are stated in a form that may be readily applied to planning situations or to the estimation of current effects of urbanization. Conversion of land to impervious surface increases storm runoff by preventing infiltration of rainwater into the soil and by eliminating surface depressions which would provide storage; consequently, the peak streamflow accompanying a storm of a given magnitude is increased. This process is assisted by the drainage alterations which typically accompany urbanization, such as the provision of storm sewerage, which speed runoff to the stream and thus prevent its infiltration or detention in some area other than the source area. Stream channel cross-section area appears to increase, in response to urbanization, in the same proportion as the increase in the average annual flood. This is the flood flow which is equalled or exceeded every 2.33 years on the average. An impervious area index is employed along with a basin slope factor to estimate channel enlargement and peak flow increase. The index may be estimated on the basis of limited information which is likely to be available. The two types of information considered here are: (1) the information contained in U.S. Geological Survey 7 1/2 inch quadrangle maps, and (2) the number of persons per square mile in the watershed in question. (Knapp-USGS)
W72-14002

4D. Watershed Protection

SEEDBED PREPARATION AND SEEDING METHODS TO ESTABLISH GRASSED WATERWAYS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 04A.
W72-13914

WINNEBAGO-BEAN CREEK WATERSHED, RICHARDSON COUNTY, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-201 254-D, $3.00 in paper copy. June 1971. 12 p.

Descriptors: *Nebraska, *Environmental effects, *Stabilization, *Watershed management, Erosion control, Sedimentation, Multiple-purpose projects, Gully erosion, Detention reservoirs, Sediment control, Dams, Spillways, Administrative agencies, Decision making, Project planning, Wildlife habitats, Waterfowl, Recreation, Flooding, Flood protection, Flood control.
Identifiers: *Environmental impact statement, *Winnebago-Bean Creek Watershed (Neb).

The project, located in Richardson County, Nebraska, involves conservation land treatment within the watershed supplemented by 16 grade stabilization structures. The project will have the following environmental impacts: reduce erosion and sediment delivery to the Missouri River from this watershed, reduce gully development in 16 problem areas, protect 1,620 acres from depreciation or destruction by gully development, reduce damages to roads and bridges, and create about 74 acres of water surface that can be used for fishing and other water-based recreation activities, and as a feeding and resting place for migratory waterfowl. Adverse impacts include: elimination of agricultural use and wildlife habitat on 74 acres in the sediment pools, elimination of agricultural and wildlife use in the 19 acres of construction areas until the areas are revegetated after construction, and inundation of about 6 miles of intermittent streams. Alternatives considered include conservation land treatment alone, converting all cropland in the 16 problem areas to grass, and several combinations of different types of structural measures. Irreversible and irretrievable commitments of resources include the land for the sediment pools, dams and spillways, and detention pools and approximately 6 miles of intermittent stream channels inundated by the planned sediment pools. (Widman-Florida)
W72-13951

WINNEBAGO-BEAN CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-201 254-F, $3.00 in paper copy. November 1971. 33 p, 3 map, 2 tab.

Descriptors: *Nebraska, *Soil conservation, *Stabilization, *Environmental effects, Missouri River, Watershed management, Erosion control, Water conservation, Structures, Sediment yield, Land development, Water conservation, Structures, Wildlife habitats, Non-structural alternatives, Administrative agencies, Crop production, Sedimentation.
Identifiers: *Environmental impact statement, *Winnebago-Bean Creek Watershed (Neb).

The project involves conservation land treatment within the Winnebago-Bean Creek watershed supplemented by 16 grade stabilization structures. The project will reduce erosion and sediment delivery to the Missouri River from this watershed, protect 2,570 acres by gully development, reduce damages to roads and bridges, and create about 74 acres of water surface that can be used for fishing and other water-based recreation activities, and as a feeding and resting place for migratory waterfowl. There will be a 50 percent reduction in the amount of sediment delivered to the Missouri River from this watershed. The project will have the following adverse impacts: eliminate agricultural use and wildlife habitat on 74 acres of cropland, woodland and pasture used in the sediment pools; eliminate agricultural and wildlife use on 19 acres used for spillways and dams; innundation of 90 acres in the detention pools; and innundation of six miles of intermittent streams. Alternatives considered include: conservation land treatment alone, converting all cropland in the 16 problem areas to grass, and several combinations of different types of structural measures. (Waldron-Florida)
W72-13966

THEORY OF STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14007

EROSION CONTROL PRACTICES IN PRIMARY CULTIVATION OF SOIL ON SLOPES OF THE CARPATHIANS, (IN RUSSIAN),
Y. H. Khudyk.
Visn Sil'S'Kohospod Nauk. 7. 47-50. 1970.
Identifiers: Arable land, Carpathians, *Erosion control, *Cultivation, Ridging, *Slopes, Soils, USSR.

Deepening of the arable layer on the slopes with subsoilers reduced erosion by 26.4-37.2%, while subsoiling together with ridging reduced it by 39-48.2% in comparison with ordinary winter plowing across the slope. Leaving the stubble without plowing until spring resulted in soil erosion of 11 m3/ha during autumn-spring on steep, heavily eroded slopes and water divides.--Copyright 1972, Biological Abstracts, Inc.
W72-14170

EROSION-AMELIORATIVE INVESTIGATIONS OF SOILS IN KAZAKHSTAN, (IN RUSSIAN),
R. Dzhanpeisov.
Tr Inst Pochvoved Akad Nauk Kaz SSR. 19: 3-23. 1970.
Identifiers: Aggregates, Amelioration, Chemicals, Colloids, *Erosion control, *Kazakhstan, *Soils, USSR.

Water and wind erosion of soils is regional-zonal. The type of soil erosion is controlled by relief-forming processes, the colloid-chemical composi-

tion of soil aggregates and man's economic activity. With respect to the aggregate-formation type, soils on the medium high mountains of southern and southeastern Kazakhstan are ferruginous-argillaceous-fulvate-humate; soils on piedmont plains and northern steppes are loose humate, and soils in desert areas are loose calcareous-argillaceous. Their resistance to erosion declines accordingly.--Copyright 1972, Biological Abstracts, Inc.
W72-14174

05. WATER QUALITY MANAGEMENT AND PROTECTION

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES - VOL II.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.

Copy available from GPO Sup Doc EP2.10:17050 DDY 12/71 $2.75; microfiche from NTIS as PB-211 910, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971, 361 p. EPA Program 17050 DDY 12/71.

Descriptors: *Biological treatment, *Trickling filters, *Bibliographies, Filters, Waste water treatment, Filtration, Reviews, Aerobic treatment, Treatment facilities, Industrial wastes, Municipal wastes.

A bibliography of 5,665 references relating to biological trickling filters studies was presented. Author references were listed in alphabetical sequence based upon the surname of the author. Anonymous articles were listed after the alphabetical author sequence, according to the alphabetical sequence of the journal, and chronologically within the journal. (See also W72-13638) (Galwardi-Texas)
W72-13639

5A. Identification of Pollutants

SIZE DISTRIBUTION OF BACTERIAL CELLS,
Science Spectrum, Inc., Santa Barbara, Calif.
V. R. Stull.
Journal of Bacteriology, Vol 109, No 3, p 1301-1303, March 1972. 4 fig, 4 ref.

Descriptors: *Bacteria, *Distribution, *Measurement, *Methodology, *Size, Instrumentation, Sampling, Laboratory equipment, Cultures, Microscopy, Photometry.
Identifiers: *Differential light scattering, Lasers, Staphylococcus epidermidis.

In a current research program to develop a basis for rapid identification of bacteria via differential light-scattering measurements, an empirical method for determining cell size and size distribution has been derived. The measurements are made with a laser light-scattering photometer which scans and records the differential light-scattering pattern of a single bacterium held fixed within the laser beam. The instrument uses an Argon-ion laser, tuned to a wavelength of 0.5145 micron. The cells are injected pneumatically from a nebulizer into the scattering chamber where they are viewed through a low-power microscope. The individual bacteria are brought into the laser beam by manual adjustment of the electric fields between the plate and point electrodes and then held in position by an automatic servomechanism. A detector system employing photomultiplier is rotated by motor-drive about the suspended particle and the light-scattering pattern is recorded graphically. Sample preparation involves (1) culturing the microbes on fresh culture media for a known period of time and at a known temperature; (2) incubating cultured cells; (3) washing with cold distilled water; and (4) storing cell suspensions at 0 degree C in distilled water until samples are transferred to the nebulizer. (Long-Battelle)
W72-13667

AN AUTOMATED LIQUID CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF TETRACYCLINE ANTIBIOTICS,
American Cyanamid Co., Pearl River, N.Y. Lederle Labs.
P. P. Ascione, J. B. Zagar, and G. P. Chrekian.
Journal of Chromatography, Vol 65, No 2, p 377-386, February 23, 1972. 6 fig, 4 tab, 19 ref.

Descriptors: *Automation, *Separation techniques, *Pollutant identification, Antibiotics (Pesticides), Organic pesticides, Instrumentation, Laboratory equipment, Flow rates, Spectrophotometry, Methodology, Solvent extractions, Statistical methods, Chemical analysis.
Identifiers: *Liquid chromatography, *Tetracycline antibiotics, Column chromatography, Chlortetracycline HCl, Tetracycline HCl, Demethylchlortetracycline HCl, Precision, Accuracy, Sample preparation, Absorbance.

A liquid chromatographic method for the determination of tetracycline antibiotics has been automated. A valve arrangement is used through which 20-30 samples are applied sequentially at a flow rate of 5 ml/min on a single column for chromatographic analysis. The components eluted from the column are automatically analyzed (12 samples/hr) by monitoring the column eluate with calcium Lactate-morpholine (CIM) through a spectrophotometric flow cell of a spectrophotometer. For the tetracyclines studied, the wavelengths where maximum absorption occured when the CIM reagent was introduced into the tetracycline-chromaphoric system were as follows: demethylchlortetracycline, 390 nm; tetracycline, 385 nm; chlortetracycline, 393 nm. A statistical study for precision and accuracy was made using 24 replicates and quadruplicate assays, respectively. The overall precision had a coefficient of variation of 1.01 with a standard error estimated to be 0.144. This method is applicable to crystalline tetracycline antibiotics and their various pharmaceutical dosage forms. (Long-Battelle)
W72-13669

A MODIFIED PLASTIC BAG COMBUSTION TECHNIQUE FOR THE RADIOASSAY OF C-14 AND H-3 IN BIOLOGICAL TISSUES,
Huntingdon Research Centre (England). Dept. of Metabolic Studies and Organic Synthesis.
J. D. Lewis.
International Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 39-40, January 1972. 1 fig, 5 ref.

Descriptors: *Radiochemical analysis, *Tritium, Carbon radioisotopes, Laboratory equipment, Oxygen, Methodology, Freeze drying, Chemicals, Pesticides, Bioassay, Chemical analysis, Chemical reactions, Radioactivity techniques.
Identifiers: *Biological samples, *Combustion techniques, *C-14, Hexadecane, Scintillation counting, Sample preparation, Tissue, Blood, Precision, H-3.

The modified plastic bag combustion technique for the radioassay of Carbon-14 and tritium in biological tissues is applicable to large and small freeze-dried samples. The advantages for using a plastic bag combustion chamber instead of a flask include: (1) disposability of the plastic bags; (2) ease in decontamination of the apparatus; and (3) elimination of the explosion hazard. Samples are placed in a polythene-nylon bag and ignition is accomplished with a projector lamp bulb. When combustion is complete, 10.0 ml of liquid scintillation fluid is injected into the bag and allowed to equilibrate for 30 minutes. A five-ml aliquot is then removed for counting. The combusion of labelled n-hexadecane added to tissue or blood yielded overall recoveries of 90-92 percent tritium and 98-99 percent for C-14. Similar results have been obtained for a wider range of labelled drugs, pesticides, and industrial chemicals. (Long-Battelle)
W72-13670

EVALUATION OF METHODS FOR DETECTION OF COLIFORM BACTERIA IN RAW MILK,
Arizona Univ., Tucson. Dept. of Dairy and Food Sciences.
J. A. Moura Fe, and F. E. Nelson.
Journal of Milk and Food Technology, Vol. 35, No. 2, p 67-70, February 1972. 4 fig, 2 tab, 19 ref.

Descriptors: *Methodology, *Coliforms, *Evaluation, *Milk, Cultures, E. coli, Sampling, Water pollution sources, Pollutant identification, Enteric bacteria.
Identifiers: Aerobacter aerogenes, Escherichia freundii, Most probable number test, Biochemical tests, Culture media, Violet Red Bile agar, Lauryl Sulfate Tryptose broth.

Various methods have been used for detecting coliforms in mild and food. Milk samples were taken from farm bulk tanks in both summer and winter. Total coliform populations were estimated by counting cells grown on Violet Red Bile agar (VRB) at 32 degrees C and on Lauryl Sulfate Tryptose Broth (LST) incubated at 37 degrees C. LST favored recovery of Aerobacter aerogenes, the IMViC-irregular types, and the majority of bacteria which produced ropiness. Escherichia coli, incubated at 44.5 C on EC medium, showed no constant relationship to total coliform numbers and was the most numerous organism detected. Plates of VRB and 5-5ube serial dilutions of LST broth gave similar total coliform estimates in milk. (Long-Battelle)
W72-13671

CHARACTERIZATION OF GAS CHROMATOGRAPHIC EFFLUENTS VIA SCANNING FLUORESCENCE SPECTROMETRY,
Harvard Univ., Cambridge, Mass. Coolidge Chemical Lab.
D. J. Freed, and L. R. Faulkner.
Analytical Chemistry, Vol. 44, No. 7, p 1194-1198, June 1972. 4 fig, 1 tab, 17 ref.

Descriptors: *Gas chromatography, *Effluents, Fluorescence, Instrumentation, Laboratory equipment, Fluorometry, Sampling, Aromatic compounds, Pollutant identification.
Identifiers: *Characterization, *Scanning fluorescence spectrometry, Anthracene, Pyrene, Naphthalene, Chemical interference, Phenanthrene, Aromatic hydrocarbons.

A simple technique for the detection and identification of gas chromatographic effluents involves the direct coupling of a gas chromatograph to a fast-scanning fluorescence spectrometer. Samples of the aromatic hydrocarbons naphthalene, phenanthrene, anthracene, and pyrene were analyzed by this technique. A 200-800 nm spectral range was continuously scanned at 5-sec intervals at 150 nm/sec in order to prevent distortions as a result of changing effluent concentrations. Typical detection limits were 0.1 picogram/sec for anthracene, 5 picograms/sec for pyrene, and 0.2 picogram/sec for phenanthrene. Fluorescence emission and excitation spectra which are sufficiently structured for use in identification have been obtained with as little as 10 ng of sample. Qualitative and quantitative aspects are compared to other detectors and the vast simplification that wavelength discrimination affords to complex chromatographs is illustrated. (Long-Battelle)
W72-13672

A QUANTITATIVE COMPARISON OF PIGMENT EXTRACTION BY MEMBRANE AND GLASS-FIBER FILTERS,
Kent State Univ., Ohio. Dept. of Biological Sciences.
E. B. Long, and G. D. Cooke.
Limnology and Oceanography, Vol. 16, No. 6, p 990-992, November 1971. 1 fig, 1 tab, 3 ref.

Descriptors: *Phytoplankton, *Chlorophyll, *Evaluation, *Separation techniques, Spectrophotometry, Lakes, Plant pigments, Detritus, Chlorophyta, Chrysophyta, Solvent extractions, Diatoms, Aquatic algae, Filtration, Cyanophyta, *Eutrophication, *Ohio.
Identifiers: *Glass fiber filters, *Membrane filters, Grange Lake, East Twin Lake, Lake Rockwell, Lake Hodgson, Clearwater Quarry, Dollar Lake, Chlorophyll a, Absorbance.

Water samples collected from six eutrophic northeastern Ohio lakes were used in a study concerned with a quanitative comparison of pigment extraction by membrane and glass-fiber filters. The phytoplankton-containing water samples were measured into 500-ml subsamples and filtered at 0.25-0.33 atm. The filter types tested were 47-mm-diameter type HA Millipore membrane filters (0.45 micron pore size; cellulose acetate) and 42.5-mm-diameter types GF/C and GF/A Whatman glass-fiber filters. The phytoplankton was extracted into acetone and absorbances measured spectrophotometrically at 665 millimicrons. Data were analyzed by 'Student's' t statistic. Absorbances of the acetone extracts from lake phytoplankton collected on glass-fiber filters, ground and extracted 2 hr, were 6-18 percent greater tahn from phytoplankton collected on membrane filters and processed identically. Use of the glass-fiber filters cut filtering time by a factor of 10 and material cost by a factor of 4 or more. (Snyder-Battelle)
W72-13673

SAMPLING AND SPATIAL DISTRIBUTION OF BENTHONIC FORAMINIFERA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
C. T. Schafer.
Limnology and Oceanography, Vol. 16, No. 6, p 944-951, November 1971. 5 fig, 1 tab, 33 ref.

Descriptors: *Protozoa, *Spatial distribution, *Sampling, Sediments, Distribution patterns, Cores, Bioindicators, Scuba diving, Benthic fauna.
Identifiers: *Foraminifera, *Gulf of St. Lawrence.

Foraminifera were collected from bottom sediments in the Gulf of St. Lawrence in order to determine spatial distribution data to provide sampling guidelines for future ecological studies. Seventeen sampling stations were used with up to six replicate cores taken at each by Scuba divers using plastic coring tubes. Results indicate that the size, spacing, and number of replicate sediment samples collected do not always adequately represent the living population. In these samples, there was a pronounced patchy geographic distribution in waters less than 24 m deep. Species proportions were most variable in waters less than 20 m deep. A significant number of living specimens was encountered to a depth of 9 cm in the bottom sediments. (Mortland-Battelle)
W72-13674

WAX-BOUND LEAD DIOXIDE POTENTIOMETRIC ELECTRODE AND APPLICATIONS TO CHELOMETRIC TITRATION,
Wisconsin Univ., Milwaukee. Dept. of Chemistry, and Wisconsin Univ., Milwaukee. Lab. for Surface Studies.
C. N. Wang, P. J. Kinlen, D. A. Schoeller, and C. O. Huber.
Analytical Chemistry, Vol. 44, No. 7, p 1152-1158, June 1972. 10 fig, 4 tab, 17 ref.

Descriptors: *Volumetric analysis, *Measurement, *Heavy metals, Anions, Potentiometers, Hydrogen ion concentration, Ions, Laboratory equipment, Zinc, Copper, Nickel, Manganese, Cadmium, Iron, Chromium, Aluminum, Lead, Separation techniques.
Identifiers: *Lead dioxide electrode, *Chelometric titration, Chemical interference, Precision.

The effects of pH, buffer, metal ion, and chelon on the shapes of potentiometric titration curves obtained with a wax-bound lead dioxide electrode were evaluated. Mechanisms of response are proposed and accuracy and precision for several well established titrations are presented. The electrode consists of powdered lead dioxide imbedded in high-melting paraffin wax. Electrical contact in the body of the electrode is by particle-to-particle contact. The electrode face contains discrete surface equilibrium reaction sites at which a stable potential is maintained. Titration data are presented for a number of metals including Al, Cr, Cd, Cu, Fe, Pb, and Zn. These data indicate that most metals ordinarily titrated with EDTA can be determined and the titration curves are not affected by the particular metal being titrated. The titration curves obtained for these metals must be interpreted in terms of a pH effect observed when decreased buffer concentrations result in an increase in potential from initiation to the end point. At pH 5, a sharp peaked shape maximum marks the end point, while at pH 10 with suitable procedure a peak shape minimum occurs at the end point. Precision and accuracy of titration approach 0.1 percent and are characteristic of the volumetric apparatus used. Titrations may be performed in forward and reverse directions. By proper selection of solution buffer concentration, titrations of less than 100 micrograms of metals yield a very distinct end-point signal. Measured solubilities show that electrode dissolution interferes only slightly for the lowest concentrations titrated. Most common anions do not interfere. (Long-Battelle)
W72-13676

DETERMINATION OF DIETHYLSTILBESTROL IN CATTLE TISSUES,
Lilly (Eli) and Co., Greenfield, Ind. Greenfield Labs.
A. L. Donoho, W. S. Johnson, and W. L. Sullivan.
Eli Lilly and Company, Procedure 5801611, January 1972. 9 p.

Descriptors: *Pollutant identification, *Gas chromatography, *Bioassay, *Cattle, Separation techniques, Hydrolysis, Solvent extractions, Methodology, Chemical analysis.
Identifiers: *Diethylstilbestrol, *Tissue, Glucuronide, Electron capture detector, Muscle, Liver, Kidneys, Biological samples, Hormones, Adipose tissue, Sample preparation.

An assay technique is described for diethylstilbestrol (DES) in cattle tissues (muscle, liver, kidney, and fat). DES and its glucuronide are extracted from the tissue with methanol and the samples are subjected to beta-glucuronidase enzymatic hydrolysis to yield free DES. Free DES is extracted from fat with chloroform. The samples are purified by liquid-liquid extraction. The DES is reacted in base with dichloracetyl chloride to form the ester which is measured by gas chromatography using electron capture detection. When carefully applied, the procedure will detect DES levels of 0.5 ppb or lower in liver samples. Quantitation is reasonably good in the 0.002 to 0.001 ppm range. Below 0.002 ppm, the procedure is only semiquantitative. (Mortland-Battelle)
W72-13677

DETECTION AND MEASUREMENT OF TRITIUM BY BREMSSTRAHLUNG COUNTING,
Mound Lab., Miamisburg, Ohio.
M. L. Curtis.
International Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 17-23, January 1972. 7 fig, 6 ref.

Descriptors: *Tritium, *Radiochemical analysis, *Radioactivity techniques, *Pollutant identification, Aqueous solutions, Testing procedures, Measurement, Sampling, Water pollution, Water pollution sources.
Identifiers: *Bremsstrahlung counting, Scintillation counting, H-3, Detection limits, Liquid scintillation.

A method of analysis is described for the detection and measurement of tritium by Bremsstrahlung counting where beta radiation from tritium cannot be readily detected. The procedure involved placing liquid or solid samples into shallow polyethylene bags and measuring the radiation using sodium iodide crystals with thin aluminum or beryllium windows and a multichannel analyzer. Tritium disintegration rates were determined by comparison with the Bremsstrahlung counting rate of a tritiated standard and by adjusting disintegration values to sample composition. The method has been used in studies of tritium adsorbed on charcoal, tritium in contaminated and discolored pump oil, and in aqueous waste materials. It is applicable to analysis for tritium in any material in the concentration range of one microcurie/cc or higher, which can be contained in polyethylene provided a comparable standard can be prepared. (Long-Battelle)
W72-13679

EFFECT OF PH ON THE FILTRATION OF AQUATIC HUMUS USING GELS AND MEMBRANES,
Norsk Institutt for Vannforskning, Oslo.
E. T. Gjessing.
Schweizerische Zeitschrift fur Hydrologie, Vol. 33, No. 3, p 592-600, December 31, 1971. 6 fig, 2 tab, 14 ref.

Descriptors: *Hydrogen ion concentration, *Humus, *Freshwater, Organic matter, Adsorption, Organic compounds, Water pollution sources, Color, Laboratory equipment, Indicators, Separation techniques, Anion exchange, Adsorption, Distillation, Sieves, Sampling.
Identifiers: *Membrane dialysis, *Gel filtration, Membrane filtration, UV absorptiometer.

Gel filtration and membrane dialysis experiments were conducted on concentrated freshwater samples to determine the effects of pH levels and ionic strength on the composition of aquatic humus. Both indicated that the molecular size of humus increased with pH, and apparently ionic strength had little to do with the observed change in size. An increase in color was also noted with a rise in pH and was attributed to the change in molecular size of the humus. Membrane dialysis of acidic, alkaline, and 'natural' samples confirmed this change of molecular size by pH. However, other investigators attributed these changes to other parameters such as a decrease in the extent of adsorption on gel due to rising pH. Finally, aggregation and condensation of humus were proposed as mechanisms for the changes observed. (Long-Battelle)
W72-13681

DEVELOPMENT OF LACTIC ACID BACTERIA DURING EARLY STAGES OF FERMENTATION IN FISH SILAGE,
Lantbrukhogskolan, Uppsala (Sweden). Dept. of Microbiology.
S. Wirahadikusumah, O. Rajala, S. Lindgren, and R. Nilsson.
Archiv fur Mikrobiologie, Vol. 82, No. 2, p 95-100, February 28, 1972. 1 fig, 1 tab, 15 ref.

Descriptors: *Fish, *Fermentation, *Pollutant identification, *Silage, Streptoccus, Aerobic bac-

teria, Lactobacillus, Methodology, Isolation, Cultures, Hydrogen ion concentration, Growth rates.
Identifiers: *Lactic acid bacteria, Streptococcus faecalis, Lactobacillus plantarum, Biochemical tests, Streptococcus lactis, Streptococcus cremoris, Lactobacillus casei, Lactobacillus buchneri, Lactobacillus brevis, Lactobacillus cellobiosus, Lactobacillus fermenti, Enterococcus, Veridans, Streptobacterium, Thermobacterium, Leuconostoc mesenteroides.

The lactic acid bacteria which develop during the early stages of fermentation in fish silage have been identified. Fish silage was prepared by mixing minced uneviscerated fish with malt and cereal meals. Dilutions of silage (1: 100,000,000) were inoculated onto agar plates and incubated at 28 degrees C for 5 days. Single colonies were removed from these plates and inoculated into MRS broth and incubated for 3 days at 28 degrees C. Isolates were classified morphologically into 3 groups including rods (Lactobacillus), round cocci, and oval cocci (Streptococcus and Leuconostoc). They were subclassified according to their ability to produce ammonia from arginine when grown at 45 C or 15 C. The first type of organisms that grew fastest was the oval cocci followed by round cocci (mostly S. faecalis). The number of oval cocci increased rapidly one day after ensiling and then decreased after 2-3 days. The round cocci increased first after 2-3 days and then decreased slowly after 4-5 days. Lactobacilli began to increase in number (more than ten billion per g silage) first after 6 days. The results showed that the pH change during silage fermentation was mainly lowered by streptococci, and in MRS medium the pH was more rapidly lowered by Streptococcus faecalis, than by Lactobacillus plantarum and other rods. (Long-Battelle)
W72-13683

A DEVICE FOR COLLECTING IN-SITU SAMPLES OF SUSPENDED SEDIMENT FOR MICROSCOPIC ANALYSIS,
Johns Hopkins University, Baltimore, Md. Chesapeake Bay Inst.
J. R. Shubel, and E. W. Schiemer.
Journal of Marine Research, Vol 30 No. 2, p 269-273,May 15, 1972. 3 fig.

Descriptors: *Sampling, *On-site data collection, *Freezing, *Sediments, Freeze drying, Microscopy, Electron microscopy, Pollutant identification.
Identifiers: *Suspended sediments, Sampling device, Light microscope.

An in-situ sampler for collecting small samples of suspended sediment for microscopic analysis has been built and tested. The device rapidly freezes a thin layer of water entrapping all of the suspended particles in it; when the sampler is recovered, the disc of ice is placed on a suitable substrate and freeze-dried. The particles can then be examined in an undisturbed state with a light microscope or with an electron microscope. (Galwardi-Texas)
W72-13693

THIN-LAYER CHROMATOGRAPHIC-ENZYMATIC IDENTIFICATION OF SOME LINDANE- AND POSSIBLE DDT-METABOLITES AS WELL AS PENTACHLOROPHENOL, (DUNNSCHICHTCHRO-MATOGRAPHISCH-ENZYMATISCHER NACHWEISEINIGER LINDAN-UND THEORETISCH MOGLICHER DDT-METABOLITEN SOWIE VON PENTACHLORPHENOL).
Federal Biological Inst. for Land and Forestry, Berlin (West Germany). Inst. for Plant Preservation Research.
F. Geike.
Journal of Chromatography, Vol 67, No 2, p 343-349, May 3, 1972. 4 tab, 16 ref. English summary.

Descriptors: *Pollutant identification, *DDT, Separation techniques, Organic compounds, Chlorinated hydrocarbon pesticides, Ultraviolet radiation.
Identifiers: *Thin layer chromatography, *Metabolites, *Enzymatic inhibitors, *Pentachlorophenol, Lindane, Amylase, p-chlorobenzaldehyde, p-chlorobenzoic acid, Benzophenone, Chlorobenzene, Benzoic acid, 1 2 4 5 tetrachlorobenzene, 1 2 3 trichlorobenzene, 1 2 4 trichlorobenzene.

The possible identification of p-chlorobenzaldehyde, p-chlorobenzoic acid, benzophenone, chlorobenzene, benzoic acid, pentachlorophenol, 1,2,4,5-tetrachlorobenzene, 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene by their inhibition of the enzymes bovine liver esterase, trypsin, acid and alkaline phosphatase, alpha-and beta-amylase on thin-layer plates was investigated. Pentachlorophenol was a strong inhibitor of all enzymes studied and was detected in the range of 10 ng with bovine liver esterase to 3 micrograms with alpha-amylase. Benzophenone showed strong inhibition against the phosphatases, while a moderate effect was observed for the other enzymes. Chlorobenzene could not be identified by inhibition of any of the enzymes by this technique. The other substances showed a very different behavior and were often only inhibitory after UV irradiation. (Long-Battelle)
W72-13760

A TECHNIQUE FOR CURIE POINT PYROLYSIS GAS CHROMATOGRAPHY OF COMPLEX BIOLOGICAL SAMPLES,
Stichting voor Fundamenteel Onderzoek der Materie, Amsterdam (Netherlands). Istituut voor Atoom en Molecuulfysica.
H. L. C. Meuzelaar, and R. A. in't Veld.
Journal of Chromatographic Science, Vol 10, No 4, p 213-216, April 1972. 3 fig, 18 ref.

Descriptors: *Methodology, Gas chromatography, Pollutant identification, Systematics, Classification, Water pollution sources.
Identifiers: *Curie point pyrolysis gas chromatography, *Biological samples, *Reproducibility, Neisseria meningitides, Neisseria sicca, Sample preparation, Performance evaluation, Pyrograms, Pyrolysis gas chromatography.

Curie-point pyrolysis gas chromatography is considered to be a very promising technique to be used in the classification and identification of complex biological samples. A technique is described which utilizes a special sample preparation procedure in which 5-15 microliters of a uniform, opalescent suspension of the insoluble biological sample is applied in small drops to a filament by means of a microsyringe with glass tips. The ferromagnetic filament is held in a horizontal position and rotates slowly to insure uniform distribution of the sample, while the liquid evaporates. The coated filament is then inserted into a Pyrex reaction tube which is designed to fit into the special pyrolysis unit. The pyrolysis unit is directly coupled to a capillary column and allowed exchange of reaction chambers after each analysis. Strains of Neisseria meningitides and N. sicca were used to evaluate the performance of the system. A comparison of the pyrograms shows that the level of qualitative as well as quantitative reproducibility is such that pyrograms from the same sample are almost superimposable. (Byrd-Battelle)
W72-13761

THE QUANTIMET 720P FOR ROUTINE BIOLOGICAL ASSAY AND POTENCY CALCULATION FROM COLONY COUNT, INHIBITION AND EXHIBITION ZONE MEASUREMENTS,
Imanco Ltd., Royston (England).
For primary bibliographic entry see Field 05B.
W72-13762

VARIATION OF PRECISION WITH TIME FOR AUTOANALYZER DATA,
Institute of Rural Science, Aberystwyth (Wales). Analytical Lab.
For primary bibliographic entry see Field 07B.
W72-13763

OSMOTIC STABILITY AND SODIUM AND POTASSIUM CONTENT OF L-FORMS OF STREPTOCOCCUS FAECALIS,
Wadsworth General Hospital, Los Angeles, Calif.
For primary bibliographic entry see Field 05C.
W72-13764

A REVIEW OF THE METHODS FOR THE IDENTIFICATION OF PERSISTENT HYDROCARBON POLLUTANTS ON SEAS AND BEACHES,
Shell Research Ltd., Chester (England). Thornton Research Center.
E. R. Adlard.
Journal of the Institute of Petroleum, Vol 58, No 560, p 63-74, March 1972. 12 fig, 3 tab, 37 ref.

Descriptors: *Oil wastes, *Persistence, *Analytical techniques, *Pollutant identification, Oil spills, X-ray fluorescence, Mass spectrometry, Separation techniques, Gas chromatography, Flame photometry, Trace elements, Oil pollution, Colorimetry, Neutron activation analysis, Tracers, Oceans, Beaches, Oil, Centrifugation, Specific gravity, Sulfur, Nitrogen, Boron, Weathering, Heavy metals, Organic compounds, Zinc, Strontium, Lead, Nickel, Molybdenum, Copper, Chromium, Cobalt, Cesium, Potassium, Sodium, Manganese, Magnesium, Calcium, Titanium, Iron, Water pollution sources, Tagging.
Identifiers: *Hydrocarbons, Sample preservation, Infrared spectroscopy, Ultraviolet spectroscopy, Paper chromatography, Thin layer chromatography, Column adsorption chromatography, Emission spectroscopy, Atomic absorption spectroscopy, Fuel oil, Microwave spectroscopy, Crude oil, Oil characterization, Flame ionization gas chromatography, Flame photometric gas chromatography, Flame ionization detector, Sample preparation, Flame photometric sulfur detector, Cleanup, Wax, Asphaltenes, Kjeldahl procedure, Oxygen flask combustion, Fingerprinting, Uranium, Zirconium, Vanadium, Tin, Barium, Silver, Gallium, Neodymium, Lanthanum, Detection limits.

The literature regarding sampling and analysis of oil wastes is reviewed and evaluated. A wide variety of analytical techniques are discussed and the feasibility of labelling crude oil is considered. It is concluded that there is no shortage of methods for identifying oily pollutants. Among the techniques reviewed, those most likely to be generally available are infrared spectroscopy, emission spectroscopy, gas chromatography, and thin-layer chromatography. A standard gas chromatographic method for pollutant identification has been established by the British Institute of Petroleum and other techniques will perhaps be standardized in the future. Labelling all oil-carrying ships is not feasible. All the methods suggested for labelling crude oil cargos have severe technical limitations and there would be serious problems with international recognition and administration. (Mortland-Battelle)
W72-13766

STUDIES ON THE DETERMINATION OF PHYSIOLOGICAL LEVELS OF CHROMIUM IN SERUM BY GAS CHROMATOGRAPHY,
Florida Univ., Gainesville. Dept. of Pathology.
J. Savory, M. T. Glenn, and J. A. Ahlstrom.
Journal of Chromatographic Science, Vol 10, No 4, p 247-252, April 1972. 3 fig, 5 tab, 8 ref.

Descriptors: *Chromium, Chemical analysis, *Gas chromatography, Proteins, Chemical precipitation, Separation techniques, Urine, Aqueous solutions, Trace elements, Heavy metals.

Identifiers: *Serum, *Electron capture gas chromatography, Chromium trifluoroacetylacetonate, Electron capture detector, Scintillation counting, Blood, Ashing, Biological samples, Chemical interference, Precision.

A gas chromatographic procedure developed for measuring chromium in serum involves the extraction of chromium as chromium trifluoroacetylacetonate and the utilization of an electron capture detector. The chromium is coprecipitated with serum proteins thus eliminating ionic interference. Using this procedure, recoveries of chromium (III) added to serum averaged 75 percent; the precision of replicate determinations was 14.4 percent; and normal values obtained were 2.7-24 micrograms per liter. Other techniques were also investigated, including direct extraction with no prior treatment and wet-and dry-ashing, but they yielded poor recoveries of chromium (III). (Mortland-Battelle)
W72-13767

NEW METHODS FOR DETECTION AND QUANTIFICATION IN THIN-LAYER CHROMATOGRAPHY: A STUDY OF PYROLYSIS AND COMBUSTION SYSTEMS,
Federal Inst. for Lipid Research, Muenster (West Germany).
K. D. Mukherjee, H. Spaans, and E. Haahti.
Journal of Chromatographic Science, Vol 10, No 4, p 193-200, April 1972. 4 fig, 4 tab, 15 ref.

Descriptors: *Chemical analysis, *Organic compounds, Lipids, Pollutant identification, Organic acids, Hexadecanol, Alcohols, Methodology.
Identifiers: *Thin layer chromatography, *Pyrolysis, *Detection, *Combustion, Cholesterol, Triglycerides, Flame ionization detector, Thermal conductivity detector, Palmitic acid, Fatty acids, Waxes.

A scanning system has been developed for detecting organic solute zones on thin-layer chromatograms. Chromatography is carried out in quartz or Pyrex tubes whose internal walls are coated with a thin layer of adsorbent. The thin-layer tubes are passed gradually through a furnace while the tubes are being purged with nitrogen. The solutes are consecutively vaporized, either by pyrolysis or by combustion depending upon whether a pure adsorbent or an adsorbent containing an oxidizing agent is used. The products of pyrolysis are monitored by an FID, either directly, or after their oxidation to carbon dioxide and subsequent reduction to methane. Similarly, carbon dioxide formed by in situ combustion of solute zones on layers containing cupric oxide is reduced to methane and detected by the FID. The performance of these detection systems has been tested with model mixtures of lipids and lipid extracts of biological origin. Further applications of these methods are outlined. (Snyder-Battelle)
W72-13768

ON CALCULATION OF THE AREAS OF OFF--CHART CHROMATOGRAPHIC PEAKS USING DATA OBTAINED WITH THE AID OF INTEGRATORS,
Akademiya Nauk SSSR, Moscow. Institut Organicheskoi Khimii.
For primary bibliographic entry see Field 07B.
W72-13769

ON-LINE COMPUTER-CONTROLLED ELECTRICAL DETECTION IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W72-13770

GAS LIQUID CHROMATOGRAPHIC ANALYSIS OF HYDROCARBON MIXTURES. A REPORT ON THE WORK OF THE INTERNATIONAL CONFERENCE OF BENZOLE PRODUCERS,
International Conference of Benzole Producers, Paris (France).
K. H. V. French.
Journal of Chromatography, Vol 67, No 2, p 237-245, May 3, 1972. 3 fig, 4 tab, 3 ref.

Descriptors: *Instrumentation, *Methodology, *Gas chromatography, Laboratory equipment, *Organic compounds, Mathematical studies, Aromatic compounds, Chemical analysis, Calibrations.
Identifiers: *Hydrocarbons, *Gas liquid chromatography, *Precision, *Mixtures, Aromatic hydrocarbons, Aliphatic hydrocarbons, Interlaboratory studies, Errors, Reproducibility, Repeatability, Katharometers, Flame ionization detector, Toluene, Organic solvents, Hexane, Cyclohexane, Methylcyclopentane, Ethylbenzene, Octane, Nonane, Xylene, Mesitylene, Isopropylbenzene, Alkanes.

The International Conference of Benzole Producers (ICBP), through interlaboratory studies, has determined the precision attainable with minimum apparatus and procedure standardization in the analysis of hydrocarbon mixtures. The results from samples of each hydrocarbon mixture analyzed by the participating laboratories were averaged and the precision obtained was in the range of 0.001-30 percent. Some of the conclusions reached were that (1) katharometers and flame ionization detectors give equally precise results down to the 0.1 percent (w/w) level. Flame ionization detectors give satisfactory precision down to 0.001 percent (w/w); (2) a major source of error could be associated with synthetic mixtures; and (3) the repeatability and reproducibility of experiments could be 3 and 8 percent, respectively, if the instructions for the determination of response factors are strictly followed. Some of the ICBP recommendations include the following: (1) A peak of a standard should have an area in the same order as the components being determined, preferably a peak at least 5.0 cm high and 0.5 cm wide at half-peak height. (2) If an internal standard is used it must be resolved from components being determined and impurities. (3) Response factors should be the mean of values calculated from chromatograms on two synthetic mixtures and should differ by less than 4 percent. (Long-Battelle)
W72-13771

THE PRESENT STATUS AND FUTURE PROSPECT OF THE TURBIDOSTAT,
National Chemical Research Lab., Pretoria (South Africa).
T. G. Watson.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 2, p 229-243, February 1972. 11 fig, 31 ref.

Descriptors: *Cultures, *Growth rates, *Microorganisms, Monitoring, Population, Measurement, Instrumentation, Bioindicators, Bacteria, Photometry, Productivity, Density, Pumps, Hydrogen ion concentration, Carbon dioxide, Nutrients, Proteins, E. coli, Gases, Turbidity.
Identifiers: *Turbidostats, Chemostats, Sensors, Continuous cultures, Batch cultures, Klebsiella aerogenes, DNA, RNA, Ethanol, Biosynthesis, Pyruvate, Substrate utilization.

Due to the need to culture organisms continuously at or near the maximum specific growth rate, a task for which the chemostat is unsuitable, use of the turbidostat is growing. The turbidostat controls organism concentration directly and not dilution rate; therefore it operates most successfully close to the maximum specific growth rate where the organism concentration changes rapidly with dilution rate. The functioning of turbidostats, potential uses and some representative studies in which they have been used are discussed. Methodology for the monitoring of population density, including use of photo-electric sensors, pH sensors, and gas-concentration sensors, and for the control and monitoring of nutrient additions is reviewed. The turbidostat still has rather limited appeal because other techniques in many circumstances offer more convenient methods of approach. However, recent interest in transient, periodic, and oscillatory phenomena in microbial populations is giving impetus to the turbidostat. For example, it has been used in a study of the effect of ethanol on the maximum specific growth rate of Klebsiella aerogenes, for a study of induced oscillatory phenomena in K. aerogenes in the presence of various drugs, and for a study on the regulation of pyruvate biosynthesis in E. coli. (Mortland-Battelle)
W72-13772

A NEW REAGENT FOR DETECTING TRYPTOPHAN, INDOLE, AND INDOLE-3-ACETIC ACID IN THIN-LAYER CHROMATOGRAPHY,
Naval Medical Research Unit No. 3, Cairo (Egypt). Dept. of Medical Zoology.
F. N. Boctor.
Journal of Chromatography, Vol 67, No 2, p 371-372, May 3, 1972. 1 tab, 2 ref.

Descriptors: *Amino acids, Separation techniques, Methodology, Pollutant identification, Color reactions, Chemical reactions, Solvents.
Identifiers: *Indole, *Tryptophan, *Indole-3-acetic acid, *Thin layer chromatography, *Chromagenic reagents, *Phosphoric acid, Detection limits, Sensitivity, p-Dimethylaminobenzaldehyde, Alanine, Arginine, Aspartic acid, Cysteine, Glutamic acid, Glycine, Histidine, Lysine, Hydroxyproline, Isoleucine, Methionine, Phenylalanine, Proline, Serine, Threonine, Tyrosine, Valine.

Tryptophan and 18 other amino acids, indole, and indole-3-acetic acid were analyzed by thin-layer chromatography to determine the suitability of phosphoric acid as a chromagenic reagent. The amino acids were dissolved in 0.1 N HCl and indole and indole-3-acetic acid in 2 ml ethanol, with a resulting concentration of 100 mg/100 ml. 0.5, 1, 2, 5, 10 microliters of each component were spotted on a 250 millicron silica gel thin-layer plate. After the butanol-acetic acid-water (65:13:22) solvent had travelled 10 cm, the plate was left to dry, sprayed with phosphoric acid reagent, and heated for 40 min at 110 degrees. The eighteen standard amino acids, except tryptophan, gave no color with the reagent. Tryptophan, indole, and indole-3-acetic acid gave different colors. The sensitivity of the reagent was of the same order as that of DMAB. After chromatographic separation, 0.5 micrograms could be detected but before separation 0.005 micrograms gave the colors. This method depends on a reaction between phosphoric acid and tryptophan, indole, and indole-3-acetic acid. The nature and mechanism of the reaction are unknown. (Long-Battelle)
W72-13773

AN ARTIFACT IN THE GAS CHROMATOGRAPHIC DETERMINATION OF IMPURITIES IN PENTACHLOROPHENOL,
Umea Univ., (Sweden). Dept. of Organic Chemistry.
C. Rappe, and C. A. Nilsson.
Journal of Chromatography, Vol 67, No 2, p 247-253, May 1972. 7 fig, 7 ref.

Descriptors: *Gas chromatography, *Mass spectrometry, *Halogenated pesticides, *Herbicides, Chemical analysis, Organic compounds, Analytical techniques, Pesticides, Pollutant identification.
Identifiers: *Pentachlorophenol, *Chemical impurities, Isomers, Chemical interference, Flame ionization gas chromatography.

Commercial samples of pentachlorophenol were analyzed by gas chromatography and mass spectrometry. The main impurity was found to be 3,4,5,6-tetrachloro-2- (2,3,4,5,6-pentachlorophenoxy) phenol. In gas chromatographic analyses using a heated injection block, the impurity underwent a ring closure yielding a dioxin impurity which suggests the possibility of its occurrence in commercial samples. Isomers of pentachlorophenol also were identified as impurities during direct inlet mass spectrometry. In another set of experiments pentachlorophenol was treated with diazomethane to facilitate separation of impurities, since methoxy ethers are easier to separate than phenols. A methoxy ether of the phenol compound was found. Chlorinated phenoxyphenols have not been previously observed as contaminants in chlorinated phenols. (Long-Battelle)
W72-13774

COMPLEXATION OF METAL IONS WITH NATURAL POLYELECTROLYTES (REMOVAL AND RECOVERY OF METAL IONS FROM POLLUTED WATERS),
Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry.
H. H. G. Jellinek, and S. P. Sangal.
Water Research, Vol 6, No 3, p 305-314, March 1972. 3 fig, 1 tab, 8 ref.

Descriptors: *Heavy metals , *Ions, Solvent extractions, Chemical precipitation, Water quality control, Water pollution, Chelation, Cations, Copper, Zinc, Cadmium, Nickel, Chromium, Separation techniques, Water analysis.
Identifiers: *Polyelectrolytes, *Recovery, *Complexation, Complexing agents, Albumin, Gelatine, Polygalacturonic acid.

A number of complexation experiments were performed with natural polyelectrolytes in order to ascertain their suitability for metal (Cu, Cd, Zn, Ni, Cr) removal and recovery from water. Bovine albumin-polymethyacrylic acid (PMMA), gelatine-PMMA, gelatin-alginic acid, pectin, gelatin-oxidized starch, and polygalacturonic acid (PGA) were complexing agents employed in the testing with special emphasis on PGA. Solutions containing known amounts of metal ions were complexed with PGA and maximum weight percentages of the metal ions calculated (percent w/w): Cu 98.5, Cd 88.5, Zn 80, Ni 70, and Cr 77. Thus, PGA proved to be an efficient complexation agent for these metals and increased the ratio of the volumes of the original metal solutions to those of the metal solutions extracted from the solid polymer complex several hundred fold. Only small amounts of polymer were lost during extraction of the metal ions from the complexes by hydrochloric acid, so that multiple complexation cycles can be carried out by replenishing only the small amounts of polymer lost. (Mackan-Battelle)
W72-13776

NICKEL POLLUTION,
University Coll. of Wales, Aberystwyth. Dept. of Agricultural Biochemistry; and University Coll. of Wales, Aberystwyth. Dept. of Biochemistry.
W. M. Ashton.
Nature, Vol 237, No 5349, p 46-47, May 5, 1972. 3 tab, 3 ref.

Descriptors: *Nickel, *Soil contamination, *Vegetation, Pollutants, Trace elements, Chemical analysis, Copper, Gravimetric analysis, Air pollution effects, Pollutant identification, Soil analysis, Heavy metals.
Identifiers: *Atomic absorption spectrophotometry, *Wales.

Herbage and soil samples were obtained from a farm in South Wales near a large nickel works to determine the possibility of airborne nickel contamination. Ashed herbage and air-dried soil samples obtained in 1934 contained sufficient nickel for the analysis of HCl extracts by the dimethylglyoxime procedure. Leaf samples analyzed contained large amounts of nickel; however, washing the leaves removed most of the nickel from the surface of the leaves. Only minute traces of nickel and copper were found in washed peeled potatoes. Six samples of vegetation and soil obtained in 1971 were analyzed by atomic absorption spectrophotometry. The vegetation contained 1.3-2.0 ppm of nickel, the first inch of topsoil 625-1150 ppm, and the second inch of topsoil 200-350 ppm. This represents a marked decrease in nickel contamination since the 1930's. (Synder-Battelle)
W72-13778

METABOLISM OF POLYCHLORINATED NORBORNENES BY CLOSTRIDIUM BUTYRICUM,
Mainz Univ. (West Germany). Institut fuer Anorganische Chemie und Kernchemie.
For primary bibliographic entry see Field 05B.
W72-13779

RAPID METHOD FOR DETECTION AND CHARACTERIZATION OF STEROIDS,
California Univ., Berkeley. Dept. of Chemistry.
G. Steel, and W. Henderson.
Analytical Chemistry, Vol 44, No 7, p 1302-1304, June 1972. 1 fig, 1 tab, 10 ref.

Descriptors: *Mass spectrometry, Lake sediments, Aquatic soils, *California, Ethers, Separation techniques, Organic compounds, Alcohols, Water analysis, Chemical analysis, Aquatic life.
Identifiers: *Steroids, *Liquid solid chromatography, *Biological samples, *Thin layer chromatography, Sample preparation, Stigmaster, Fucosterol, *Mono Lake (Calif), Cholesterol, Brassicasterol, Campesterol, Stigmasterol, Cholestanol, Ergosta-7 22-diene-3 beta-ol, beta-Sitosterol, Stigmasta-5 25-diene-3 beta-ol, 24-methylenecholesterol, Sterols, Characterization, Trimethylsilylation, Mass spectra.

Samples of macro- and microorganisms, lake water, bottom muds, and consolidated sediments taken from Mono Lake, California were analyzed for steroids using mass spectrometry. Crude sterol fractions were isolated by liquid-solid chromatography followed by treatment with a trimethylsilylation reagent for thin-layer chromatographic separation. The resulting silyl ethers were then analyzed by a temperature programmed direct inlet probe mass spectrometer and compared to standard sterol silyl ethers. Cholesterol, brassicasterol, campesterol, and stigmasterol were identified from these samples. (Long-Battelle)
W72-13781

SPECTROPHOTOMETRIC METHOD FOR DETERMINING LOW LEVELS OF WATER-SOLUBLE BORON IN FERTILIZERS,
Forest Products Lab., Madison, Wis.
H. P. Peterson, and D. W. Zoromski.
Analytical Chemistry, Vol 44, No 7, p 1291, June 1972. 1 tab, 3 ref.

Descriptors: *Boron, *Fertilizers, *Spectrophotometry, Chemical analysis, Nitrites, Nitrates, Aqueous solutions, Methodology, Separation techniques, Color reactions, Chemical reactions, Solvent extractions.
Identifiers: Recovery, Absorbance, Chemical interference, Sample preparation, Sensitivity.

A spectrophotometric method for determining low levels of water-soluble boron in fertilizers utilizes the carmine color development after the boron has been extracted and interfering impurities removed with 2-ethyl-1,3-hexanediol in chloroform. After extraction, aliquots are acidified with HCl and H2S04 and a known volume of carmine solution added. Absorbance of the colored solution is measured at 600 nm against a reagent blank. Recovery of boron increased with a diol concentration up to ten percent; the described procedure gave a 90 percent recovery using a 10 percent diol solution. A 5-minute extraction with an aqueous NaOH solution resulted in maximum recovery of boron. Six commercially available inorganic fertilizers were analyzed for boron by this method. Samples of each of these fertilizers were spiked with known amounts of boric acid and again analyzed. Average recovery for these samples was 102.4 percent. (Synder-Battelle)
W72-13782

DETERMINATION OF SUBMICROGRAM AMOUNTS OF BORON USING THE B-10 (N, ALPHA) LI-7 REACTION,
Eastman Kodak Co., Rochester, N.Y. Research Labs.
M. Lelental.
Analytical Chemistry, Vol 44, No 7, p 1270-1272, June 1972. 5 fig, 13 ref.

Descriptors: *Boron, *Radiochemical analysis, *Chemical reactions, Pollutant identification, Aqueous solutions, Gamma rays, Measurement, Adsorption, Electron microscopy, Radioactivity techniques.
Identifiers: *Scanning electron microscopy, Lithium, Plastics, Detectors, Chemical interference, Alpha emission, Boron radioisotopes, Lithium radioisotopes, Detection limits, Neutron irradiation, Li-6, Li-7, B-10, Biological samples.

A technique which utilizes electron microscopy for the measurement of submicrogram quantities of boron in aqueous solutions and biological samples is based on the utilization of the B-10 (n, alpha) Li-7 reaction and the measurement of gamma or alpha radioactivity after the completion of activation. The detection of radioactivity involves a microscopic examination of tracts produced on plastics of cellulose esters, namely, cellulose butyrate, cellulose triacetate, and cellulose nitrate. In order to reduce statistical error to below 4 percent, radioactivity counting for boron determination covers areas of the micrograph containing approximately 1000 tracts. The limit of the quantitative determination of boron by this method was estimated to be 38 nanograms B/sq cm. The very low level of background made this limit of sensitivity possible. Hence, this method is the most sensitive known for boron determinations. Since it is based upon a nuclear reaction, and thus does not suffer from the limitations imposed by spectrophotometric methods, it can be applied to all boron compounds. This method is singularly free from interference by other elements. Lithium-6 (present to the extent of 7.6 percent in natural lithium) is the only element that will produce the tracks obtained with B-10. The sampling limitation requires that the boron-containing material be in a layer of a thickness less than the alpha particles/range to preclude detection loss caused by self-absorption. The procedure offers significant possibilities in the study of processes dealing with the adsorption of boron compounds or the spatial distribution of microgram amounts of boron. (Long-Battelle)
W72-13784

MEASUREMENTS OF VERY LOW OXYGEN TENSIONS IN UNSTIRRED LIQUIDS,
Waterloo Univ. (Ontario). Dept. of Physics.
C. J. Koch, and J. Kruuv.
Analytical Chemistry, Vol 44, No 7, p 1258-1263, June 1972. 7 fig, 2 tab, 15 ref.

Descriptors: *Measurement, *Liquids, *Instrumentation, *Dissolved oxygen, *Pressure, Water vapor, Laboratory equipment, Membrane processes, Electrodes, Nitrogen, Carbon dioxide, Polarographic analysis.
Identifiers: *Oxygen electrodes, Oxygen tension.

A number of problems have been encountered in using a commercial membrane-covered, polaro-

graphic oxygen micro electrode. The sources of the large zero currents have been analyzed and found to be attributable to various physical factors. The single greatest cause has been found to be water vapor which was eliminated by using a desiccant in the measuring chamber. Membrane application and dissolved oxygen in the body of the electrode were also important especially with respect to long-term sensitivity and zero current stability. Through the solution of these problems the useful range of the oxygen cathode has been extended to less than 50 parts per million in gases or about 0.06 micromole in liquids. (Long-Battelle)
W72-13785

IDENTIFICATION OF ORGANOCHLORINE PESTICIDE RESIDUES BY ULTRAVIOLET SOLID-PHASE PHOTOLYSIS,
Agricultural Research Service, Beltsville, Md. Soils Lab.
D. E. Glotfelty.
Analytical Chemistry, Vol 44, No 7, p 1250-1254, June 1972. 5 fig, 1 tab, 5 ref.

Descriptors: *Ultraviolet radiation, *Pollutant identification, *Chlorinated hydrocarbon pesticides, *Pesticide residues, Methodology, Gas chromatography, Halogenated pesticides, Chemical analysis, Aldrin, Dieldrin, Heptachlor, DDD, DDT, DDE, Water pollution sources, Organic pesticides.
Identifiers: *Photolysis, *Electron capture gas chromatography, Gas liquid chromatography, Sample preparation, Heptachlor epoxide, 1-hydroxychlordene, trans-chlordane, Chlordane, Nonachlor, Electron capture detector, Metabolites, Isomers, p p'DDT, p p'DDD, p p'DDE.

A simple, rapid method is given for the identification of nanogram quantities of organochlorine insecticide residues in soil, water, and plant extracts. The pesticides tested included aldrin, dieldrin, heptachlor, heptachlor epoxide, 1-hydroxychlordene, trans-chlordane, chlordene, nonachlor, and p,p' isomers of DDD. The hexane-extracted pesticides were irradiated in silica reaction cells with UV light for 30 min and analyzed by electron capture gas liquid chromatography. Liquid-phase photolysis was also performed for comparison of products formed. Water, soil and plant material samples were analyzed preliminarily by accepted EC-GLC procedures to locate and quantitate possible pesticide peaks. The concentration of the extract was then adjusted to approximate that of a pesticide standard solution. Only two compounds, nonachlor and p,p'-DDD, failed to undergo significant degradation in the allotted exposure time. Dieldrin and p,p'-DDE degraded completely, and the remaining parent peaks were small for 1-hydroxychlordene, chlordene, and aldrin. Heptachlor epoxide, trans-chlordane, chlordene, and p,p'-DDT, each gave one major product, whose GLC peak height was approximately 80 percent of the original nonirradiated parent peak. Thirty-minute exposure of p,p'-DDE was much too severe, resulting in complete destruction of all photolysis peaks. The optimum exposure time was 30 seconds, in which about 90 percent of the parent p,p'-DDE was degraded and the maximum concentration of products was attained. Aldrin could not be identified in the presence of dieldrin because the three most abundant degradation peaks were identical to those obtained by the exposure of dieldrin. (Long-Battelle)
W72-13786

PRECISION OF ELECTRICAL DETECTION MEASUREMENTS OF POWDERED SAMPLES IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
G. H. Morrison, and B. N. Colby.
Analytical Chemistry, Vol 44, No 7, p 1206-1210, June 1972. 4 fig, 6 tab, 10 ref.

Descriptors: *Trace elements, Data processing, Pollutant identification, Automation, Strontium radioisotopes, Heavy metals, Data collections, Manganese, Iron, Copper, Magnesium, Chromium, Titanium, Strontium, Alkaline earth metals, Water pollution.
Identifiers: *Detection, *Powered samples, *Spark source mass spectrometry, *Precision, Biological samples, Graphite electrode, Sample preparation, Chemical interference, Zirconium, Vanadium, Rubidium, Yttrium, Mass spectra, Mg-26, Cr-52, Mn-55, Fe-56, Cu-63, Zr-64, Cu-65, Ti-46, Ti-47, V-51, Sr-88, Pb-85, Y-89, Zr-90, Zirconium radioisotopes, Vanadium radioisotopes, Rubidium radioisotopes, Yttrium radioisotopes, Titanium radioisotopes, Manganese radioisotopes, Chromium radioisotopes, Iron radioisotopes, Copper radioisotopes, Magnesium radioisotopes.

The feasibility of using electrical detection as a means of improving spark source mass spectrometric precision has been studied in the analysis of graphite blended powdered samples. All data were obtained from real and synthetic graphite samples using a Nuclide GRAF-2 spark source mass spectrometer with a computer on-line electrical detection system. After analyzing a variety of sample powders with this system, it was found that an analytical precision on the order of 3-6 percent can be expected. Electrostatic peak switching and computer on-line data acquisition and evaluation helped keep measurement time to a minimum. Several methods of sample pretreatment were used and the resulting electrode homogeneity was evaluated. (Byrd-Battelle)
W72-13787

METHOD FOR DETERMINATION OF MERCURY IN BIOLOGICAL MATERIALS BY NEUTRON ACTIVATION ANALYSIS,
National Bureau of Standards, Washington, D.C. Activation Analysis Section.
H. L. Rook, T. E. Gills, and P. D. LaFleur.
Analytical Chemistry, Vol 44, No 7, p 1114-1117, June 1972. 1 fig, 4 tab, 27 ref.

Descriptors: *Neutron activation analysis, *Mercury, *Pollutant identification, Methodology, Fish, Separation techniques, Leaves, Coals, Sediments, Freeze drying, Radiochemical analysis, Mass spectrometry, Trace elements, Heavy metals, Gamma rays, Aquatic soils, Soil analysis, Radioactivity techniques, Tracers, Evaluation.
Identifiers: *Biological materials, Orchard leaves, Wheat flour, Precision, Recovery, Sample preparation, Biological samples, Gamma spectrometry, Fuel oil, Tissue, Liver, Hg-203, Method validation.

A method is described for the determination of mercury in a variety of matrices. For analysis 0.5-gram samples were encapsulated in cleaned, heat treated quartz tubes, irradiated, washed in nitric acid and ignited. After combustion, the ash was heated to about 800 C for 5 min removing all volatile components from the sample into a condenser which was washed in nitric acid. The resulting solution was counted using a high efficiency, high resolution Ge (Li) gamma ray spectrometer. Additions analysis was used to determine if mercury were lost during analysis. The method was first tested for complete recovery of mercury by burning non-irradiated samples of orchard leaves with Hg-203 tracer added. A total of eight separations was carried out with a mean recovery of 99.52 percent and a relative standard deviation of plus or minus 1.68 percent. To test the recovery of mercury incorporated into an organism, Hg-203 nitrate was added to the water in a tank containing goldfish. Dead fish were removed from the tank, frozen, lyophilized, and counted whole, followed by analysis for Hg-203 using the combustion technique. Experimental results showed a mean recovery of 98.9 percent with a relative standard deviation of plus or minus 1.0 percent. The method was checked by analyzing samples of flour and coal having mercury concentrations ranging from 0.01 to 5 ppm. Where mercury levels were high enough (greater than 1 ppm), samples were analyzed nondestructively by irradiation followed by direct counting of the Hg-197. These samples were then analyzed by the described combustion technique and the results compared. The procedure has subsequently been used to determine the Hg concentration of two new Standard Reference Materials, Orchard Leaves and Beef Liver, being offered by the National Bureau of Standards. (Long-Battelle)
W72-13788

DETERMINATION OF FLUORIDE IN VEGETATION USING THE SPECIFIC ION ELECTRODE,
Diamond Shamrock Chemical Co., Baltimore, Md. Chemetals Div.
R. L. Baker.
Analytical Chemistry, Vol 44, No 7, p 1326-1327, June 1972. 1 fig, 1 tab, 4 ref.

Descriptors: *Fluorides, *Vegetation, *Separation techniques, Chemical analysis, Bioassay, Ions, Evaluation, Measurement, Pollutant identification.
Identifiers: Ion selective electrodes, Sample preparation, Chemical interference.

The determination of fluoride in vegetation with a fluoride specific ion electrode is less time-consuming than the Willard and Winter distillation technique or modifications thereof. It does not require constant monitoring by the analyst, and a minimum amount of reaction apparatus is required. A 25- to 30-gram vegetation sample was collected and the dry weight calculated from a uniform 10-gram sample. Ten millimeters of sodium hydroxide was added to a 5-10 gram sample which was dried for 2 hr at 150 C, fused for 2 hr at 550 C, cooled, and then dissolved in 25 ml of water. The sample was then diluted to 50 ml, filtered, and aliquots were analyzed. Generally, not more than 0.10 ml of 1000 micrograms/ml fluoride solution was necessary to obtain a reading with the electrode. The accuracy and precision of the method was plus or minus 10 percent. The effects of fusion temperature and interfering ions were not studied since there was excellent agreement between the distillation and fusion methods. The distillation method removed all interferences while the fusion standard addition method effectively canceled them out. (Synder-Battelle)
W72-13789

EMISSION SPECTROMETRIC DETERMINATION OF TRACE AMOUNTS OF MERCURY,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
F. E. Lichte, and R. K. Skogerboe.
Analytical Chemistry, Vol. 44, No. 7, p 1321-1323, June 1972. 1 fig, 2 tab, 12 ref.

Descriptors: *Mercury, *Trace elements, Leaves, Heavy metals, Reduction (Chemical), Pollutant identification, Chemical analysis, Water analysis, Spectroscopy.
Identifiers: *Emission spectrometry, Microwave plasma excitation, Atomic absorption spectrophotometry, Cold vapor atomic absorption spectrophotometry, Sample preparation, Biological samples, Blood, Precision, Detection limits, Accuracy.

Microwave plasma excitation (emission spectrometry) which utilizes the reduction-vaporization approach was used to determine ultratrace concentrations of mercury in a variety of sample types. For most analyses, a sample solution volume of 0.1-0.5 ml was adequate, but was increased to an appropriate size for samples having an unusually low concentration. For emission spectrometric determinations using standard solutions, the detection limit was estimated to be 0.6

picogram. Quantitative measurements on 10-ml samples containing 0.01 ppb mercury were made with a precision of plus or minus 10-12 percent. To test the accuracy of the method samples of blood, leaves, concentrated H2SO4 and triply distilled water were analyzed by emission and the cold cell atomic absorption techniques. Duplicate results generally agreed within 10 percent for both techniques indicating that the comparative results are consistent within experimental error. It should be noted that the emission analyses were carried out on amounts of mercury ranging from 0.34 to 12 ng (distilled water and leaf B samples, respectively), while the absorption measurements covered the absolute range of 17 to 60 ng. This is indicative of the relative analysis capabilities of the two techniques. (Snyder-Battelle)
W72-13790

SEMIINTEGRAL ELECTROANALYSIS: THEORY AND VERIFICATION,
Trent Univ., Peterborough (Ontario).
For primary bibliographic entry see Field 02K.
W72-13791

ANALYTICAL USES OF CHARGE-TRANSFER COMPLEXATION: SPECTROPHOTOMETRIC METHOD FOR IODIDE IN WATER,
Edgewood Arsenal, Md.
E. J. Poziomek, and D. W. Reger.
Analytica Chimica Acta, Vol, 58, No. 2, p 459-462, February 1972. 2 tab, 15 ref.

Descriptors: *Spectrophotometry, *Iodides, *Aqueous solutions, *Water analysis, Chemical analysis, Iodine, Pollutant identification, Chlorides, Bromides, Anions, Sodium chloride, Methodology, Saline water, Analytical techniques.
Identifiers: *Charge-transfer complexation, 4-cyano-1-methylpyridinium iodide, Perchlorates, Ultraviolet absorption, Chemical interference, Sodium bromide, Sodium perchlorate, Absorbance.

Iodide content can be determined in water samples containing chloride, bromide and/or perchlorate anions by a spectrophotometric examination of the charge-transfer transition of pyridinium iodides. The ultraviolet absorption of the 4-cyano-1-methylpyridinium iodide charge-transfer complex in the region 340-350 nm is used as a measure of the iodide. Analyses of distilled water, USP saline, and aqueous sodium chloride solutions indicated that iodide could be determined within a range of 0.01-1.00 percent in the presence of the aforementioned anions. This spectrometric procedure provides a simple method for the determination of iodide over a wide concentration range in aqueous solutions containing other halides and/or perchlorate. Adaptation of this method to other applications requires that the particular system be checked with the pyridinium perchlorate to insure that no reactant is present which gives products with absorption in the 340-350 nm region. The analysis may also be extended for use in non-aqueous solvents. In that case the charge-transfer absorption is found at longer wavelengths and is usually more intense. Depending on particular needs, a mixed water-organic solvent system could also be employed. (Long-Battelle)
W72-13792

SPECTROPHOTOMETRIC DETERMINATION OF TRACE QUANTITIES OF IRON (III) BY AN EXCHANGE REACTION WITH METAL ACETYLACETONATES,
Assiut Univ. (Egypt). Dept. of Chemistry.
M. M. Aly.
Analytica Chimica Acta, Vol. 58, No. 2, p 467-469, February 1972. 1 fig, 5 ref.

Descriptors: *Spectrophotometry, *Iron, Chemical reactions, Alkali metals, Colorimetry, Heavy metals, Cations, Color reactions, Trace elements, Methodology, Analytical techniques, Anions, Pollutant identification, Chlorides, Magnesium compounds, Nitrates, Sulfates, Fluorides, Ammonium compounds, Potassium, Calcium, Magnesium, Strontium, Zinc, Lead, Manganese, Nickel, Aluminum, Mercury, Sodium.
Identifiers: *Exchange reactions, *Acetylacetonates, *Chemical interference, Dioxane, Chloroform, Absorbance, Metal complexes, Zinc compounds, Barium, Ammonium sulfate.

In the spectrophotometric determination of trace quantities of iron (III) by an exchange reaction with metal acetylacetonates, aliquots of iron solution are added to 3.0 ml of zinc or magnesium acetylacetonate in 7.0 ml of dioxane or chloroform. The resulting color change is measured with a spectrophotometer set at 440 nm. The colorimetric reaction resulted from an instantaneous ion exchange between iron and the metal in magnesium or zinc acetylacetonate. Presumably the occurrence of the reaction is due to the greater stability of the iron acetylacetonate complex as compared with that of magnesium or zinc. Chemical interference was not observed when ammonium ions, Na, K, Mg, Ca, Sr, Ba, Zn, Pb, Mn, Ni, Al or Hg (II) were present in the iron solution up to 0.05 M. Copper did not interfere when the Cu-Fe ration was less than 30. Chromium did not interfere in the chloroform technique due to the insolubility of chromium salts in chloroform; it did interfere in the dioxane method, particularly when this method was applied to a highly acidic aqueous solution and the prepared sample was left more than 1 h before the absorbance was measured. Chloride, nitrate, and sulphate had no effect on the measurements but fluoride interfered. The chloroform technique was found to be more useful since inorganic ions do not interfere in the solutions containing chloroform. (Long-Battelle)
W72-13793

VOLTAMMETRY IN METHANOL, ETHANOL, AND SULFOLANE AS SOLVENTS,
Pittsburgh Univ., Pa. Dept. of Chemistry.
J. F. Coetzee, and J. M. Simon.
Analytical Chemistry, Vol. 44, No. 7, p 1129-1133, June 1972. 5 tab, 18 ref.

Descriptors: *Alkali metals, *Cations, Ions, Alcohols, Polarographic analysis, Measurement, Zinc, Manganese, Cobalt, Copper, Electrodes, Sodium, Potassium, Cesium, Electrical properties.
Identifiers: *Barium, *Voltammetry, *Organic solvents, Methanol, Ethanol, Sulfolane, Acetonitrile, Perchlorates, Samarium, Lanthanum, Lithium, Rubidium.

Polarographic half-wave potentials were measured for alkali metals, and barium ions in the solvents methanol, ethanol, sulfolane, and acetonitrile. Measurements in sulfolane were made with a 3-electrode polarograph, cell, salt bridge, silver reference electrode (AgRE), and rotated platinum microelectrode; those in methanol and ethanol were made with a Coleman 3-512 fiber tip SCE instead of the AgRE. The results were expressed as reduction potentials. For methanol, reliable standard potentials are available, and the sets of half-wave and standard potentials are reasonably consistent. The half-wave potential of barium is solvent-dependent; barium was the only higher charge type cation giving reversible waves in several solvents for which solvation was most likely to be predominantly electrostatic. In water, methanol, ethanol, sulfolane, and acetonitrile as solvents, the half-wave potential of barium was more positive that that of potassium by 0.22, 0.18, 0.18, 0.24, and 0.33 volt, respectively. It would appear that the 'electrostatic' solvation of the barium ion, relative to that of the potassium ion, is weaker in water than in the alcohols. (Long-Battelle)
W72-13794

SENSITIVE FLUORESCENCE METHOD FOR THE DETERMINATION OF CHLOROPHYLL A/CHLOROPHYLL B RATIOS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
N. K. Boardman, and S. W. Thorne.
Biochimica et Biophysica Acta, Vol 253, No 1, p 222-231, November 2, 1971. 8 fig, 1 tab, 13 ref.

Descriptors: *Plant tissues, *Chlorophyll, Plant pigments, Separation techniques, Spectrophotometry, Fluorescence, Chromatography, Beans, Temperature, Nitrogen, Methodology, Chemical analysis, Solvent extractions.
Identifiers: *Chlorophyll a, *Chlorophyll b, Spectrofluorimetry, Absorbance, Spinach, Accuracy, Spinacia oleracea, Phaseolus vulgaris, Pheophytin a, Pheophytin b, Protochlorophyll, Sensitivity, Organic solvents, Sample preparation.

Sensitive spectrofluorimetric methods have been developed for the accurate estimation of chlorophyll a/chlorophyll b ratios in extracts of whole leaves or isolated plastids, where the amount of chlorophyll b (chl b) is low compared with that of chlorophyll a (chl a). Chl a and b were extracted from spinach leaves (Spinacia oleracea), and protochlorophyll from dark-grown bean plants (Phaseolus vulgaris). After all extracts were purified by repeated chromatography, pheophytin a and b were obtained by acidifying purified solutions of chl a and b. Pigment purity was checked by spectral scans at 350-750 nm and absorbance ratios obtained. For the determination of chl a/chl b ratios by the ethanol method, the tissue was ground in ethanol, the extract clarified by centrifugation and diluted. With the ether method, the tissue was ground in acetone and the pigments transferred to an ether solution which was dried over anhydrous sodium sulfate and diluted. After determining the fluorescence emission and excitation spectra of chl a and b in diethyl ether at room temperature using a specially equipped fluorescence spectrometer, the chl a/chl b ratios were determined from the relative fluorescence amplitudes at 666 nm (maximum of chl a) and 646 nm (maximum of chl b). Chl a/chl b ratios were determined on as little as 0.5-1 microgram of chlorophyll, but satisfactory results can be obtained with 0.2 microgram of chlorophyll. The ethanol method at liquid-nitrogen temperature is suitable for measuring chl a/chl b ratios of up to 100 with an accuracy of better than plus or minus 5 percent. The ether method at room temperature covers the range up to a chl a/chl b ratio of 60, with an accuracy of plus or minus 5 percent. The accuracy of the methods described is dependent on the resolution of the emission and excitation monochromators. The measurements used were an excitation half bandwidth of plus or minus 1.5 nm and an emission half bandwidth of plus or minus 1.0 nm. (Byrd-Battelle)
W72-13796

A NEW LIGHT TRAP FOR PLANKTON,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
D. A. Jones.
In: Fourth European Marine Biology Symposium, September 14 and 20 1969, Bangor, Wales, 1971 p 487-493. 2 fig, 2 tab, 8 ref.

Descriptors: *Zooplankton, *Sampling, *Equipment, Light, Automation, Nets, Amphipoda, Annelids, Invertebrates, Larvae, Crustaceans.
Identifiers: *Light trap, Euphausiids, Phaeocystis, Macroinvertebrates, Arthropods, Littorina littorea, Calliopius rathkei, Orchomenella commensalis, Praunus flexuosus, Schistomysis spiritus, Temora longicornis, Paracalanus, Pseudocalanus, Acartia clausii, Centropages hamatus, Carcinus meanus, Balanus, Sagitta elegans, Pleurobrachia pileus, Atylus swammerdami, Orchestia gammerella, Bathyporeia guilliamsoniana, Meganictyphanes norvegica, Pagurus bernhardus, Nyctiphanes couchii, Corophium volutator, Palaemon serratus.

A light trap for catching plankton at night is designed to run automatically and retains the catch for removal at the convenience of the operator. It consists of an electric light source enclosed in a wire frame covered with plankton netting. Zooplankton are attracted by the light beam and enter a conical entrance at the base. The organisms cannot excape as they encounter difficulty in finding the exit when sinking downward with the onset of daylight. The light is shaded so plankton will not be attracted to the side of the trap. A sleeve and collecting bucket on the lower rim of the trap facilitate removal of the catch. In tests of the apparatus, the differences in zooplankton caught when the light trap was switched on and off indicate an increased efficiency of 94 percent when operational. Results compared favorably with those using a 0.5-m townet, with a mean catch of 44,000 zooplankton individuals per night. About 4 percent of the catch was plankton organisms other than the photopositive zooplankton for which the trap was intended. (Mortland-Battelle)
W72-13797

A STUDY OF LIGHT ATTENUATION IN MONTEREY BAY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
T. W. Crews.
Master's Thesis, September 1971. 149 p, 52 fig, 10 tab, 26 ref.

Descriptors: *Sea water, *Instrumentation, *On-site tests, *Physical properties, *Chemical properties, *California, Attenuation, Light, Oxygen, Phosphates, Sediments, Suspended solids, Salinity, Density, Methodology, Sampling, Absorption, Oceans, Upwelling, Phosphorus, Water temperature, Telemetry, Optical properties, Oceanography.
Identifiers: *Monterey Bay (Calif), Beam transmission, Coulter counter, Lasers, Particulate matter, Pycnocline.

A single ocean station was occupied (using an oceanographic vessel) for 27 hours during the Upwelling Period in Monterey Bay, California in order to find the qualitative relations between alpha and temperature, salinity, density, oxygen and phosphate concentrations, and particulate matter at a single site over an extended period of time, and to make comparisons with previous local studies. A Marine Advisors' Model C-2 Beam Transmissometer (alpha meter) which compares favorably with a Scripps folded path transmissometer was used to study light attenuation. Other instruments included a Bissett-Berman Telemetering Salinity-Temperature-Depth-Sound Velocity System Model 9040 which can be set in various modes of operation depending on the environmental conditions measured; a Sippican Expendable Bathythermograph System with an accuracy of plus or nimus 0.2 degree C and plus or minus 2 percent or 15 feet, whichever is greater; and a Model T 15-Channel Coulter Counter for particulate matter analysis. A total of 48 casts were made during the 27-hr period with all measurements being taken at the same depths. It was found that the vertical distributions of the oceanographic parameters studied are dependent on both the seasonal conditions and geographical location. The largest concentration of suspended particles was found in the upper 10-15 m of the water column where most of the light attenuation occurred. The largest attenuation gradient was found in the pycnocline. A linear relation was suggested between the attenuation coefficient and the cumulative projected cross-sectional area of the particles. (Long-Battelle)
W72-13798

SALMONELLA.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05C.
W72-13800

VERSATILE COLORIMETRIC COULOMETER,
Honeywell Research Center, Hopkins, Minn.
For primary bibliographic entry see Field 02K.
W72-13802

SIMPLE DEVICE FOR COMPENSATION OF BROAD-BAND ABSORPTION INTERFERENCE IN FLAMELESS ATOMIC ABSORPTION DETERMINATION OF MERCURY,
Jefferson Chemical Co., Inc., Austin, Tex. Austin Labs.
R. L. Windham.

Descriptors: *Mercury, Instrumentation, Laboratory equipment, Pollutant identification, Water pollution sources, Heavy metals, Methodology, Chemical analysis, *Spectrophotometry.
Identifiers: *Chemical interference, Flameless atomic absorption spectrophotometry, Absorbance, Reliability, Palladium chloride, Recovery.

Palladium chloride on a glass wool mercury absorber attached to a cycling flameless vaporization system was used to compensate for absorption interference in the flameless atomic absorption technique for the determination of mercury. The palladium chloride absorber was prepared by dipping a small plug of glass wool into a 1 percent solution of palladium chloride. Mercury was vaporized, allowed to equilibrate for 1 minute using a peristalter pump, and the absorbance measured at the peak maximum. Mercury was determined in samples containing deionized water, nitric acid, mercury standard of 0.10 microgram, and one or none of the following background-producing compounds: acetone, methyl isobutyl ketone, HC1. Erroneously high absorbance peaks were obtained for all of the above solutions. When mercury was absorbed from the vapor streams by palladium chloride on glass wool, the absorbance decreased by 0.06 absorbance unit, which corresponds to the 0.01 microgram Hg present and to the absorbance of the test sample which had no organic contaminants. The lifetime of the PdC12 absorber is dependent on sample load, but as many as ten samples have been observed to cause no decrease in absorbing ability. This method for background compensation is convenient for mercury determinations whenever a broad-band background interference is present or suspected. It appears to be reliable and specific for mercury. (Long-Battelle)
W72-13803

NEUTRON-ACTIVATION DETERMINATION OF VANADIUM IN OILS AND CATALYSTS,
Instituto de Asuntos Nucleares, Bogota (Colombia).
A. Arroyo, and D. Brune.
Mikrochimica Acta, No 2, p 239-241, March 1972. 2 ref.

Descriptors: *Vanadium, *Oil, *Neutron activation analysis, *Catalysts, Trace elements, Chemical analysis.
Identifiers: Crude oil, Petroleum residues, Vanadium radioisotopes, Oil residues, Chemical interference, V-52, Al-28, Sensitivity, Detection limits, S-37, Sample preparation.

Vanadium in crude and residual oils and in catalysts at concentration levels of 0.2-200 and 400-2000 ppm, respectively, has been determined by means of neutron-activation analysis. The samples were irradiated for four minutes in a thermal flux of 2 giga n/sq mm/sec in a Lockheed reactor followed by a decay period of three minutes. The 1.44 MeV gamma-ray of V-52 was measured with a NaI (Tl) crystal connected to a pulse-height analyzer. Samples were measured for a period of one minute each. Interference by the nuclides Al-28 and S-37 was stripped off; however, the activities of those nuclides limited the degree of sensitivity of V. A precision study on the heavy gas oil containing 0.20 ppm vanadium gave a precision of about 5 percent. The limits of detection of vanadium in oils and in catalysts by the instrumenal technique are estimated to be 0.01 and 10 ppm, respectively. Using this technique, five samples, including the standard can be analyzed in less than 15 minutes. (Snyder-Battelle)
W72-13804

MICRODETERMINATION OF CARBON, HYDROGEN, NITROGEN AND OXYGEN IN PETROLEUM COMPOUNDS WITH AN AUTOMATIC ELEMENTAL ANALYZER,
Sun Oil Co., Marcus, Hook, Pa.
A. J. Smith, G. Myers, Jr., and W. C. Shaner, Jr.
Mikrochimica Acta, No 2, p 217-222, March 1972. 1 fig, 5 tab, 8 ref.

Descriptors: *Oil, *Chemical analysis, Oxygen, Nitrogen, Carbon, Hydrogen, Evaluation, Methodology, Organic compounds, Automation, Instrumentation, Laboratory equipment, Analytical techniques.
Identifiers: *Elemental analyzer, *Petroleum products, *Chemical elements, Hydrocarbons, Anthracene, Asphaltenes, Crude oil.

The applicability of the Perkin-Elmer Elemental Analyzer has been evaluated for the analysis of carbon, hydrogen, nitrogen and oxygen in typical petroleum compounds. Comparison of the Elemental Analyzer results were made with carbon and hydrogen analyses by the Pregl method, oxygen by the Unterzaucher method, and nitrogen results from the automated micro Dumas Analyzer. The results obtained by the automated method were found comparable to those obtained by conventional methods. The automated method was found useful for the analysis of nitrogen in petroleum samples ranging from 0.05 to 0.1 percent N. Samples of transformer oil containing known amounts of added phenol were analyzed for oxygen at the 0.2-1.0 percent oxygen level. (Snyder-Battelle)
W72-13805

TITRIMETRIC DETERMINATION OF TRACE SULFUR IN PETROLEUM USING A LEAD ION SELECTIVE ELECTRODE,
Sun Oil Co., Marcus Hook, Pa.
R. N. Heistand, and C. T. Blake.
Mikrochimica Acta, No 2, p 212-216, March 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Sulfur, *Volumetric analysis, Trace elements, Chemical analysis, Pollutant identification, Methodology.
Identifiers: *Ion selective electrodes, *Petroleum products, *Lead electrodes, Precision, Accuracy.

A rapid, simple method is described for the determination of trace total sulfur in petroleum distillates. The petroleum sample is combusted using an oxyhydrogen burner. The combustion products are collected in 50 ml of absorber solution containing 10 mg of sodium nitrite and 0.444 mg of sodium sulfate. The excess nitrite is destroyed by boiling. After cooling, sufficient 1,4-dioxane is added to make a 50 volume percent solution for the titration. The titration is carried out using an anodic 0.5 microamp polarizing current through a lead ion-selective electrode with standardized (0.0025 M) lead perchlorate as the titrant. The potential break at the endpoint is determined graphically from the titration curve and related to the total sulfur in the petroleum sample. The precision and accuracy of this method are not significantly different than the turbid metric method and it is not limited by the amount of sulfur produced. (Snyder-Battelle)
W72-13806

SOLVENT EXTRACTION AND SEPARATION OF ZIRCONIUM, NIOBIUM AND TANTALUM

BY 2-CARBETHOXY-5-HYDROXY-1- (4--TOLYL)-4-PYRIDONE,
Zagreb Univ. (Yugoslavia). Inst. of Inorganic and Analytical Chemistry.
M. Janko, and M. J. Herak.
Mikrochimica Acta, No 2, p 198-207, March 1972. 9 fig, 1 tab, 7 ref.

Descriptors: *Solvent extractions, *Separation techniques, Organic compounds, Radioisotopes, Organic acids, Aqueous solutions.
Identifiers: *2-Carbethoxy-5-hydroxy-1- (4-tolyl)-4-pyridone, *Zirconium, *Niobium, *Tantalum, Oxalic acid, Organic solvents, Ta-182, Scintillation counting, Efficiency, Zr-95, Nb-95, Zirconium radioisotopes, Niobium radioisotopes, Tantalum radioisotopes.

The metals zirconium, niobium, and tantalum were extracted from oxalic and hydrofluoric acid solutions by 2-carbethoxy-5-hydroxy-1- (4-tolyl)-4-pyridone (HA) dissolved in chloroform, in the presence or absence of mineral acids. Extraction mechanisms for the separation of niobium from fluoride solutions and zirconium from oxalate solutions were proposed from distribution ratios determined by using radionuclides. It was not possible to show a mechanism for the extraction of tantalum from fluoride by this method. The separation of zirconium and niobium from oxalate and fluoride solutions and the separation of tantalum and niobium from fluoride solutions as well as back-extractions by hydrofluoric and oxalic acids were described. The results indicated that HA is an efficient extractant for the metals in both oxalate and fluoride systems and that the efficiency of extraction decreased in the sequence: tantalum, niobium, zirconium. (Long-Battelle)
W72-13807

A COMPUTERIZED SYSTEM FOR STORING, RETRIEVING, AND CORRELATING NMR DATA,
Hercules Research Center, Wilmington, Del.
For primary bibliographic entry see Field 07C.
W72-13808

DDT: INHIBITION OF SODIUM CHLORIDE TOLERANCE BY THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-13809

OIL POLLUTION: PERSISTENCE AND DEGRADATION OF SPILLED FUEL OIL,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-13810

SANDWICH KBR DISK FOR SCANNING VOLATILE PESTICIDES,
Agricultural Research Service, Beltsville, Md. Entomology Research Div.
P. A. Giang.
Analytical Chemistry, Vol 44, No 7, p 1340-1342, June 1972. 1 fig, 1 ref.

Descriptors: *Pesticides, *Instrumentation, *Pollutant identification, *Volatility, Analytical techniques, Infrared radiation, Laboratory equipment, Pesticide residues, Methodology, Phosphothioate pesticides, Phenolic pesticides, Chlorinated hydrocarbon pesticides, Halogenated pesticides.
Identifiers: *Infrared spectroscopy, *Sandwich KBr Disk procedure, Detection, Dichlorvos, Potassium bromide, Malathion, Schradan, Sample preparation.

An excellent infrared spectrum for volatile pesticides could be obtained by placing samples on a freshly prepared KBr disk in the barrel of a Wilks Mini-Press and covering this disk with another KBr disk. If the sample of pesticide is a solution, the solvent must be evaporated completely after the solution is mixed with the KBr in the agate mortar and before it is transferred into the depression in the disk. Therefore, a low-boiling solvent such as spectranalyzed methylene chloride or pentane is preferred in making the sample solution. In subsequent experiments, it was found that this disk sandwich procedure for volatile chemicals can also be used with minute amounts of certain samples of pesticidal residues. (Long-Battelle)
W72-13811

2-AMINO-4-METHYLTHIAZOLE AS A REAGENT FOR THE GRAVIMETRIC DETERMINATION AND EXTRACTION OF MERCURY (II),
Roorkee Univ. (India). Dept. of Chemistry.
S. N. Tandon, P. K. Srivastava, and S. R. Joshi.
Analytica Chimica Acta, Vol 59, No 2, p 311-315, April 1972. 2 fig, 2 tab, 9 ref.

Descriptors: *Mercury, *Aqueous solutions, *Solvent extractions, Chemical analysis, Gold, Trace elements, Solubility, Anions, Cations, Separation techniques, Gravimetric analysis, Chelation, Heavy metals, Pollutant identification, Gold radioisotopes.
Identifiers: *2-Amino-4-methylthiazole, Hg-203, Ag-110m, Au-198, Precision, Silver radioisotopes, Mercury radioisotopes, Silver, Chemical interference, Complexation, Organic solvents.

High aqueous solubility and selectivity make 2-amino-4-methylthiazole a good reagent for the gravimetric determination and extraction of mercury (II). To samples containing 20-150 mg of Hg (II), such as Hg-203 in Hg (NO3)2, an aqueous 0.025 M solution of the reagent was added in slight stoichiometric excess, followed by a pH 9.2 buffer. The resulting precipitate was filtered, washed, dried at 90-100 C for 1 h, and weighed as HgC4H4N2S. The error was within plus or minus one percent at a relative standard deviation of 0.67 percent. No interference was caused by fluoride, oxalate, citrate, and tartrate, but iodide, cyanide, sulphide, thiosulphate, and EDTA interfered. Ag (I) and Au (III) were found to interfere with complexation but, after testing the best solvents for extraction, it was found that above pH 8.4 the mercury complex can be extracted quantitatively into amyl acetate or di-isopropyl ether whereas silver and gold complexes show poor or negligible extraction. The use of radioisotopes of the metals allowed precision in determinations of degrees of complexation and extraction. Radiometric and thermal analyses were done to determine the pH of maximum precipitation and heat stability of the complex. (Mackan-Battelle)
W72-13812

GROWTH OF ENDOMYCOPSIS LIPOLYTICA ON HYDROCARBONS,
Regional Research Lab., Jorhat (India). Biochemistry Div.
J. N. Nigam, B. K. Lonsane, K. Vadalkar, H. D. Singh, and J. N. Baruah.
Journal of General and Applied Microbiology, Vol 17, No 6, p 433-437, December 1971. 3 tab, 10 ref.

Descriptors: *Yeasts, *Oil fields, Isolation, Cultures, Biomass, Soil fungi, Separation techniques.
Identifiers: *Endomycopsis lipolytica, *Substrate utilization, *Aliphatic hydrocarbons, Alkanes, Petroleum products, Enrichment, Biochemical tests, India, Octadecane, Eiconsane, Undecane, Decane, Hendecane, Hexadecane, Nonadecane, Petroleum fractions, Gas oil, Diesel oil, White kerosene, Dodecane, Tridecane, Tetradecane, Pentadecane, Heptadecane.

The ability of the yeast Endomycopsis lipolytica to grow on hydrocarbons was assessed using ten strains of this ascosporogenous yeast which were isolated from the oil fields of Assam in India. Biomass yield from gas-oil, diesel oil, and white kerosene by all the strains were studied in a shake flask. Fermentation studies were carried out in a 3-liter fermenter at 10 percent gas-oil concentration, and growth was measured as the amount of ammonium hydroxide necessary to maintain operational pH. The growth characteristics of the 10 strains of yeast on various petroleum fractions and n-alkanes are reported as well as biochemical characteristics such as pellicle formation, splitting of arbutin, and litmus milk tests. (Long-Battelle)
W72-13817

GROWTH OF SALMONELLA TYPHIMURIUM IN SKIM MILK CONCENTRATES,
Wisconsin Univ., Madison. Food Research Inst.
C. A. Dega, J. M. Goepfert, and C. H. Amundson.
Applied Microbiology, Vol 23, No 1, p 82-87, January 1972. 4 fig, 1 tab, 10 ref.

Descriptors: *Milk, *Growth, Coliforms, *Pressure, Enteric bacteria, Growth rates, Temperature, E. coli, Measurement, Water pollution sources, Cultures, Environmental effects, Atmospheric pressure, *Salmonella.
Identifiers: *Salmonella typhimurium, Characterization, Culture media.

An investigation was made of the influence of various levels of skim milk solids and temperature on the duration of lag phase, growth rate, and extent of growth of Salmonella typhimurium. The effect on growth of salmonellae (and a strain of Escherichia coli) of reduced pressure at a constant solids level and under conditions simulating vacuum condensation of skim milk was also studied. S. typhimurium grew when inoculated into skim milk solutions ranging from 10 to 60 percent solids and over a temperature range of 23 to 44 C. At 10 to 12 C, growth was evident only in the 10 percent skim milk. As the total solids level was increased or incubation temperature was deviated from the optimum, or both, there was an increase in the lag phase and generation time of salmonellae. A lower cell population resulted. The generation time at 37 C of S. typhimurium incumbated at atmospheric pressure was approximately one-half that in skim milk concentrates held under reduced pressure. A slightly longer lag phase and lower cell yield characterized the growth under reduced pressure. Concentration of skim milk had little or no effect on viability of salmonellae or E. coli when the vapor temperature in the vacuum pan was below the maximum growth temperature for salmonellae. Increasing the vapor temperature to 48 C caused a two-log reduction in viable organisms during the concentrating period (65 min). (Long-Battelle)
W72-13818

A CONTINUOUSLY MONITORED RESPIRATION CHAMBER FOR FISH,
Antioch Coll., Yellow Springs, Ohio.
J. O'Hara.
Water Research, Vol 5, p 143-145, 1971. 1 fig, 1 tab, 6 ref. WP-01281-01.

Descriptors: *Oxygen requirements, *Fish physiology, *Laboratory equipment, *Research equipment, Oxygen, Dissolved oxygen, Biochemical oxygen demand, Respiration, Bioassay, Environmental effects, Sunfishes.
Identifiers: *Respirometers, Oxygen utilization, Respiration rates.

Oxygen utilization by fish can be used as a measure of the general metabolic activity of the organism and the influence of environmental variables and stresses can be indicated by how they alter this metabolic rate. Determination of recovery periods from stress as well as establishing fairly precise levels of no stress effect depend upon establishing a continuously monitored oxygen utilization rate. An apparatus that provides a con-

tinuous recording of the respiration rates of fish is described. The respirometer uses the flowing water technique and provides extremely reliable determinations of respiration rates to be made on small to medium size fish. Ten bluegills (Lepomis macrochirus) were tested to determine the repeatability of measurements using this apparatus. The results show close values of oxygen utilization by fish in this size class when tested at 25C. (Svensson-Washington)
W72-13872

METHOD AND MEANS FOR DETECTING COLIFORM BACTERIA IN WATER,
Hach Chemical Co., Ames, Iowa. (Assignee)
C. C. Hach.
U. S. Patent No 3,553,082, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 292, January 5, 1971.

Descriptors: *Patents, *Bacteria, *Indicators, Biological pollutants, *Coliforms, *Bioindicators, *Pathogenic bacteria, *Pollutant identification, Water pollution, Water pollution sources.

The test liquid sample and a nutrient medium are introduced into a chamber having a separator so that any gas developed from fermentation by bacteria may be collected. The nutrient medium may be lactose broth or brilliant green lactose bile broth solution. The claim is that these procedures take less time than do the U.S. Public Health Service Drinking Water Standards tests. (Sinha-OEIS)
W72-13881

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.

National Academy of Sciences, Washington, D.C., August 9-13, 1971. 119 p, 1 fig, 9 tab, 71 ref.

Descriptors: *Environmental effects, *Pollutant identification, *Path of pollutants, Water pollution sources, *Dispersion, *Geochemistry, *Biological properties, *Transfer, Elements (Chemical), Disposal, Water pollution effects, Aquatic organisms.

The Ocean Science Committee of the Ocean Affairs Board conducted a workshop to examine the problems related to its marine environmental quality program. The problem areas selected for study included: identification of major pollutants, their sources and input rates; delineation of processes affecting the dispersal of these pollutants; the geochemical and biological transfer of critical elements or compounds in the ocean; establishing the effects of pollutants on living organisms; and identification of the sites of final deposition of specific elements and compounds in the ocean environment. Results of these investigations are presented and recommendations are made. (Ensign-PAI)
W72-13903

U234/U238 DISEQUILIBRIUM IN GROUNDWATERS OF CENTRAL TEXAS,
Rice Univ., Houston, Tex. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W72-13971

THE CONCENTRATIONS OF CADMIUM, COPPER, IRON, MANGANESE, MOLYBDENUM, NICKEL, VANADIUM AND ZINC IN PART OF THE TROPICAL NORTHEAST ATLANTIC OCEAN,
Liverpool Univ., (England). Dept. of Oceanography.
J. P. Riley, and D. Taylor.
Deep-Sea Research, Vol. 19, p 307-317, 1972. 2 fig, 4 tab, 10 ref.

Descriptors: Elements (Chemical), *Atlantic Ocean, *Assay, Water sampling, Laboratory tests, Analytical techniques, Chelation, Ion exchange, Colorimetry, *Spectrophotometry, Distribution, *Cadmium, Copper, *Iron, *Manganese, Molybdenum, *Nickel, Vanadium, Zinc, *Trace elements.

Determinations of cadmium, copper, iron, manganese, molybdenum, nickel, vanadium, and zinc have been carried out on water samples from the tropical north-east Atlantic Ocean, using a chelating ion-exchange concentration method followed by atomic absorption spectrophotometry, or for molybdenum and vanadium by colorimetry. The results indicate that cadmium, iron, manganese, and nickel are relatively uniformly distributed in this area, whereas molybdenum, vanadium, zinc, and, to some extent, copper show larger variations of a random nature. (Houser-ORNL)
W72-13985

IODINE IN THE DEEP WATER OF THE OCEAN,
Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-13986

PERMISSIBLE ACTIVITY DISCHARGE INTO RECEIVING WATERS THROUGH RADIOACTIVE WASTE WATER FROM NUCLEAR POWER PLANTS (ZULASSIGE AKTIVITATSEINLEITUNG IN VORFLUTER DURCH RADIOAKTIVE ABWASSER AUS KERNKRAFTWERKEN),
P. G. Brunner.
Wasser und Boden, Vol. 5, No. 4, p 124-126, 1971. 2 fig, 4 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Discharge, *Regulation, Administrative agencies, Management, Monitoring, Radioisotopes, Surface waters, Water pollution control, Water pollution sources.
Identifiers: Radiation safety, Radiation control.

Details are given of the future consumption of electric energy and of the future installed electric power from nuclear power plants. Based thereon, the permissible radioactive discharge per 100 MWe into waters is determined to be 1.5 Ci/a, except T, for a total power of nuclear power plants of 100,000 MWe. Considering the capacity of decontamination plants the permissible activity discharge per 100 MWe can be provisionally established to be 1 Ci/a. (House
W72-13987

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Radiation Data and Reports, Vol. 13, No. 7, p 403-405, July 1972. 1 tab, 6 ref.

Descriptors: *Radioactivity, *Survey, *Assay, *Measurement, *Sampling, Analytical techniques, Data collections, Fallout, Public health, Regulation, Water pollution, Water pollution sources, Radioisotopes.
Identifiers: *Surveillance program.

In the section on water, data are presented on the gross alpha and beta radioactivity (suspended solids and dissolved solids) for samples collected the following ten rivers during November 1971: Clinch River, Colorado River, Dolores River, Mississippi River, Ohio River, Roanoke River, San Miguel River, St. Lawrence River, White River and Yampa River. (Houser-ORNL)
W72-13988

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Available from Sup Doc, U.S. Printing Office, Wash., D.C., 20402, for $0.50/copy. Radiation Data and Reports, Vol. 13, No. 6, p 360-366, June 1972. 2 fig, 6 tab, 8 ref.

Descriptors: *Radioactivity, *Assay, *Measurement, Food chains, Milk, Iodine, *Strontium, Cesium, Barium, Water, Water pollution, Water pollution sources, Nuclear explosions, Fallout, *Sampling, Data collection, Public health, Governments, *California, *Sewage.
Identifiers: Surveillance program.

In the water section, data are presented on the gross alpha and beta radioactivity (suspended and dissolved solids) for samples collected from seventeen rivers during October 1971. Strontium-90 data results are given for samples collected and composited from 26 rivers during January - March 1971. For Caliornia data are reported on the monthly average beta radioactivity for samples of domestic waters for the period January - December 1970. Other data for California in 1970 include: radiomidide concentrations; gross radioactivity in sewage samples; and comparison of radioactivity in domestic water and sewage. (Howser-ORNL)
W72-13989

STRONTIUM-90 AND CESIUM-137 IN CANNED SEAFOOD, TAIWAN, REPUBLIC OF CHINA, 1970-1971,
National Tsing Hua Univ., Hsinchu (Taiwan). Inst. of Physics.
P. S. Weng, and A. P. Liu.
Available from U. S. Sup Doc, Gov. Printing Office, Washington, D.C., 20482, 50 cents per copy. Radiological Health Data and Reports, Vol 12, No 12, p 615-616, December 1971. 1 fig, 1 tab.

Descriptors: *Radioisotopes, *Strontium, *Cesium, *Assay, *Aquatic animals, *Fish, Food, Food habits, Food chains, Aquatic populations, Pollutants, Path of pollutants, Food processing industry.
Identifiers: Seaweed, Canned seafood, *Taiwan (China).

Since 1970, canned seafood available on the market has been regularly monitored for strontium-90 and cesium-137 radioactivity. Tsing Hua University analyzed the samples by means of standard radiochemical methods and beta-particle counting in a low, background counting system. The samples included canned seafood from Europe, North America, Japan, and Taiwan as well as wide variety of seafood extending from sardines to seaweeds. (Houser-ORNL)
W72-13990

HANFORD ATOMIC PRODUCTS OPERATION, JANUARY-DECEMBER 1969.
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-13991

A STUDY OF PHOSPHATE INDUCED ALGAL GROWTH IN ORDER TO SUPPRESS OR ELIMINATE THIS PHENOMENON,
New Mexico State Univ., University Park. Water Resources Research Inst.
N. E. Vanderborgh, and A. G. Buyers.
Available from the National Technical Information Service as PB-212 026, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Completion Report 003, June 1972, 35 p, 9 fig, 7 tab, 22 ref. OWRR A-035-NMEX (1).

Descriptors: *Algal control, *Phosphates, *Algal nutrients, *Chlorella, Algae, *Eutrophication, New Mexico, Biodegradation.

Identifiers: *Algal growth, *Radioisotope P32, Sodium pyrophosphate, Rio Grande Valley.

The kinetics of the radioactive isotope P32 uptake by the fresh water algae, chlorella, were investigated in soil-water cultures, natural systems, and synthetic culture media. Laboratory investigations were conducted at pH values of 4, 7 and 10, at a constant temperature 20 plus or minus 2C. Portions of reagent grade sodium pyrophosphate were irradiated with a fast neutron flux converting a portion of the sample into the radioisotOpe P32. (P32 emits a 1.7 Mev beta with a half-life of 14.31 days.) Tagging was done at a rate sufficient to produce an activity of 0.03 microcuries/gram. Solutions were then prepared containing the tagged pyrophosphate and used to spike chlorella cultures. The uptake of the isotope was then monitored as a function of time. After various times the cultures were sampled, filtered and counted for P32 activity. Results indicated that the kinetic interpretation of P32 uptake must allow for first order kinetics with respect to P32 at a pH of 10, and a second order kinetic scheme at pH 7 and 4. This evidence indicated that algal systems only utilize phosphorus in the orthophosphate form. Phosphorus exchange rates with soil and information about degradation pathways are included. Two experiments, one with an oxygen rich environment and the second with a carbon dioxide rich environment, were carried out with sodium pyrophosphate-chlorella, soil-water and chemical cultures. In the oxygen experiment P32 removal was eliminated in the chemical cultures and removal was slowed for the soil-water cultures. C02 enrichment greatly accelerated the removal. (Creel-NMex State)
W72-13992

A REVIEW OF PESTICIDE MONITORING PROGRAMS IN CALIFORNIA.
California State Dept. of Agriculture, Sacramento. Pesticide Advisory Committee.
For primary bibliographic entry see Field 07B.
W72-14043

INDIANA WATER QUALITY, 1969, MONITOR STATION RECORDS--RIVERS AND STREAMS.
Indiana State Board of Health, Indianapolis; and Indiana Stream Pollution Control Board, Indianapolis.
For primary bibliographic entry see Field 07B.
W72-14045

WEST VIRGINIA WATER QUALITY NETWORK.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 07B.
W72-14048

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
J. E. Cannon, W. J. Shea, and C. A. Maine.
1971. 92 P, 17 TAB.

Descriptors: *Water supply, *Water pollution control, *Rhode Island, *Sewage treatment, *Water quality, Water sampling, Surface waters, On-site data collections, State governments, Municipal water, Municipal wastes, Industrial wastes, Reviews, Coliforms, Pesticides, Radioactivity, Chemical analysis.

Rhode Island, in its program of water quality surveillance, has sampled all surface water supplies in the state, plus many semi-public supplies, swimming pools used by the public, industrial water supplies, private wells when pollution is suspected, and tap-water supplies. Tests include sampling for pesticides, radioactivity, bacteria, and chemical analyses. For pesticides, 42 out of 43 samples showed less than 2 ppb, and a recheck of the one water supply over this limit did not confirm the test results of the first sample. Coliform have not proved to be a major problem, although instances of contamination have occurred. Descriptions of the water supply activities of various cities are given. The report also describes water pollution control activities in Rhode Island during the period July 1, 1969 to June 30, 1970. Descriptions of over 20 municipalities' efforts are given, along with associated activities of land developers, industries and individual sewage disposal systems, in conjunction with municipal systems. Two important projects of the Blackstone Valley Sewer District Commission are described. These are the extension of the system of interceptor sewers and construction of secondary treatment facilities at the Bucklin Point Sewage Treatment Plant. (Poertner)
W72-14051

COMPARATIVE EFFECTS OF AQUATIC BIOTOXINS ON CARDIAC SYSTEMS,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-14056

THE ANALYSIS OF TRACE ORGANICS IN FRESH WATER BY GAS CHROMATOGRAPHY -- MASS SPECTROSCOPY,
New Hampshire Univ., Durham. Dept. of Chemistry.
J. D. Anemaet.
PhD Thesis, February 1972. 104 p, 53 fig, 14 tab, 120 ref, append. OWRR A-009-NH (3).

Descriptors: *Chemical analysis, *Extraction, *Organic compounds, *Organic acids, *Gas chromatography, *Mass spectrometry, Spectroscopy, Chromatography, Organic matter, Separation techniques, Analytical techniques.

A method for the qualitative analysis of organic substances in fresh water is presented. Four liters of water are continuously extracted with pentane. The pentane is concentrated and washed with 72% sulfuric acid to remove carbasoles and similar type compounds. The components of the pentane extract are separated by gas chromatography, using a capillary column. The separated components are directly fed to a mass spectrometer and their spectra recorded. A second four liters of water are extracted using an ion exchange column. The column is washed with sodium hydroxide and the effluent, after acidification, is extracted with chloroform followed by n-butanol. Each fraction is evaporated to dryness and the residues are methylated. The methylated residue is examined by gas chromatography, using a capillary column, and mass spectroscopy. From the pentane extract, twenty-three compounds were identified from three different classes; n-alkanes, acid esters and polynuclear aromatic hydrocarbons. From the ion exchange extract, fifteen different acids were identified and ten additional compounds remain unidentified.
W72-14057

OPTIMIZATION OF DISSOLVED OXYGEN MEASUREMENTS,
Envirogenics Co., El Monte, Calif.
H. C. Edgington.
Report available for sale by Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.25. Office of Saline Water Research and Development Progress Report No. 713, August 1971. 139 p, 19 fig, 44 tab, 16 ref. OSW Contract 14-30-2586.

Descriptors: *Desalination, *Distillation, *Dissolved oxygen, *Volumetric analysis, Analytical techniques, Pollutant identification, Measurement.
Identifiers: *Winkler method, End-point detection, Back titration.

The purpose was to evaluate the effect of the various parameters affecting the precision and accuracy of the Winkler method for measuring dissolved oxygen (D.O.), and to develop an optimized procedure of high accuracy and precision. Laboratory research was conducted to evaluate (1) methods for end-point detection, (2) handling parameters, (3) interferences, (4) reagent characteristics, and (5) interfering ions. Based on the results of these tests, an optimized Winkler method was developed which is capable of a precision of at least 0.75 microgram O2/l and an accuracy of 1% or 0.5 microgram O2/l (whichever is greater) in the range from 0 to saturation. The essential features of the optimized procedure are: The true D. O. Content of a sample is determined through the analysis of samples and deoxygenated samples in the NR mode. Samples are collected and fixed under N2. Excess standard thiosulfate solution is added to the fixed sample and then an aliquot is back titrated voltametrically with standard iodate solution. By this method errors due to I2 loss, interfering ions, and end-point detection are largely avoided as are corrections for iodide oxidation and D. O. blanks of the reagents. (OSW abstract)
W72-14066

CO-PRECIPITATION APPLIED IN THE DETERMINATION OF LEAD IN DRINKING WATER, (IN SERBO-CROATIAN),
Vojnomedicinska Akademija, Belgrade (Yugoslavia). Higijenskohem. Inst.
B. D. Spasojevic, and D. A. Jovanovic.
Acta Pharm Jugosl. 21 (3): 103-107. Illus. 1971. English summary.
Identifiers: Pollutant determination, *Lead, Polarography, *Chemical precipitation, *Potable water.

Co-precipitation by zinc phosphate was used in the determination of Pb in drinking water. The precipitate was separated through a sintered glass filter and after its dissolution in diluted HNO3, Pb was determinated by polarography. In the range from 0 to 25 microgram (0.125 mg/l) the recovery amounts to 96-98% of the Pb present in the sample. As the maximum permissible level of Pb in drinking water is limited to 0.050 mg/l, the procedure described can be successfully used in the Pb intake control.--Copyright 1972, Biological Abstracts, Inc.
W72-14179

ARAZATE METHOD FOR ESTIMATING COPPER IN WATER,
Connecticut Univ., Storrs. Dept. of Animal Industries.
A. C. Smith.
J Dairy Sci. 55 (1): 39-41. 1972.
Identifiers: *Arazate, Contamination, *Copper, *Milk, Analytical techniques, Pollutant identification.

(A determination of Cu in water is needed to minimize Cu contamination during handling, cooling and processing of milk.) A method using zinc dibenzyldithiocarbamate (Arazate) for estimating Cu in water was not significantly different from the Bathocuproine procedure. Repeatability trials at 2 levels of Cu gave standard deviations of 0.001 and 0.002 ppm. Twelve samples with 0.1 and 0.2 ppm of added Cu had recoveries of 93 to 104% and 93 to 103% with means of 100 and 99%. The presence of >10 ppm of chlorine, however, interfered with the recovery of Cu.--Copyright 1972, Biological Abstracts, Inc.
W72-14191

5B. Sources of Pollution

SAMPLING AND SPATIAL DISTRIBUTION OF BENTHONIC FORAMINIFERA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.

For primary bibliographic entry see Field 05A.
W72-13674

EFFECT OF PH ON THE FILTRATION OF AQUATIC HUMUS USING GELS AND MEMBRANES,
Norsk Institutt for Vannforskning, Oslo.
For primary bibliographic entry see Field 05A.
W72-13681

SEASONAL VARIATION OF THE SUSPENDED SOLID MATTER, OFF THE COAST OF NORTH YORKSHIRE,
Leeds Univ. (England). Wellcome Marine Lab.
A. J. Newton, and J. S. Gray.
Journal of the Marine Biological Association of the United Kingdom, Vol. 52, No. 1, p 33-47, February 1972. 4 fig, 5 tab, 17 ref.

Descriptors: *Suspended solids, *Organic matter, Sea water, Coasts, Statistical methods, Water temperature, Tidal effects, Waves, River flow, Flow rates, Mathematical models, Regression analysis, Salinity, Wind, Rainfall, Filtration, Suspended load, Water analysis, Tides, Statistical models, Currents (Water), Sampling.
Identifiers: *Seasonal variation, *North Sea, Sea state, Tidal range, River Esk.

Water samples were taken weekly over a 2-year period from three sampling sites on the North Sea to determine seasonal variation in suspended solids. Samples were collected in a 2-liter automatic sampler and taken to the laboratory in polypropylene bottles. They were vigorously agitated to resuspend any settled solid material and analyzed by a filtration process. A number of parameters were measured at the sampling sites for possible correlation with distribution of suspended solids: temperature, salinity, tidal range, wind, rainfall, flow rate of the River Esk, and sea state. Sea state, sea temperature, tidal range, and river flow correlated significantly with suspended solid values. It was suggested that most of the variation in the load of suspended matter in this area is controlled by wave action, tidal currents, and river flow. The correlation with temperature was not felt to be a causal relationship. Using multiple regression equations as mathematical models, it was possible to derive accurate predictions of the natural suspended solid load. These models could then be used to detect changes in suspended load under discharge conditions. (Mortland-Battelle)
W72-13682

OZONATION REACTIONS OF SELECTED PESTICIDES FOR WATER POLLUTION ABATEMENT,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05G.
W72-13685

CELLULOLYTIC ACTIVITY IN MUNICIPAL SOLID WASTE COMPOSTING,
Bureau of Solid Waste Management, Cincinnati, Ohio.
F. J. Stutzenberge, A. J. Kaufman, and R. D. Lossin.
Canadian Journal of Microbiology, Vol 16, 1970, p 553-560, 10 fig, 26 ref.

Descriptors: *Municipal wastes, *Cellulose, *Microorganisms, Temperature, Hydrogen ion concentration, *Degradation (Decomposition).
Identifiers: *Composting, Open windrow method, Aspergillus fumigatus, Bacillus, Thermoactinomyces, *Cellulose activity.

Those factors that might influence cellulose decomposition during the open windrow method of municipal solid waste composting were investigated. Composting temperatures reached a maximum of 55-65 degree C at 3 weeks and then gradually decreased during the rest of the 79 day process. The pH values of compost samples homogenized in distilled water decreased slightly during the initial stages of the process and then increased gradually to final values of 7.0-8.5. Clarified compost extracts were assayed for cellulose activity by measuring the hydrolysis rate of carboxymethylcellulose (CMC). Maximal cellulose activity of compost increased 10-fold at a logarithmic rate while the cellulose content decreased 50%. In a preliminary search for microorganisms active in cellulose degradation during the composting process, three cellulolytic species were isolated; these were identified as Aspergillus fumigatus, a Bacillus species and a Thermoactinomyces species of the Actinobifida group. (Galwardi-Texas)
W72-13686

A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. Kothandaraman.
Available from University Microfilms, Ann Arbor, Michigan. Order No. 69-1374, Microfilm $3.00, Xerox $7.80. Ph. D. Dissertation, June 1968, 168 p.

Descriptors: *Dissolved oxygen, *Stream stabilization, *Statistical models, Simulation analysis, Monte Carlo Method, Ohio River, *Biochemical oxygen demand.
Identifiers: *Dissolved oxygen deficit, Deoxygenation coefficient, Reaeration coefficient.

A method for the prediction of dissolved oxygen deficits in a stream with known initial conditions was developed by taking into account the variations in deoxygenation and reaeration coefficients. A hypothetical stream situation was used to establish the significance in predicting dissolved oxygen deficit. Statistical models were formulated and tested for the variations in these coefficients using published data. Simulation techniques using the Monte Carlo method were employed in predicting the probabilistic variation in dissolved oxygen deficits for known initial conditions and the results were verified with survey data observed for the Ohio River-Cincinnati Pool reach. The predicted results using probabilistic models were found to agree with the observed values within practical limits and gave more consistent results than conventional methods. (Galwardi-Texas)
W72-13688

OBSERVATIONS ON THE MERCURY CONTENT OF MYOXOCEPHALUS QUADRICORNIS (L.) (TELEOSTEI, COTTIDAE) IN FINLAND,
Helsinki Univ. (Finland). Zoological Museum.

Ann Zool Fenn. Vol 8, No. 3, p 331-335, 1971. Illus.

Descriptors:
Identifiers: Path of pollutants, cottidae, Finland, *Mercury, Myoxocephalus quadricornis, Teleostei, Fish physiology, Oxygen.

The Hg content was determined in the fourhorn sculpin, a glacial relict occurring in the Baltic and in some lakes. In an unpolluted area of the Baltic the Hg content varied between 0.06-0.36 ppm, being positively correlated with size. In the stunted specimens of Lake Ladoga the content was the same as in the largest specimens in the Baltic. In the Hg-polluted lake Paijanne the Hg content of M. quadricornis was elevated with values up to 1.9 ppm. In another lake, Nasijavi, with the same degree of Hg pollution, however, the Hg contamination of M. quadricornis was very low (0.02-0.28ppm), possibly because the O sub 2 content of its waters is so low.--Copyright 1972, Biological Abstracts, Inc.
W72-13695

GEOLOGICAL CONSIDERATIONS OF SANITARY LANDFILL SITE EVALUATIONS,
Geological Survey, Morgantown, W. Va.
P. Lessing, and R. S. Reppert.
West Virginia Geological and Economic Survey Environmental Geology Bulletin No 1, 1971. 33 p, 4 fig, 1 tab, 16 ref, 4 append.

Descriptors: *Sanitary engineering, *Landfills, *Waste disposal, *Water pollution control, *Geological surveys, Topography, Geology, Bedrock, Soils, Hydrology, Planning, Solid wastes, West Virginia.

The geologic aspects of a landfill, both advantageous and detrimental, are discussed. Topics include topography, bedrock, geology, soil, and hydrology. Geologic guidelines are suggested that will lead to proper site location and minimum pollution. Landfills, by their nature, produce and contribute various gases, leachate, organic and inorganic solids and liquids, and noxious odors to out environment. Proper evaluation and management of landfills will minimize the affect of these elements upon the environment. Thus landfills should not be in contact with surface water. Surface drainage should be diverted around landfills to prevent flow through, over, or near the landfill. This is particularly important at sites near rivers and creeks that may flood. Included are a list of pertinent references and four appendixes. (Woodard-USGS)
W72-13719

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W72-13720

FRESH WATER WINNING AND SALT WATER ENCROACHMENT IN THE AMSTERDAM DUNE WATER CATCHMENT AREA,
Amsterdam Water Works (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13724

APPLICATION OF NATURAL ISOTOPES IN GROUND WATER HYDROLOGY,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
For primary bibliographic entry see Field 02F.
W72-13728

WATER QUALITY OF STREAMS IN THE NESHAMINY CREEK BASIN, PENNSYLVANIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W72-13737

THERMAL AQUACULTURE: ENGINEERING AND ECONOMICS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 06B.
W72-13743

EFFECTS OF LAND USE ON MUNICIPAL WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 04C.
W72-13759

THE QUANTIMET 720P FOR ROUTINE BIOLOGICAL ASSAY AND POTENCY CALCULATION FROM COLONY COUNT, INHIBITION AND EXHIBITION ZONE MEASUREMENTS,
Imanco Ltd., Royston (England).
C. P. Bond, D. J. Berry, and J. A. Crawley.

The Microscope, Vol 20, No 1, p 165-174, April 1972. 8 fig, 2 ref.

Descriptors: *Bioassay, Assay, *Bacteria, Viability, Pollutant identification, Inhibition, Laboratory equipment, Automation, Computers, Nutrients, Antibiotics (Pesticides), Microorganisms, Microscopy, Quality control.
Identifiers: *Quantimet 720P Petriscope, *Counting, Dark field illumination, Accuracy, Reproducibility, Detection.

The Quantimet 720 Petriscope is designed to automate microbiological examination for routine biological assay and potency calculation from colony count and for inhibition and exhibition zone measurements for research and quality control applications. Problems arise in such examinations due to the subjective assessments which have to be applied to malformed inhibition zones which often have diffuse edges and also due to errors arising from the tedium of colony counting. The Quantimet 720P accurately counts and sizes bacterial colonies using dark field illumination without any errors due to repetition. On inhibition zone measurements, the Quantimet 720P is able to utilize different forms of illumination to overcome errors due to insufficient contrast. Dark field illumination can be used in many cases but others require a unique 'diffusion detecting' graticule between the bright field illumination source and the petri dish. The image of the graticule is then detected through areas of inhibition but not through areas of microbiological growth. These alternative forms of illumination allow completely reproducible, objective measurements to be made on zone areas of diameters with on-line automatic calculation and print-out of potency in real time. (Byrd-Battelle)
W72-13762

A REVIEW OF THE METHODS FOR THE IDENTIFICATION OF PERSISTENT HYDROCARBON POLLUTANTS ON SEAS AND BEACHES,
Shell Research Ltd., Chester (England). Thornton Research Center.
For primary bibliographic entry see Field 05A.
W72-13766

THE PRESENT STATUS AND FUTURE PROSPECT OF THE TURBIDOSTAT,
National Chemical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 05A.
W72-13772

THE ANNUAL CYCLE IN QUANTITY AND COMPOSITION OF THE ZOOPLANKTON OF THE SARGASSO SEA OFF BERMUDA. II. THE SURFACE TO 2,000 M,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
G. B. Deevey, and A. L. Brooks.
Limnology and Oceanography, Vol 16, No 6, p 927-943, November 1971. 17 fig, 3 tab, 23 ref.

Descriptors: *Zooplankton, *Seasonal, *Distribution patterns, Crustaceans, Systematics, Sampling, Gastropods, Mollusks, Protozoa, Worms, Larvae, Plankton nets, Copepods, Sea water, Nets, Equipment, Marine animals, Amphipods.
Identifiers: *Sargasso Sea, Tunicates, Coelenterates, Chaetognaths, Macroinvertebrates, Bermuda, Ostracods, Euphausiids, Foraminifera, Pteropods, Spinocalanus, Mecynocera, Pleuromamma, Calocalanus, Heterorhabdus, Lucicutia, Haloptilus, Clausocalanus, Phyllopus, Eucalanus, Metridia, Calanus, Rhincalanus, Oithona, Oncaea, Mormonilla, Conaea, Farranula, Calanus tenuicornis, Calanus finmarchicus, Nannocalanus minor, Macrocypridina, Halocypris, Halocypria, Archiconchoecia, Conchoecia, Euconchoecia, Evadne spinifera, Lucifer typus, Fritilliaria, Oikopleura, Sagitta minima, Sagitta lyra, Sagitta macrocephala, Eukrohnia, Krohnitta subtilis, Spiratella (Limacina), inflata, Desmopterus papilio.

A qualitative and quantitative year-round study has been made of the microzooplankton of the 2000-m water column in the Sargasso Sea. Monthly hauls were made over four depth ranges. For hauls of the upper 500 m, an open meter net of No. 2 and No. 8 nylon equipped with a flowmeter was used. The other three depth ranges were sampled with a 0.75 square meter Be plankton sampler with the individually metered nets of No. 8 mesh. Each net was towed for 10-20 min at 1-2 knots when it reached the approximate center of its depth range. In the upper 500 m highest numbers were found in October and April; between 500 and 1,000 m the highest numbers were present in July, March, and May; from 1,000 to 5,000 m the numbers were highest in August, January, and March. In the deepest waters sampled numbers were highest in July, October, March, and May. Crustacea increased in importance and in diversity below 500 m. Copepods comprised 70 percent of the plankton of the upper 500 m and 85.2 percent in the deepest waters sampled. Pelagic ostracods were next in importance, but were relatively less numerous below 1,500 m. Highest numbers of calanoid genera and ostracod species were noted between 500 and 1,500 m. Euphausiids were most numerous between 1,500 and 2,000 m with a November maximum. Tunicates, coelenterates, chaetognaths, Foraminifera, pteropods, and various larval forms were most abundant in numbers and species in the upper waters, but occurred in small numbers below 500 m. (Mortland-Battelle)
W72-13775

NICKEL POLLUTION,
University Coll. of Wales, Aberystwyth. Dept. of Agricultural Biochemistry; and University Coll. of Wales, Aberystwyth. Dept. of Biochemistry.
For primary bibliographic entry see Field 05A.
W72-13778

METABOLISM OF POLYCHLORINATED NORBORNENES BY CLOSTRIDIUM BUTYRICUM,
Mainz Univ. (West Germany). Institut fuer Anorganische Chemie und Kernchemie.
I. Schuphan, and K. Ballschmiter.
Nature, Vol 237, No 5350, p 100-101, May 12, 1972. 2 fig, 1 tab, 12 ref.

Descriptors: *Metabolism, *Chlorinated hydrocarbon pesticides, Clostridium, Yeasts, Halogenated pesticides, Separation techniques, Anaerobic bacteria, Cultures, Soil microorganisms, Soil bacteria, Organic pesticides, Soil contamination, Chemical reactions.
Identifiers: *Clostridium butyricum, *Polychlorinated norbornenes, Saccharomyces, Fate of pollutants, Substrate utilization, Electron capture gas chromatography, Dechlorination.

In order to determine the ability of Clostridium butyricum to metabolize polychlorinated norbornenes, cells were grown anaerobically on water-covered potatoes and subjected to various concentrations (0.1-1,000 ppm) of norbornenes. At the end of an experiment the whole culture medium was homogenized and extracted with toluene. The resulting solution was used for electron capture gas chromatography. Culture and potatoes gave no interfering peaks in the chromatogram. The results obtained show that C. butyricum metabolizes hexa, penta, and tetrachloro-norbornenes. No dechlorinated products of the hexachloro-norbornene could be found using well-aerated yeast (Saccharomyces) cultures or soil microorganisms, mostly actinomycetes, on agar plates. To what extent the dechlorination reactions described can be found with other microorganisms is under investigation. (Long-Battelle)
W72-13779

SALMONELLA.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05C.
W72-13800

REGULARITIES OF SR90 AND CS137 CIRCULATION IN DIFFERENT LINKS OF FOOD CHAIN IN ZOOCOENOSIS,
Akademiya Nauk SSSR, Moscow. Inst. of Animal Morphology.
A. I. Il'Enko.
Zh Obshch Biol. Vol 31, No 6, p 698-709, 1970. (English summary).
Identifiers: *Path of pollutants, *Food chains, Birds, Cesium-137, Circulation, Fish, Food, Links, Mammals, Reptiles, Strontium-90, Zoocoenosis.

Sr90 and Cs137 circulation was studied in different links of food chains. Their distribution from prey to predators (predatory fishes, reptiles and mammals), the content of Sr90 increases and that of Cs137 decreases in some tissues of mammals, phytophagous and insectivorous birds were compared. Transfer of these tracers from prey body to predators (predatory fishes, reptiles and mammals) show the content of Sr90 and Cs137 in the skeleton and muscles of the predator increases. The amount of Cs137 in muscles of predatory birds is lower than in the body of rodents on which they feed and that of Sr90 in the bone tissue of predators is lower than in prey skeleton. Differences in the content of tracers in various links of food chains in the biocoenosis are due to ecological and morphological differences between the organisms. The amount of tracers varies in animals which differ in feeding habits.--Copyright 1971, Biological Abstracts, Inc.
W72-13801

OIL POLLUTION: PERSISTENCE AND DEGRADATION OF SPILLED FUEL OIL,
Woods Hole Oceanographic Institution, Mass.
M. Blumer, and J. Sass.
Science, Vol 176, No 4039, p 1120-1122, June 9, 1972. 3 fig, 8 ref.

Descriptors: *Oil spills, *Environmental effects, *Sediments, *Persistence, *Degradation (Decomposition), Water pollution sources, Oil pollution, On-site investigations, Sampling, Gas chromatography, Organic compounds, Mass spectrometry, Aromatic compounds, Biodegradation, Physical properties, Coasts, Massachusetts, Pollutant identification, Microbial degradation.
Identifiers: *Fuel oil, Heptadecane, Alkanes, Isoprenoids, Phytane, Benzene, Naphthalane, Crude oil, Buzzards Bay, Pristane, Substrate utilization.

A 2-year old oil spill site in Buzzards Bay, Massachusetts, where 600 metric tons of oil had been spilled, was studied in order to gain information on the persistence and degradation of spilled oil in a coastal environment. Measurements of oil degradation in this area involved determining the n-Csub17/pristane ratio in sediments. Hydrocarbons were identified by chromatographic and mass spectrometric analyses. The results indicated that fluctuations in hydrocarbon degradation products found in sediments were due to weathering, oxygen availability, and location. The slow hydrocarbon degradation, as evidenced by their persistence over a two-year period, was principally carried out by microbial utilization of alkanes and the partial dissolution of lower-boiling aromatic hydrocarbons. Field and laboratory observations confirm that there is a decrease in the degradation rate from normal alkanes to iso- and cycloalkanes and to aromatic hydrocarbons. Branched and cyclic hydrocarbons are attacked even more slowly than the n-alkanes; after 2 years, isoprenoids (phytane, pristane, and the C sub 18 homolog) were evident and alicyclic and aromatic hydrocarbons remained prominent in the polluted sediments. The boiling range of the spilled oil and the relative abundances

of homologous hydrocarbons (e.g., phytane and pristane) have been well preserved. The above findings are in agreement with the known geochemical stability of hydrocarbons. (Long-Battelle)
W72-13810

GENERAL GROUND-WATER QUALITY IN FRESH-WATER AQUIFERS OF DELAWARE,
Delaware Geological Survey, Newark.
K. D. Woodruff.
Report of Investigations No 15, July 1970. 22 p, 5 fig, 5 tab, 8 ref.

Descriptors: *Groundwater resources, *Water quality, *Chemical analysis, *Aquifers, *Delaware, Sampling, Water wells, Water demand, Freshwater, Dissolved solids, Specific conductivity, Iron, Nitrates, Water utilization, Water supply.
Identifiers: *Groundwater quality, *Freshwater aquifers.

Information on groundwater quality in Delaware has become critical for three reasons: (1) increased water demand, (2) need for a better understanding of groundwater flow patterns, (3) need for a 'base' against which future quality changes can be measured. Analyses of about 150 water quality samples from wells show that Delaware's fresh groundwaters are suitable for most purposes. High iron content may occur, however, in wells tapping the Columbia and the Potomac Formations. Overall, total dissolved solids in Delaware aquifers are relatively low except in the Cheswold and Frederica aquifers Miocene), and parts of the Piney Point Formation (Eocene). High nitrates were found in a few wells tapping the Columbia formation and may be due to the use of agricultural fertilizers. The average ratio of total dissolved solids to specific conductivity computed from samples was 0.70. Except for the Magothy Gormation, no simple relationship was observed between groundwater quality and depth in fresh water-bearing portions of the aquifers. (See also W72-13833 and W72-13834) (Woodard-USGS)
W72-13832

NITRATE CONTAMINATION OF THE WATER--TABLE AQUIFER IN DELAWARE,
Delaware Geological Survey, Newark.
J. C. Miller.
Report of Investigations No 20, May 1972. 36 p, 10 fig, 2 tab, 46 ref.

Descriptors: *Water pollution sources, *Groundwater, *Nitrates, *Delaware, *Chemical analysis, Water supply, Septic tanks, Sampling, Water analysis, Water wells, Data collections, Soil properties, Aquifer characteristics, Water pollution control.
Identifiers: *New Castle County (Del), *Kent County (Del).

The increasing population of the State of Delaware is placing severe strains on the quality of groundwater in the water-table aquifer by disposing of septic-tank effluent in the soil. The permeable water-table aquifer, containing reserves of 331 million gallons per day, is very vulnerable to contamination by objectionable or toxic fluids and dissolved substances placed on or in the soil. Two areas were studied in order to evaluate the problem. A nitrate specific-ion electrode was used for the analyses. The first area, in the vicinity of Porter-Woods roads in New Castel County, has soils of very low permeability, is generally water logged during the rainy seasons, and has a very high water table. Groundwaters in this area had very low nitrate contents due to a lack of oxidizing conditions in the soils, but overflowing septic-tank systems cause overland movement of bacteria into shallow wells. The second area, south of Moores Lake in Kent County, has very permeable soils and underlying sands with a low water table. Nitrate levels from one to three times the health limit for drinking water were in the area. Deep wells into artesian aquifers are the immediate remedial measure for the Moores Lake area until the community is served by public sewers. (See also W72-13832 and W72-13833) (Woodard-USGS)
W72-13834

EXPERIMENTAL INJECTION OF TERTIARY--TREATED SEWAGE IN A DEEP WELL AT BAY PARK, LONG ISLAND, N. Y.--A SUMMARY OF EARLY RESULTS,
Geological Survey, Mineola, N.Y.
J. Vecchioli.
New England Water Works Association, Vol 86, No 2, p 87-103, June 1972. 4 fig, 5 tab, 12 ref.

Descriptors: *Injection wells, *Artificial recharge, *Reclaimed water, *New York, Sewage, Aquifer characteristics, Water quality, Methodology, Groundwater movement, Saline water intrusion, Salinity, Well filters, Well screens, Clogging, Deep wells.
Identifiers: *Long Island (NY).

As of May 1971, nine groundwater recharge tests ranging in duration from 2 to 33 days had been made at Bay Park, Long Island, New York. Injection rate was generally 350 gpm. The maximum volume injected in any one test was 14 million gallons. After each test, the injection well was pumped to waste, partly to restore lost capacity and partly to extract water previously recharged and, thus, to restore the quality of the water in the Magothy aquifer to near-native condition. Reclaimed water was injected through a gravel-packed well constructed with an 18-inch diameter fiberglass casing above a 16-inch diameter stainless-steel screen. The experiments have shown that the Magothy aquifer can be recharged with reclaimed water through the use of injection wells. Stringent quality requirements would have to be maintained on the injected water to minimize well clogging. For example, turbidity, iron, aluminum, and phosphate contents of the injection water would have to be kept at near-zero levels, and the water would have to be chlorinated; otherwise, the rate of clogging would require frequent redevelopment of the well. (Woodard-USGS)
W72-13839

HYDROLOGY OF ALABAMA AREAS--COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY,
Alabama Marine Resources Lab., Dauphin Island.
E. I. Bault.
Available from the National Technical Information Service as COM-72-104687, $3.00 in paper copy, $0.95 in microfiche. Alabama Marine Resources Bulletin, No 7, February 1972. 36 p, 18 fig, 2 tab, 22 ref.

Descriptors: *Estuaries, *Water pollution sources, *Path of pollutants, *Chemical analysis, *Alabama, Gulf of Mexico, Deltas, Industrial wastes, Sewage, Nitrates, Phosphates, Dissolved oxygen, Water temperature, Turbidity, Salinity, Data collections, Sampling, Tidal effects, Winds.

Twenty-one hydrological stations in five Alabama estuarine areas were sampled monthly from January, 1968 through March 1969. Nitrite-nitrogen, nitrate-nitrogen, orthophosphate-phosphorus, total phosphorus, pH, dissolved oxygen, temperature, turbidity and salinity were determined at each station. Bimonthly isohalines and isotherms and graphical representations of micronutrients and chemophysical parameters are presented. All data are presented in tables or graphs, and comparisons are made among the estuarine areas. The Mobile Delta had the highest nitrate, nitrite, and total phosphorus values of any Alabama estuarine study area. The Mobile River is the principal pollution source in this area with an excess of 90% of the pollution of the Mobile Delta in its waters. The high nitrite values are principally caused by domestic sewage from Mobile and paper mill effluents. (Woodard-USGS)
W72-13840

ENDOSULFAN IN THE RHINE RIVER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
For primary bibliographic entry see Field 05C.
W72-13847

SUSPENDED SEDIMENT DATA SUMMARY MARCH 1966-MAY 1967, UPPER CHESAPEAKE BAY (TOLCHESTER TO HAVRE DE GRACE),
Maryland Fish and Wildlife Administration, Annapolis.
For primary bibliographic entry see Field 02L.
W72-13849

PRELIMINARY REPORT ON TECHNIQUES FOR MARINE MONITORING SYSTEMS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
D. F. Soule, and J. D. Soule.
Available from the National Technical Information Service as COM-72-10452, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Program Technical Note USC-SG-IT-71, August 1971. 5 p, 6 fig.

Descriptors: *Monitoring, *Water pollution sources, *Marine biology, *Harbors, *California, Analytical techniques, Methodology, Pacific coast region, Marine animals, Marine plants, Ecology, Environmental effects.
Identifiers: *Monitoring techniques, Settling racks.

Techniques for monitoring systems to assist in assessing the impact of pollution on marine biotic communities are presented. Described is a system consisting of attaching small settling racks to docks, floats and buoys, which is effective in evaluating the biotic content of the water column. Racks were installed at 8 locations in the Los Angeles Harbor and adjacent coastal waters and changed monthly. At the same time racks were changed, plankton tows were made and productivity measurements were conducted. Benthic samples were taken with either an orange peel or small Campbell grab. Sediment samples were collected. Temperature and oxygen readings were made at each station. Settling racks have acted as effective substrates for good growth of several species of hydroids, tunicates, polychaete worms, caprellids, amphipods and other crustaceans, bryozoans, mollusks, and echinderms, as well as the algae Ulva and Enteromorpha. The racks have provided a more diverse assemblage of organisms in every instance than the benthic samples taken at the same time. (Woodard-USGS)
W72-13850

INVESTIGATIONS OF ORGANIC MATTER IN GROUNDWATER OF OIL- AND GAS-BEARING REGIONS (METODICHESKIYE ISSLEDOVANIYA V OBLASTI IZUCHENIYA ORGANICHESKOGO VESHCHESTVA PODZEMNYKH VOD NEFTEGAZONOSNYKH OBLASTEY),

Descriptors: *Groundwater, *Organic matter, *Natural gas, *Oil, *Water chemistry, Geochemistry, Chemical reactions, Physicochemical properties, Aqueous solutions, Solutes, Organic compounds, Carbon, Inorganic compounds, Rocks, Hydrogeology, Exploration, Water sampling, Analytical techniques, Investigations, Instrumentation.
Identifiers: *USSR, Reagents, Humic acids, Pyridine, Iodation, Bitumen, Dispersion halos, Skewness.

This collection of 11 papers presents the results of investigations conducted in 1967-68 by the Laboratory of Hydrochemistry and Hydrogeology of the Moscow Institute of Geology and processing of Mineral Fuels. Topics discussed include: (1) organic-matter components in groundwater as possible indicators of oil and gas deposits; (2) composition of chloroform extracts and carbon eluates from groundwater; pyridine as a direct indicator of productivity in oil and gas prospecting; (5) determination of total organic carbon in natural waters containing large amounts of chlorides and carbonates; (6) determination of humic acids in groundwater; and (7) refined procedures for determining iodate oxidation. (Josefson-USGS)
W72-13856

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.
For primary bibliographic entry see Field 05A.
W72-13903

A FRAMEWORK FOR IDENTIFICATION AND CONTROL OF RESOURCE DEGRADATION AND CONFLICT IN THE MULTIPLE USE OF THE COASTAL ZONE,
California Univ., Berkeley. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05G.
W72-13906

DDT RESIDUES IN EIGHT CALIFORNIA MARINE FISHES,
Philadelphia Community Coll., Pa.
S. B. Shaw.
Calif Fish Game. 58 (1): 22-26. 1972.
Identifiers: *California, Chromatography, *DDT, English, Fish, Lingcod, Marine fish, Petrale, Rattail, Sablefish, Sole, *Monterey Bay, *Pesticide residues.

Levels of DDT, DDD, DDE, and total DDT residues in the livers and flesh of marine fishes, mainly from Monterey Bay, were determined using gas-liquid chromatography. Mean values for total DDT residues for liver ranged from 4.7 ppm wet weight (rough scale rattail) to 0.22 ppm (lingcod), and for flesh ranged from 2.0 ppm (sablefish) to 0.035 ppm (lingcod). Maximum values for total DDT residues in some individual fishes approached or exceeded FDA limits of 5.0 ppm wet weight, e.g., for livers: sanddab 13 ppm, rough-scale rattail 7.9 ppm, sablefish 6.9 ppm, English sole 6.1 ppm, and petrale sole 4.8 ppm; for flesh: sablefish 6.3 ppm and rough-scale rattail 4.7 ppm.--Copyright 1972, Biological Abstracts, Inc.
W72-13946

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13962

ON THE PHYSICO-CHEMICAL BEHAVIOR OF RADIOACTIVE CERIUM IN SEA WATER,
National Inst. of Radiological Sciences, Nakaminato (Japan). Marine Radio-Ecological Research Station.
S. Hirano, T. Koyanagi, and M. Saiki.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/3. 13 p, 4 fig, 9 ref.

Descriptors: *Radioisotopes, *Fallout, *Nuclear explosions, *Effluents, Radioactive waste disposal, Assay, Physiochemical properties, Behavior, Oceans, Equilibrium, Hydrogen ion concentration, Chemical reactions, Path of pollutants, Water pollution sources.
Identifiers: *Radioactive cerium.

An experiment to enhance the knowledge of the physico-chemical behavior of radioactive cerium in sea water was conducted. A summarization of the results includes: Radioactive cerium in sea water exists mainly in dissolved form with about 20% to 25% forming into the particulate state of more than 1.2 microns in diameter. A considerable portion of radioactive cerium exists as ionic species in sea water. Radioactive cerium is hydrolyzed slowly at pH greater than 6. Equilibrium between natural cerium and radioactive cerium may be achieved after a fairly long time. (Houser-ORNL)
W72-13970

U234/U238 DISEQUILIBRIUM IN GROUNDWATERS OF CENTRAL TEXAS,
Rice Univ., Houston, Tex. Dept. of Geology.
Joel Kronfeld.
Publication No. GJO-935-1 (Pt. 2), p 303-310, June 1971. 11 ref.

Descriptors: *Radioactivity, *Uranium radioisotopes, *Equilibrium, *Hydrologic systems, Groundwater, Surface waters, Surface-groundwater relationships, Water pollution, Analytical techniques, Isotope fractionation, Aquifers, *Texas.
Identifiers: *Trinity aquifer, *Lake Waco (Tex).

Samples of ground and surface waters from central Texas were analyzed for U content and U234/U238 ratio. The analysis method and results are presented. Surface U concentrations and isotopic ratios contrasted markedly with subsurface values. In general, surface U concentrations were higher than subsurface and were much closer to isotopic equilibrium. Lake Waco water samples had a U234 ratio of 1.2 and a U content of 0.66 ppM while ground water from beneath the city of Waco had a ratio of 5.6 and U content of 0.07 ppM. Surface waters exhibited between 15 and 40% excess U234. The ground water samples exhibited between 250 and 1300% relative enrichment of U234. The factors governing the extreme fractionation were not established. (Houser-ORNL)
W72-13971

SORPTION-DESORPTION REACTIONS OF MERCURY WITH SUSPENDED MATTER IN THE COLUMBIA RIVER,
Washington Univ., Seattle. Dept. of Oceanography.
M. H. Bothner, and R. Carpenter.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper IAEA/SM-158/5. 18 p, 9 fig, 1 tab, 16 ref.

Descriptors: *Radioisotopes, *Mercury, *Columbia River, *Pacific Ocean, *Sediment, *Suspended load, *Sorption, *Desorption, Absorption, Adsorption, Water pollution, Water pollution sources, Public health, Water types, Freshwater, Saline water, Path of pollutants.

The fluence of Columbia River suspended matter on the fate of dissolved mercury in the river and during the transition from the river to the oceanic environment has been investigated. Experimental results show that both inorganic and methyl mercury are fairly rapidly taken up by the natural assemblage of Columbia River particulates. The desorption experiments show that at least half of each of these forms is fairly easily desorbed by filtered river water of lower total mercury content. Subsequent washes with sea water remove little additional mercury from the particulates during roughly one week of contact time. (Houser-ORNL)
W72-13972

DISTRIBUTION PATTERNS FOR SOME PARTICULATE AND DISSOLVED TRACE METALS WITHIN AN ACTIVE GLACIAL FJORD,
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington, Paper No. IAEA/SM-158/6. 25 p, 11 fig, 5 tab, 33 ref.

Descriptors: *Distribution patterns, *Hydrographs, *Sediment distribution, *Fjords, *Glaciers, *Alaska, Cold region, Sediment distribution, Sediment load, Suspended solids, Deposition (Sediment), Trace elements, Zinc, Copper, Lead, Nickel, *Path of pollutants, Water pollution sources.

The distribution patterns of some trace metals between water and both suspended and deposited sediment has been studied in a non-iceberg fjord-estuary in S.E. Alaska. The hydrography of this type of fjord is such that, during the summer, glacial meltwater runoff enters the marine fjord initially as a concentrated sediment-plume on the surface. This sediment subsequently flocculates and settles through the subhalocline portion of the marine column. The soluble zinc content of the glacial fresh water is slightly lower than that of the marine water, and the total fresh water particulate zinc is predominantly structural. In this environment there appears to be adsorption of zinc across the halocline; and copper, lead, and nickel are covariant with iron and the suspended sediment load. The sediment deposition rates in this fjord type are very high, and the sediment texture, composition, and chemistry is uniform through the surface meter or so. The organic carbon content is around 0.1% only. The interstitial water contents of both zinc and copper approximate those in overlying water. (Houser-ORNL)
W72-13973

ADSORPTION-DESORPTION EQUILIBRIA OF SOME RADIONUCLIDES IN SEDIMENT-FRESHWATER AND SEDIMENT-SEAWATER SYSTEMS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
C. N. Murray, and L. Murray.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/7. 26 p, 11 fig, 3 tab, 28 ref.

Descriptors: *Radioisotopes, *Absorption, *Adsorption, *Sorption, *Decontamination (Water), Ion exchange, *Demineralization, Water, Rivers, Oceans, Freshwater, Sea water, Marine water, Salinity, Hydrogen ion concentration, Zinc, Cobalt, Equilibrium, *Sediment-water interfaces, Path of pollutants, Water pollution sources.
Identifiers: *Desorption, *Silver.

Experiments were made to investigate the uptake of certain radionuclides on freshwater sediments in river water (adsorption) and their subsequent release from the sediments to the seawater (desorption). It was found that for the radionuclides studied, cobalt-60, zinc-65, silver-110m, their behavior was very individual. Laboratory results suggest that certain factors strongly affect the adsorption-desorption characteristics of

the sediment. The influence of important factors such as the pH of the river, estuary and seawater, the concentration of sediment and trace element in the river water, the speciation of the trace element, the mineralogy of sediment, the formation of particulate material in the river water and flocculation of this by sediment in the estuary and sea, and salinity effects on desorption are discussed. From a knowledge of these factors, it is possible to predict, as a first approximation for a given sediment, the amount of radionuclide that will be taken up by a given weight of freshwater sediment in a very simple river system under equilibrium conditions. When this sediment reaches the marine environment the amount of desorbed radionuclide can be calculated. (Houser-ORNL)
W72-13974

TRANSPORT AND DEPLETION OF RADIONUCLIDES IN THE COLUMBIA RIVER,
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.
D. E. Robertson, W. B. Silker, J. C. Langford, M. R. Petersen, and R. W. Perkins.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/9. 23 p, 13 fig, 1 tab, 7 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Radioactive waste disposal, *Water pollution sources, *Columbia River, Sediments, Sediment transport, Deposition (Sediment), Assay measurement, Radioactivity, Seasonal, Hydrology, Distribution, Suspended solids, Biota, Plankton, *Path of pollutants.

The radionuclide transport and depletion processes in the Columbia River are being characterized following the closure of the last of the Hanford plutonium production reactors in January 1971. Radionuclide concentrations are periodically being measured in river water, sediments and biota between Hanford and Bonneville Dam to determine the rates and mechanisms of the processes which govern the distribution and behavior of the radionuclides in the Columbia River system. All of the short-lived radionuclides in the river have now decayed, but some residual long-lived radionuclides have remained in the river, being associated mainly with sedimentary deposits in the reservoir behind McNary Dam. These radionuclides are tightly bound to the sediments and enter the river mainly by resuspension, especially during the high river flow in the spring and early summer. The depth distributions of radionuclides in sediment cores collected at various locations in the reservoirs behind McNary, the Dalles, and Bonneville dams are being measured to estimate radionuclide inventories, sediment resuspension and transport, and sedimentation rates in the river system. (Houser-ORNL)
W72-13975

STUDIES ON THE BEHAVIOURS AND DISTRIBUTION OF RADIOACTIVE SUBSTANCES IN COASTAL AND ESTUARINE WATERS,
Japan Atomic Energy Research Inst., Osaka.
Y. Nishiwaki, Y. Honda, Y. Kimura, H. Morishima, and T. Koga.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/11. 30 p, 15 fig, 1 tab, 9 ref.

Descriptors: *Radioisotopes, *Radioactivity effects, *Distribution, *Sediment, *Adsorption, *Hydrogen ion concentration, *Salinity, Dispersion, Tidal effects, Path of pollutants, Water pollution sources.
Identifiers: *Rare earth, *Thorium, *Osaka Bay (Japan).

Thorium and rare earth elements have continuously been discharged through a small river into the estuarine water at Osaka Bay. Studies of the variation of concentration of these elements under various natural conditions were made. Studies on adsorption of these elements on some bottom sediments were carried out in the water with different salinities and pH. One of the important factors influencing the concentration of the elements in the water is tidal oscillations. The gross beta activities in water at the same location in the estuary widely varied at each time of sampling. The dispersion of the elements in the estuarine water were not interpreted by simple dilution and diffusion of the element in water mass. The presence of the mud flats, as well as the marine meteorological conditions, seem to affect markedly the distribution of the element in the estuarine water. The adsorption of the element on the bottom sediment was influenced not only by the coarseness of the sediment but also by the salinity and pH of the water. (Houser-ORNL)
W72-13976

THE EVALUATION OF PUBLIC RADIATION EXPOSURE FROM THE CONTROLLED MARINE DISPOSAL OF RADIOACTIVE WASTE (WITH SPECIAL REFERENCE TO THE UNITED KINGDOM),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
A. Preston, and N. T. Mitchell.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington, Paper No. IAEA/SM-158/36. 20 p, 2 fig, 5 tab, 17 ref.

The application of critical path techniques is discussed in relation to the evaluation of public radiation exposure from the controlled marine disposal of radioactive waste. The discussion relates exclusively to the situation in the UK, since critical path techniques have eeen more extensively applied there and because there is a dearth of published information on which to base reliable estimates of radiation dose commitment for other situations. The principal sources of radioactive waste at this time are nuclear power programmes and especially at the stage at which fuel is reprocessed. In the UK, low level liquid radioactive wastes from these programmes are dispersed in surface waters and the inshore marine environment. The origin and nature of such of these disposals as are made to estuaries and the sea are briefly summarized and the method of control is outlined. (Houser-ORNL)
W72-13977

MUSSELS AND BARNACLES AS INDICATORS OF THE VARIATION OF MANGANESE-54, COBALT-60 AND ZINC-65 IN THE MARINE ENVIRONMENT,
Southern California Coastal Water Research Project, Los Angeles.
D. R. Young, and T. R. Folsom.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/42. 18 p, 8 fig, 1 tab, 33 ref.

Descriptors: *Nuclear explosions, *Nuclear powerplants, *Fallout, *Effluents, *Water pollution sources, *Aquatic life, *Mussels, *Crustaceans, Absorption, Assay, Radio-isotopes, Zinc, Cobalt, Manganese, Radioactive tracers.
Identifiers: *Mytilus californianus.

The intertidal byssal mussel Mytilus californianus and the oceanic gooseneck barnacle Lepas anatifera are efficient indicators of spatial and temporal changes in levels of three radiometals in the marine environment. Lepas specimens collected from the northeastern Pacific during the first half of 1964 demonstrated oceanic-to-coastal ratios of manganese-54, cobalt-60, and zinc-65 fallout from the 1961-62 thermonuclear tests of approximately 3:1, 4:1, and 2:1, respectively. Cesium-137 in the surface layers of the two sectors (whose centers lie about 1,500 and 300 km west of San Diego) also showed a 3:1 oceanic-to-coastal enhancement of fallout from this source. Mytilus specimens collected during the 1963-64 along the northeastern Pacific Coast showed a fairly uniform distribution of manganese-54 and cobalt-60 between latitudes 46 and 29 degrees north, but dramatically reflected the point source of Hanford-produced zinc-65 emanating from the mouth of the Columbia River. Relatively high zinc-65 concentrations, possibly related to this source, were detected in Mytilus from northern Baja California, Mexico--1,900 km to the south. (Houser-ORNL)
W72-13978

CONCENTRATIONS OF ZINC-65 IN MARINE FOODSTUFFS AND PACIFIC COASTAL RESIDENTS,
Battelle-Pacific Northwest Labs. Richland, Wash.
T. H. Essig, G. W. R. Endres, J. K. Soldat, and J. F. Honstead.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/43. 33 p, 12 fig, 3 tab, 6 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Columbia River, *Pacific Ocean, *Aquatic environment, Radioisotopes, Water pollution, Water pollution sources, Food chains, Zinc, Assay, Public health, Digestion, Path of pollutants, Measurement.

The Hanford plant, located on the Columbia River in southeastern Washington, for a number of years discharged small concentrations of radionuclides into the river with the once-through cooling water from the production reactors. Most of the radionuclides were short-lived activation products but a few nuclides persisted in the river all the way down to the Pacific Ocean. Small amounts of radionuclides from Hanford have been found in fin fish such as salmon, but by far the greatest concentrations occur in the various shellfish taken from sites near the mouth of the Columbia River. Two of these nuclides are biologically active (Zn65 and P32) and have been routinely measured in seafood. This study describes Zn65 in people living in two coastal communities in Oregon and Washington in the spring of 1970 and the fall of 1971, and the relationship between their body burdens and their seafood intake. The study was designed to obtain data about both the average for the communities and the maximum seafood consumers. (Houser-ORNL)
W72-13979

CONCENTRATIONS AND DISTRIBUTIONS OF LONG-LIVED FALLOUT RADIONUCLIDES IN OPEN OCEAN SEDIMENTS,
Woods Hole Oceanographic Institution, Mass.
V. E. Noshkin, and V. T. Bowen.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/45. 21 p, 6 fig, 5 tab, 25 ref.

Descriptors: *Oceans, *Sediments, *Atlantic Ocean, *radioisotopes, *Strontium, *Cesium, Sampling, Cores, Depth, Analytical techniques, Measurement, Movement, Sediment transport, Momentum transfer, Model studies, Fallout, Aquatic environment, *Path of pollutants, Water pollution sources.
Identifiers: *Mediterranean Sea, *Plutonium.

Analyses of deep open-ocean sediment cores from the North and South Atlantic and the Mediterranean Sea show the presence of Sr90, Cs137 and 239, Pu238 in measurable amounts distributed to depth within the sediment columns. Comparison of the quantities of these radionuclides accumulated in the sediments with either estimated integrated deliveries to the sea surface or the measured inventories in the overlying water masses has been used to estimate the residence times of the radionuclides in the water column. For Sr90 and Cs137 these computed residence times are orders of magnitude shorter than those estimated for the stable elements. Plutonium is removed from the water column significantly more rapidly than either Sr90 or Cs137. The ratio of Cs137 to Sr90 in the sediments is higher than that found in precipitation, suggesting that a larger fraction of ocean water Cs137 is associated with sedimenting particles than has been previously assumed. (Houser-ORNL)
W72-13980

THE GEOCHEMISTRY OF RADIOCARBON IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
T. D. Mathews, A. D. Fredericks, and W. M. Sackett.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper IAEA/SM-158/48. 22 p, 4 fig, 1 tab, 25 ref.

Descriptors: *Geochemistry, *Carbon radioisotopes, *Gulf of Mexico, *Nuclear explosions, Fallout, Distribution, Distribution pattern, Ocean circulation, Model studies, Hydrologic models, Sampling, Analytical techniques, *Path of pollutants, Water pollution sources.

This study was conducted to achieve a better understanding of the contemporary geochemistry of radiocarbon in the Gulf of Mexico and adjacent areas. Bomb C14 was found in various biological samples and samples of coral, atmosphere, and water as a result of efforts to map bomb C14 distribution in the Gulf. A circulation model for the western Gulf of Mexico was also proposed. Lateral transport from east to west and downward migration due to eddy diffusion were suggested as mechanisms of renewal of intermediate and deep water in the western Gulf. Residence times for these water masses were found to be 130 years and 270 years respectively. (Houser-ORNL)
W72-13981

ANOMALOUS TH228/TH232 AND TH230/232 ACTIVITY RATIOS IN BACKWATER SEDIMENTS ALONG THE WEST COAST OF INDIA.
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
D. U. Joshi, and A. K. Ganguly.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Environment, July 10-14, 1972, Seattle, Washington. Paper IAEA/SM-158/50. 14 p, 5 fig, 2 tab, 4 ref.

Descriptors: *Indian Ocean, *Coasts, *Assay, *Equilibrium, *Sediments, Harbours, Backwater, Sediment distribution, Distribution patterns, Interfaces, Radioisotopes, Geochemistry, Analytical techniques, *Path of pollutants, Water pollution sources.
Identifiers: Disequilibrium, Thorium (Natural), *Bombay (India).

Recently, remarkable disequilibrium between Th228 and Th232 activities has been observed in the top layer sediments of the backwaters along the Indian Coast. The Th228/Th232 activity ratios in Bombay harbour region (19 deg N, 73 deg E) and Kerala belt (8 deg to 10 deg N, 76 deg to 77 deg E) have been found to be in the range of 0.55 to 0.67, while this ratio is in the range of 2.00 to 2.19 along the rest of the West Coast of India between Bombay and Kerala region (19 deg to 15 deg E, 76 deg to 77 deg E). A geochemical study of these sediments is being carried out by leaching the samples with 5% EDTA at pH 3.00 in order to investigate the processes occurring on the surface and the distribution of natural thorium isotopes in backwater sediments. (Houser-ORNL)
W72-13982

RADIOACTIVE WASTE MANAGEMENT PRACTICES IN WESTERN EUROPE.
European Nuclear Energy Agency, Paris (France); and Organization for Economic Co-Operation and Development Paris (France).
For primary bibliographic entry see Field 05G.
W72-13983

ENVIRONMENTAL RADIOACTIVITY AT THE NATIONAL NUCLEAR RESEARCH CENTRE, PELENDABA. REPORT FOR THE YEAR 1970.
Atomic Energy Board, Pretoria (South Africa).
As. D. Van, and C. M. Vleggaar.
Available from NTIS, Springfield, Va., $3.00 copy/$0.95 mf. Publication No. PEL-216, September 1971. 21 p, 2 fig, 26 tab, 10 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Radioactivity, *Measurement, *Monitoring, Fallout, Water pollution, Air pollution, Water pollution sources, Sediment, Path of pollutants, Assay, Radioisotopes, Water, Milk, Food chains, Public health, Strontium, Nuclear explosions, Testing, Africa.
Identifiers: *South Africa, Critical nuclide identification.

A revised environmental survey program, with the emphasis on monitoring of the critical paths of exposure of the general public, was introduced during the 1970 period. Results of determinations of both gross radioactivity and of individual nuclides in samples of fish and water (which are critical materials for liquid effluent releases) from the Hartbeespoort Dam and from the Crocodile River, are given and discussed. Results of gamma-spectrometric and Sr90 analyses of milk, the critical material for releases to the atmosphere, are presented. Results of regular investigations of the composition of effluent releases, which are performed in order to be able to detect possible other critical nuclides, are given. Levels of deposited and airborne activity from nuclear bomb tests are reported. (Houser-ORNL)
W72-13984

THE CONCENTRATIONS OF CADMIUM, COPPER, IRON, MANGANESE, MOLYBDENUM, NICKEL, VANADIUM AND ZINC IN PART OF THE TROPICAL NORTHEAST ATLANTIC OCEAN,
Liverpool Univ., (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W72-13985

IODINE IN THE DEEP WATER OF THE OCEAN,
Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
S. Tsunogai.
*Oceans, *Iodine, *Deep water, *Oxidation, *Chemical reaction, *Iodides, Distribution patterns, Profiles, Verticle migration, Depth, Sampling, Analytical techniques, Research and development, Cycles, Assay.

The distribution of iodine in the ocean was studied to ascertain the source of the iodine in deep water. Iodine in sea water was separated from iodate immediately upon sampling and both forms were determined. The concentration of iodide in the ocean is much smaller than that of iodate. The higher concentrations of iodide, however, were found in the surface water, near the bottom and in the water from some deep layers. The production rate of iodide from iodate in the bottom (or on the bottom) was estimated from the vertical distribution of iodide in the near-bottom water. This also gave the oxidation rate of iodide in the deep water. The production of iodide in the bottom water plays a fairly important role in the cycle of iodine in the ocean. Another source of iodide is presumed to be present in the deep water by taking into account the oxidation rate of iodide and the balance of iodide in the deep water. This source may be distributed locally and cause the higher concentrations of iodide found in some deep layers. (Houser-ORNL)
W72-13986

PERMISSIBLE ACTIVITY DISCHARGE INTO RECEIVING WATERS THROUGH RADIOACTIVE WASTE WATER FROM NUCLEAR POWER PLANTS (ZULASSIGE AKTIVITATSEINLEITUNG IN VORFLUTER DURCH RADIOAKTIVE ABWASSER AUS KERNKRAFTWERKEN),
For primary bibliographic entry see Field 05A.
W72-13987

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05A.
W72-13988

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05A.
W72-13989

STRONTIUM-90 AND CESIUM-137 IN CANNED SEAFOOD, TAIWAN, REPUBLIC OF CHINA, 1970-1971,
National Tsing Hua Univ., Hsinchu (Taiwan). Inst. of Physics.
For primary bibliographic entry see Field 05A.
W72-13990

HANFORD ATOMIC PRODUCTS OPERATION, JANUARY-DECEMBER 1969.
Battelle Memorial Inst., Richland, Wash.

Available from Sup Doc, GPO, Washington, D.C., 20402, for $0.50 per copy. Radiological Health Data and Reports, Vol 12, No 12, p 643-662, December 1971. 7 fig, 13 tab, 23 ref.

Descriptors: *Nuclear powerplants, Effluents, *Monitoring, *Radioactivity, Assay, Bioassay, Water pollution, Water pollution sources, Waste water disposal, Nuclear wastes, *Columbia River, Population, Food chains, *Path of pollutants.

Results are presented from routine sampling of biological materials and other media from surveillance and environmental monitoring around nuclear facilities at Hanford site. (Houser-ORNL)
W72-13991

THE BIODEGRADATION OF OIL IN SEAWATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, Calif.
T. B. O'Neill.
Available from NTIS, Springfield, Va 22151 as AD-740 757. Price $3.00 paper copy; $0.95 microfiche. Naval Civil Engineering Laboratory Technical Note N-1195, January 1972. 15 p, 1 tab, 15 ref.

Descriptors: *Oil spills, *Water pollution sources, *Sea water, *California, *Biodegradation, Microbial degradation, Marine microorganisms, Analytical techniques, Sampling, Beaches, Sands, Sediment, Bacteria, Fungi, Yeasts.

Natural oil seeps and accidental spills are common to the coast of Southern California. Field observations and laboratory tests support the view that marine microorganisms have the capacity to oxidize and thus degrade oil and derivatives of oil. Samples were collected from beach sand, sediment water, and tar deposits from 15 different sites of Southern California, where oil spills are chronic. The laboratory techniques of isolating and culturing hydrocarbon-oxidizing microorganisms are described. Included are cell density studies, where Navy fuels are used as the sole source of energy for microbes in the collected samples. To date, 62 hydrocarbon-oxidizing species, 48 bacteria, 10 fungi and 4 yeasts have been isolated. (Woodard-USGS)
W72-14012

CHEMICAL FACTORS THAT INFLUENCE THE AVAILABILITY OF IRON AND MANGANESE IN AQUEOUS SYSTEMS,
Geological Survey, Menlo Park, Calif.
J. D. Hem.
Geological Society of America Bulletin, Vol 83, No 2, p 443-450, February 1972. 8 fig, 12 ref.

Descriptors: *Iron, *Manganese, *Aqueous solutions, *Nutrients, *Oxidation-reduction potential, Hydrogen ion concentration, Water chemistry, Solubility, Colloids.
Identifiers: *Nutrient availability.

The principal factors affecting aqueous chemical behaviour of iron and manganese may be studied using Eh-pH diagrams designed to show predominant solute species, stable solid forms, and solubility. Simple systems which contain water and the metal, and more complicated systems which contain fixed total amounts of one to four additional anions are considered. Relatively small shifts in Eh or pH can greatly change the equilibrium solubility of the metals. Some complexes, especially ferric fluoride and probably organic ferrous and ferric complexes, may strongly influence the solubility of iron. Because iron and manganese have low solubilities in oxidizing systems at pH levels near or little above neutrality, small shifts in Eh or pH, and complexing effects, may be very important in making the metals available to plants and animals. (Knapp-USGS)
W72-14022

DESIGN AND SITING CRITERIA FOR ONCE-THROUGH COOLING SYSTEMS BASED ON A FIRST-ORDER THERMAL PLUME MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05C.
W72-14030

PHOSPHORUS IN WASTEWATER,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
L. J. Hetling, and I. G. Carcich.
Technical Paper Number 22, June 1972. 19 p, 3 fig, 6 tab, 51 ref.

Descriptors: *Detergents, *Water pollution, *New York, *Laundering, *Phosphorus, Data collections, Water pollution control, Water quality, Sewage, Water analysis, Analytical techniques, Phosphates, Soaps, Surfactants, Cleaning, Waste water (Pollution), Phosphorus compounds, Chemical wastes.

The current interest in the contribution of detergents toward increased phosphate levels in sewage led to this investigation in New York State. By analyzing sewage from homes using both a detergent and a control soap, it was found that the removal of phosphorus from detergents would result in the lowering of per capita phosphate levels in sewage by approximately 50% (from 3.2 lbs/capita/year to 1.6 lbs/capita/year). Composite samples were taken daily for three weeks for both the soap and the detergent. The samples were filtered with a 0.8-micron filter on site. They were then refrigerated and tested the next day. (Poertner)
W72-14046

THE NORTHERN MAINE REGIONAL TREATMENT SYSTEM, AROOSTOOK RIVER--PRESTILE STREAM, A PLAN FOR CLEAN WATER, SUMMARY REPORT.
Northern Maine Regional Planning Commission, Presque Isle.
For primary bibliographic entry see Field 05D.
W72-14049

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb, R. A. Boland, Jr., and F. A. Hermann, Jr.
For sale by Supt. of Documents, U. S. Government Printing Office, Washington, D. C. 20402 for $1.50. Office of Saline Water Research and Development Progress Report No. 736, October 1971. 183 p, 149 plates. Contract 14-30-2656.

Descriptors: *Brine disposal, *Outlets, *Saline water, Water pollution control, Effluents, Desalination, *Model studies, Estuaries, *Dispersion, Path of pollutants.
Identifiers: Marine ecology, *Diffusers, *San Diego Bay, *Galveston Bay, *Delaware River.

Model studies were conducted to study the dispersion of heated waste brine from a desalting plant outfall. The existing fixed-bed models of San Diego Bay, Galveston Bay, and Delaware River located at the Waterways Experiment Station, Vicksburg, Mississippi, were chosen as typical estuaries. The objectives of the tests were to determine dispersion rates of the brine waste, to define the dynamic equilibrium distribution of the waste after a period time, and in case of the Delaware River model, to determine the effects of freshwater inflow on dispersion rates and equilibrium values. Results indicate: (a) in estuaries such as San Diego Bay, with low tidal current velocities and very little fresh water flow into the system, dispersion and flushing rates will be extremely slow, and the time to reach dynamic equilibrium will be comparatively long; (b) in large shallow estuaries such as Galveston Bay extreme care should be used in selection of an outfall site, since flow conditions in the immediate vicinity of the diffuser are highly significant in overall dispersion rates and thus tend to trap the effluent, (c) in estuaries similar to the Delaware River, which has appreciable freshwater discharge and tidal currents, sufficient mixing of the effluent will probably occur. (OSW abstract)
W72-14064

A STUDY OF THE DISPOSAL OF THE EFFLUENT FROM A LARGE DESALINATION PLANT,
Dow Chemical Co., Midland, Mich.
P. G. LeGros, E. F. Mandelli, W. F. McIlhenny, D. E. Winthrode, and M. A. Zeitoun.
Available from the National Technical Information Service as PB-206 020, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 316, January 1968. 491 p. Contract 14-01-0001-675 and 14-01-0001-1161.

Descriptors: *Brine disposal, *Brines, *Saline water, Effluents, *Waste disposal, *Desalination, Plants, Outlets, Cost estimates.
Identifiers: *Environmental model, Outfall location, Effluent dispersal, Intake-outfall locations, Environmental factors.

The effluent from any desalting plant will contain almost all of the materials dissolved in the feed solution in higher concentrations than in the feed and will contain any materials either intentionally or unavoidably added. The control of the intake and discharge of the large quantity of sea water is extremely important. Ten coastal strips were selected: five on the Atlantic Coast, two on the Gulf Coast and one on the West Coast. The oceanography, meterology, and marine topography of these selected coastal strips were studied from the available literature. An economic analysis was made of the effects of the effluents from large desalting plants operating on a hypothetical bay. Prelimary engineering designs and cost estimates of three intake-outfall configurations were made. The effects of interaction and of mixing of the various streams were considered. A criteria for the design of the outfall system was chosen. Recommendations are presented on the type, frequency, and intensity of pre-plant oceanographic and biological surveys and of post plant monitoring and verification surveys. (OSW abstract)
W72-14086

CONTAMINATION OF LETTUCE IRRIGATED WITH SEWAGE EFFLUENT,
Advisory Service, Exeter (England). Agricultural Development.
A. A. Nichols, P. A. Davies, K. P. King, E. J. Winter, and F. L. C. Blackwall.
J Hortic Sci, 46 (4): 425-433, Illus, 1971.
Identifiers: *Contamination, Irrigation, *Lettuce-D, *Sewage effluent, *E. coli.

Faecal contamination on lettuce growing in the open as indicated by the presence of Escherichia coli I was demonstrated for up to 21 days after irrigation with sewage effluent, although the level of contamination usually decreased after 3-7 days. Recovery of other coliform bacteria gave parallel results; counts of these organisms and of other bacteria also indicated the persistence of more general pollution.--Copyright 1972, Biological Abstracts, Inc.
W72-14104

POLLUTANT CONCENTRATIONS IN ABNORMAL YOUNG TERNS FROM LONG ISLAND SOUND,
American Museum of natural History, New York.
For primary bibliographic entry see Field 05C.
W72-14134

THE FISH FAUNA OF THE ESTUARINE AREA OF THE RHINE AND MEUSE RIVERS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
K. F. Vaas.
Biol Jaarb, 36: 115-128, Illus, Maps, 1968, English summary.
Identifiers: Estuarine conditions, *Fish fauna, Gobio-Gobio, *Meuse River, Netherlands, Water pollution sources, Pomatoschistus-Microps, *Rhine River.

The river system leading the greater part of the water of the rivers Rhine and Meuse towards the North Sea via the rivers Hollands Diep and Haringvliet, can be divided into 5 areas according to composition of its fish fauna. In the mouth of the Haringvliet only marine elements are found. In the Haringvliet proper, some freshwater elements penetrate. The Hollands Diep is characterized by a mixture of the most tolerant marine and freshwater species. In the rivers carrying water derived from the Meuse, freshwater species are well

developed, better than in those rivers which carry the water of the Rhine, because the Rhine is polluted and its salinity is increased. The river gudgeon Gobio gobio (L) was more frequently encountered in the rivers carrying Rhine water. Four spp. originating in the sea penetrate the rivers far into the freshwater zone beyond the eastern border of the area investigated and the body Pomatoschistus microps (Kryer) spawns in the area. These 5 spp. were found throughout the whole area, but the goby was less numerous in the mouth of the Haringvliet.--Copyright 1972, Biological Abstracts, Inc.
W72-14153

DETERMINATION OF THE RESERVE OF AVAILABLE PHOSPHATES IN IRRIGATED SOILS (IN RUSSIAN),
M. K. Agishev.
Tr Kaz Nauchno-Issled Inst Zemled, 9/10, 61-76, 1970.
Identifiers: Accumulation, Buckwheat-D, *Fertilizers, Irrigated soils, *Minerals, *Phosphates, Phosphorus, Spring, Tomatoes-D, Wheat-M.

The application of mineral and organic fertilizers over a number of years resulted in the accumulation of available P in the soil. Regular manuring with N and K increased the available phosphate. The amount of P extracted from the soil by a 1% solution of ammonium carbonate was low because of the secondary precipitation of soluble phosphates. The phosphorization of irrigated soils in Kazakhstan is indicated.--Copyright 1972, Biological Abstracts, Inc.
W72-14169

THE HYDROLOGICAL CONDITIONS OF AMBARO BAY (NORTHWESTERN MADAGASCAR): CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 05C.
W72-14182

ON NITROGEN FORMS IN DEW OR FROST WATER: II. ON THE CHANGES OF NITROGEN DIOXIDE IN THE AIR, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
Kyozo Nagai.
Sci Rep Fac Agric Ibaraki Univ. 18: 9-16. Illus. 1970. English summary.
Identifiers: *Air pollution, Dew, Frost, *Humidity, *Nitrogen dioxide, *Temperature.

The mutual effects of temperature and humidity on chemical changes of nitrogen dioxide introduced in the air is analyzed.--Copyright 1972, Biological Abstracts, Inc.
W72-14186

INORGANIC PHOSPHATE FRACTIONS IN CALCAREOUS SOILS IN RELATION TO MOISTURE AND INCUBATION PERIOD,
Ranchi Univ. (India).
For primary bibliographic entry see Field 02G.
W72-14189

THE PERSISTENCE OF ENDOSULFAN IN SURFACE WATER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
P. A. Greve.
Meded Fac Landbouwwet Rijksuniv Gent. 36 (1): 439-447. Illus. 1971. (Engl. summ.).
Identifiers: *Adsorption, *Endosulfan, Ferric hydroxide, Gel, Water pollution sources, Path of pollutants, Filtration.

The degradation of endosulfan in surface water is a complicated process in which presence and type of silt and bacterial, pH and O2 content of the water are important variables. Only healthy surface water can degrade endosulfan quickly. Relatively small changes in the environment can significantly disturb the degradation processes. For the purification of surface water to drinking water the removal of endosulfan is accomplished most easily by adsorption techniques. River silt readily adsorbs endosulfan; more than 80% of the endosulfan present can be removed by simple filtration. Better adsorption is brought about by using ferrichydroxyde-gel and charcoal. Ferrichydroxide-gel catalyzes the hydrolysis of endosulfan in the adsorbed phase.--Copyright 1972, Biological Abstracts, Inc.
W72-14193

CERTAIN FEATURES OF RESPIRATORY METABOLISM OF PLANTS UNDER CONDITIONS OF AN INCREASING WATER DEFICIENCY, (IN RUSSIAN)
Kazan State Univ., (USSR).
For primary bibliographic entry see Field 03F.
W72-14195

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: I. THE FERTILIZER SOLUTION AND ITS INITIAL REACTION WITH SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
C. H. Williams.
Aust J Soil Res. 9 (2): 83-94. Illus. 1971.
Identifiers: Capillarity, Diffusion, *Fertilizers, Leaching, Minerals, *Phosphates, *Soils, Solution, Suction.

The P and Ca contents of the fertilizer solution in contact with moist soil were similar to those of the metastable triple-point solution (MTPS) produced when an excess of monocalcium phosphate is shaken with water. The average P, Ca, and S concentrations of saturated aqueous extracts of superphosphate at 20 degree C were 4.0 M, 1.5 M and 0.023 M respectively. The pH of these extracts ranged from 1.60 to 1.92 (0.15-0.47 units higher than that of MTPS). The S content of the fertilizer solution was generally .02-.01 of the P content. In the absence of leaching both diffusion and capillarity were involved in the movement of phosphate from superphosphate particles into moist soil. The fertilizer solutes entered the soil mainly by diffusion but on soils of low moisture content the increase in pore size of the fertilizer particles, which resulted from the dissolution of monocalcium phosphate, led to a reversal of the suction gradient between soil and particles which caused movement of some of the fertilizer solution into the soil by capillarity. Leaching of superphosphate applied to dry soils by rainwater is likely to yield fertilizer solutions which have higher pH, lower P and Ca contents, and higher S contents than the saturated solutions arising from superphosphate particles in contact with moist soil. When synthetic fertilizer solution reacted with acid soils the rate of removal of phosphate an Ca from solution depended upon the phosphate sorption capacity of the soil. In calcareous soil the CaCO3 played a major part in phosphate precipitation. Appreciable amounts of Fe and particularly Al were dissolved from each of the soils studied by the synthetic fertilizer solution to give solutions which, on standing, readily formed precipitates of phosphate. Both sulfate and organic S compounds were displaced from the acid by the fertilizer solution but, in the calcareous soil, sulfate was coprecipitated with the phosphate. (See also W72-14199) --Copyright 1972, Biological Abstracts, Inc.
W72-14198

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: II. MOVEMENT OF THE PHOSPHORUS AND SULPHUR INTO THE SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

Aust J Soil Res. 9 (2): 95-106. Illus. 1971.
Identifiers: Leaching, Phosphates, *Phosphorus, *Soils, Sorption, Sulfate, *Sulfur.

Phosphate moving into moist soil from particles of surface-applied superphosphate penetrated a hemispherical zone beneath the particle. The size of this zone and the distribution of phosphate through it were governed by the phosphate sorption capacity of the soil, the size of the particle, and the soil moisture. In calcareous soils the CaCO3 content was important in determining phosphate penetration. Phosphate from superphosphate particles penetrated rapidly into moist (100 cm tension) soil during the 1st 5 or 6 days after contact and continued to move through the soil at a decreasing rate throughout the whole of an 8-wk period. Movement of sulfate from surface-applied superphosphate, into soil was governed by the particle size of the fertilizer and the soil moisture, both of which influenced the rate of solution of CaSO4. The distribution of the sulfate through the soil was influenced by the sulfate sorption capacity of the soil. The rate of penetration of sulfate from surface-applied superphosphate into calcareous soil was considerably less than when the superphosphate was applied to acid soils. Leaching influenced the movement of both P and S into the soil. It caused distortion of the hemispherical distribution of phosphate beneath superphosphate particles, resulting in deeper penetration of phosphate below the particles and smaller horizontal movement away from them. It also greatly enhanced the solution of sulfate, especially from small particles. The optimum particle size of superphosphate will vary from soil to soil, but a 2.5 mm diameter particles is likely to satisfy a wide range of soil and environment conditons. (See also W72-14198)--Copyright 1972, Biological Abstracts, Inc.
W72-14199

STATISTICAL STUDIES ON THE RELATION BETWEEN NITRIFICATION AND SOIL TEMPERATURE AND SOIL MOISTURE,
Deutscher Wetterdienst, Brunswick (West Germany).
For primary bibliographic entry see Field 02G.
W72-14200

5C. Effects of Pollution

ESTURINE ECOSYSTEMS AND HIGH TEMPERATURES,
North Carolina Water Resources Research Inst., Raleigh.
B. J. Copeland, and H. Lee Davis.
Available from the National Technical Information Service as PB-211 808, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 68, June 1972 (UNC-WRRI-72-68). 90 p, 39 fig, 9 tab, 47 ref. OWRR A-041-NC (1).

Descriptors: *Water pollution effects, *Heated water, *Water temperature, *Water quality standards, *Esturaries, *Thermal pollution, *North Carolina, Nutrients, Sewage effluents, Eutnophication, Algae, Cyanophyta, Chlorophyta, Metabolism, Nekton, Benthos, Biomass.
Identifiers: *Pamlico River estuary, Photosynthesis/respiration ratios.

Responses of estuarine community structure, respiration and production to added heat, sewage and their combination were investigated. Plastic pools containing transplanted ecosystems from South Creek Estuary, N. C. were used. Tempera-

ture replication achieved. Temperature in the heated pools was regulated at 5 C (9F) above that of the ambient pools. Thermal treatment increased nutrient regeneration rates, yielding slightly higher algal biomass; although, seasonal differences were more significant. Gross community productivity was regulated by ammonia, light, and temperature levels and total respiration by temperature and primary productivity. Sewage addition substantially increased ammonia levels, particularly during the winter. Community metabolism responded positively to thermal treatment, but not to sewage treatment. Thermal treatment and the combination of sewage and thermal treatments increased the photosynthesis/respiration ratios (P/R) during spring and summer, but decreased the P/R when temperature was limiting during winter. Temperature had very little effect on phytoplankton composition during the spring. Blue-green algae and coccoid green algae dominated in the heated and sewage-treated pools during summer. Nekton and benthic increased to higher biomass in heated pools during spring and achieved a lower biomass in the heated pools during summer than in the ambient pools. No significant differences were observed during winter among heated and ambient pools. Sewage addition did not substantially alter patterns between heated and ambient systems. Oysters, bay clams and widgeon grass reached higher biomass in heated pools during winter than in ambient pools. A flow-through experiment was conducted during the 1971 summer to test more realistic estuarine conditions. Results were substantially the same as obtained under quiescent conditions.
W72-13636

THE PLANKTON OF LAKE GARDNO NEAR THE BALTIC SEA DURING THE SUMMER SEASON,
Polish Academy of Sciences, Pszczna. Hydrobiological Station.
Jerzy Strzelecki, and Tadeusz Poltorak.
Acta Hydrobiol. 13 (3): 269-294. Illus. 1971. Pol. and Russ. summ.
Identifiers: Aphanizomenon-Flos-Aquae-Gracile, Baltic Sea, *Gardno Lake, Lyngbya-Limnetica, Microcystis aeruginosa, Plankton, Poland, Season, Summer, *Tintinnopsis-Ovalis, *Cyanophyta, *Eutrophication.

The eutrophic Lake Gardno is seasonally supplied by the water of the Baltic Sea. The occurrence of 257 taxons of algae and 69 taxons of animals was noted. Of the class Bacillariophyceae about 40% of species were found, assigned to halophilous and brackish forms. Cyanophyta occurred in masses (69.7%) with the predominant species Microcystis aeruginosa, Lyngbya limnetica, and Aphanizomenon flos-aquae f. gracile. In the zooplankton the most numerously represented were Protozoa (78.4%), Tintinnopsis ovalis being the predominant form. Littoral and benthic species prevailed among algae and animals, this being related with the shallowness of the water and overgrowth of the lake with higher plants.--Copyright 1972, Biological Abstracts, Inc.
W72-13637

PROCEEDINGS, FOURTEENTH CONFERENCE ON GREAT LAKES RESEARCH.

Proceedings of Conference held at University of Toronto, Ontario, April 19-21, 1971. International Association for Great Lakes Research, Ann Arbor Michigan. 834 p.

Descriptors: *Great Lakes, *Lake Superior, *Lake Erie, *Lake Huron, *Lake Michigan, *Lake Ontario, Biology, Limnology, Geology, Meteorology, Hydrology, *Eutrophication, Lakes, Thermal pollution, Lake sediments, Nutrients, Phytoplankton, Primary Productivity.

The Fourteenth Conference on Great Lakes Research was co-hosted by Canada Centre for Inland Waters at Burlington and the Great Lakes Institute at the University of Toronto. There were 132 papers presented on the topics of biology, chemical limnology, geology, meteorology and hydrology, physical limnology and general. (See also W72-13641 thru W72-13665.
W72-13640

EVIDENCE FOR THE EUTROPHICATION OF LAKE ONTARIO FROM THE SEDIMENTARY DIATOM SUCCESSION,
Waterloo Univ. (Ontario). Dept. of Biology.
H. C. Duthie, and M. R. Sreenivasa.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 1-13. 5 fig, 3 tab, 20 ref. Wisconsin Dept. of Natural Resources D. J. Project F-83-R.

Descriptors: *Eutrophication, *Lake Ontario, *Diatoms, *Sediments, Bioindicators, Succession, Cores, Plankton, Paleolimnology, Palynology, Systematics, Great Lakes.
Identifiers: *Fossil diatoms, Achnanthes, Navicula, Stephanodiscus, Melosira, Tabellaria fenestrata, Cyclotella, Mysis relicta, Fragilaria.

Interpretation of the paleolimnology of Lake Ontario based on sedimentary diatom succession is valid if distortion is reasonably consistent and if differential preservation of various species is consistent down the core. Of five sediment cores, only one had fossil diatoms preserved below 90 cm. Well preserved diatoms were found to a depth of 277 cm and are described; below this they were disintegrated and are not included. Seventy-three diatom taxa were identified from this core from a deep east-central area. Counts per sample varied from 227 to 1294. Most individuals belonged to a few planktonic species, but there were low numbers of many nonplanktonic species. Many of the dominant plankters in the Great Lakes are eurytopic; others are more typical of oligotrophic environments. The proportion of diatoms characteristic of oligotrophy decreases in upper samples. At 19-21 cm there was an increase in numbers of all major species. This interval includes the horizon of Ambrosia pollen, about 150 year BP, correlated with forest clearance and settlement. Since then Melosira italica subsp. subarctica has been gradually replaced in importance by M. islandica, suggesting cultural eutrophication. (See also W72-13640) (Jones-Wisconsin)
W72-13641

INFLUENCES OF THERMAL EFFLUENTS UPON AQUATIC PRODUCTION IN LAKE ONTARIO,
State Univ., of New York, Albany. Dept. of Biological Sciences.
M. W. Fenlon, D. C. McNaught, and G. D. Schroder.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 21-26. 2 fig, 4 tab. 9 ref. DACW 35-69-C-0050.

Descriptors: *Thermal pollution, *Aquatic productivity, *Lake Ontario, Daphnia, Predation, Eutrophication, Secondary Productivity, Primary productivity, Standing crops, Nuclear powerplants, Water pollution effects, Outlets, Zooplankton, Fish harvest.
Identifiers: Bosmina, Daphnia retrocurva, C-14, Ceriodaphnia, Cyclops bicuspidatus.

To test the systems approach to the effect of heat and to utilize techniques to control primary production, information was assembled by measuring primary and secondary production off the Niagara Mohawk plant, Nine Mile Point, Lake Ontario while the plant was under construction, and again while it was in limited operation. Primary productivity rates for the planktonic algae were measured using standard C-14 techniques. Additions of heat have increased the standing crop of Bosmina 25.0 times and Daphnia retrocurva 1.2 times in the overall study area. Adjacent to the outfall these same populations increased 123.8 and 2.4 times respectively. At the same time primary production was not significantly affected. Although temperature alone can explain such increases, possibly these zooplankters were also supported by increased algal resources. Turbulence around the outfall may be important, both in creating turbidity, thus decreasing photosynthesis, and in resuspending detrital zooplankton foods. As Bosmina and Daphnia have responded to thermal additions with increased standing crops and likely increased production, the concept of turning these herbivores over more rapidly by harvesting their fish predators appears worthwhile. Power companies may improve the quality of the lakeside by supporting commercial fishermen. (See also W72-13640) (Jones-Wisconsin)
W72-13642

THE DECLINE OF THE LARGE ZOOPLANKTER, LIMNOCALANUS MACRURUS SARS (COPEPODA: CALANOIDA), IN LAKE ERIE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
John E. Gannon, and A. M. Beeton.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 27-38. 4 fig., 41 ref.

Descriptors: *Zooplankton, *Copepods, *Lake Erie, *Distribution, Great Lakes, Niches, Seasonal Hypolimnion, Dissolved oxygen, Predation, Fish, Crustaceans, Daphnia, Temperature, Oxygen sag, Eutrophication.
Identifiers: *Limnocalanus macrurus Sars, *Calanoida.

The systematics, distribution, and ecology of Limnocalanus macrurus are recorded in literature, especially relative to Lake Erie. A large calanoid copepod, part of glacial relict fauna, differs from other copepods by its large size. It is important food for many fish species. In 1929, it was quite abundant in central and eastern basins of Lake Erie but was present in shallow western basin only during winter and spring. Migration may have taken place from Lake Huron through the St. Clair and Detroit Rivers during winter and spring. Evidently Limnocalanus underwent seasonal dispersal in Lake Erie, being confined to the cold hypolimnetic waters of eastern and central basins during summer, but distributed throughout the lake from late fall through early spring. In 1957 Limnocalanus was extremely rare in the central and eastern basins but was still present in the western basin during the spring. During extensive sampling in 1967 no Limnocalanus was found and only a few individuals were observed in 1968. Factors involved in decline of Limnocalanus in Lake Erie are discussed with hypolimnetic dissolved oxygen depletion and predation by planktivorous fish as probabilities. (See also W72-13640) (Jones-Wisconsin)
W72-13643

AVAILABILITY OF PHOSPHORUS FOR CLADOPHORA GROWTH IN LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Dept. of Botany; and Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
Chang-Kwei Lin.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 39-43. 4 fig, 15 ref.

Descriptors: *Phosphorus, *Cladophora, *Plant growth, *Lake Michigan, Algae, Phosphates, Hydrolysis, Storm water, Rainfall, Waste water (Pollution), Eutrophication, Water pollution sources, Nutrients.

Identifiers: Cladophora glomerata, Milwaukee Harbor (Wisconsin), Polyphosphates, Orthophosphates.

The profuse growth of the alga, Cladophora, in the Great Lakes has seriously curtailed shoreline recreation. Sampled from Milwaukee Harbor and from sites along Lake Michigan north of the harbor, Cladophora glomerata was analyzed for extractable inorganic orthophosphate and for its ability to hydrolyze polyphosphates. Those algae growing in the harbor area showed a consistently high value of surplus stored phosphorus and the values decreased as the distance from the harbor increased. Longer, denser, and greener Cladophora was found near the harbor than from more distant sites. Samples from all locations taken after heavy rainfalls contained substantial increases in stored phosphorus. Storm sewer overflow and increased river discharge due to precipitation could sporadically provide excessive supplies of phosphorus. Great variation in ability to hydrolyze polyphosphates was found in algae sampled from different locations. The yield of orthophosphates from polyphosphates was inversely proportional to the amount of surplus stored phosphorus in the algae. The algae growing near the harbor accumulated phosphate phosphorus while the algae growing at greater distance were concurrently phosphorus starved, perhaps they adapted to obtain their phosphorus primarily from hydrolysis of polyphosphate. (See also W72-13640) (Jones-Wisconsin)
W72-13644

EFFECT OF MINERAL PARTICULATES ON MICROBIAL DEGRADATION OF SOLID ORGANIC MATERIALS,

Ohio State Univ., Columbus. Coll. of Biological Sciences.
Patricia A. McCabe, and James I. Frea.

In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 44-51. 6 fig, 30 ref. OWRR-A-006-(6) Ohio and B-013-OHIO (6).

Descriptors: *Bacteria, *Degradation (Decomposition), *Organic matter, Actinomycetes, Nutrients, Enzymes, Lake Erie, Chemical properties.
Identifiers: *Mineral particulates, Kaolin.

Considering that the mechanisms by which particulates enhance microbial nutrition can be employed to accelerate decomposition of complex solid materials, study was made of interaction of mineral particles with cell surfaces, mineral particles with solid organic material, and enzymes adsorbed to mineral particles with solid substrates. In an aqueous medium, strong interactions occur between mineral particulates and the mycelium of a streptomycete, solid proteinaceous substrates, and the extracellular enzyme of the streptomycete. Adherence of kaolin to cell and substrate surfaces was demonstrated. Kaolin-adsorbed enzyme was assayed by its ability to release azo dye conjugated to collagen, and to degrade collagen structure. In a cell free system, kaolin-enzyme and kaolin-substrate interaction effects two enhancements of enzyme activity. Addition of kaolin to dilute enzyme solutions is a rapid method of concentrating active enzyme. Adherence of enzyme-coated kaolin to degradable material places the enzyme in immediate contact with substrate. These results support the concept of mineral particulate mediation of substrate degradation by microbial exoenzymes and help to explain how aquatic microorganisms salvage the nutrients released from bulk substrate by extracellular enzymes. These data also suggest the mechanism responsible for decomposition of resistent organic materials. (See also W72-13640) (Jones-Wisconsin)
W72-13645

VARIATIONS IN OXYGEN CONSUMPTION BY AQUATIC MACROPHYTES IN A CHANGING ENVIRONMENT,

Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
Archie J. McDonnell.

In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 52-58. 2 fig, 2 tab, 15 ref. OWRR B-016-PA (3).

Descriptors: *Oxygen, *Aquatic plants, *Respiration, Primary productivity, Temperature, Nutrients, Eutrophication, Photosynthesis, Dissolved oxygen, Analytical techniques, Self-purification, Methodology.
Identifiers: *Oxygen consumption, Potamogeton crispus, Elodea canadensis.

Respiratory response of selected aquatic plants to changes in oxygen concentration, temperature, and exogenous nutrient additions are evaluated and criteria developed for evaluating effects a varying plant respiration rate can have on estimations of primary productivity in eutrophic systems and waste assimilation capacity of streams. Test species were run in continuous flow and batch type respirometers. Sampling sites were a nutrient-rich stream section receiving effluent from a secondary sewage treatment plant and an unenriched section supported solely by watershed drainage. Consumption rates were dependent on temperature, plant maturity, oxygen concentration of test water, and level of enrichment at growth site. Batch data were found to give results comparable to continuous flow data when analyzed according to the suggested empirical relationship. Existence of a variable respiration pattern in aquatic ecosystems can lead to overestimation of reaeration coefficients in stream oxygen balance studies, when these conefficients are calculated from field observations of dissolved oxygen concentrations, and to an underestimation of net primary productivity and daily respiration. Methodology is presented to estimate primary productivity in aquatic ecosystems from observations of diurnal variation of dissolved oxygen incorporating a variable community respiration rate. (See also W72-13640) (Jones-Wisconsin)
W72-13646

THE ICHTHYOFAUNA AND FLORA OF LAKE ST. LOUIS ON THE ST. LAWRENCE RIVER NEAR MONTREAL, QUEBEC: GENERAL FEATURES AND RECENT CHANGES,

Quebec Dept. of Tourism, Montreal. Fish and Game Wildlife Service Research Lab.
Gerard Pageau, Yvon Gravel, and Lucien Levesque.

In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 79-89. 3 tab, 47 ref.

Descriptors: *Fish populations, *Rooted aquatic plants, *St. Lawrence River, Great Lakes, Eutrophication, Water pollution effects, St. Lawrence Seaway, Urbanization.
Identifiers: *Lake St. Louis (Quebec), Hydrocharis morsus-ranae.

Increase of aquatic vegetation and changes in fish populations, directly related to accelerated eutrophication of the Great Lakes system, are reported and literature reviewed pertaining to fish and aquatic vegetation, mainly in Lake St. Louis, near Montreal, Quebec. Although some characteristic fishes of Lake St. Louis show little or no variation in their populations during the past 30 years, many species have changed. This condition may be related chiefly to a major spread of vegetation, higher climatic temperatures as well as greater transportation and deposit of silt and clay. New fish migration paths, influenced by gradually warming air, contribute to changes in fish communities. Slight changes have occurred in the floral species of Lake St. Louis over the last 30 years. Only a small number of new floristic elements were found: of the recent additions, Hydrocharis morsus-ranae (frog-bit) was introduced from Europe in the Arboretum of the Division of Botany in Ottawa from where it soon escaped and has spread down the Ottawa River to Lake St. Louis and the St. Lawrence River and now reaches Lake St. Peter. The extent of its aggressiveness is unknown thus its dispersal should be watched. (See also W72-13644) (Jones-Wisconsin)
W72-13647

DISTRIBUTION OF CHLOROPHYLL AND ITS RELATION TO PARTICULATE ORGANIC MATTER IN THE OFFSHORE WATERS OF LAKE MICHIGAN,

Oklahoma Univ., Norman. Dept. of Zoology; and Michigan Univ., Ann Arbor. Great Lakes Research Div.
Andrew Robertson, Charles F. Powers, F. Charles, and Jeanne Rose.

In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 90-101. 1 fig, 10 tab, 21 ref. PHS Grant WP-00311.

Descriptors: *Chlorophyll, *Organic matter, *Lake Michigan, *Standing crops, Phytoplankton, Detritus, Seston, Biomass, Distribution patterns.
Identifiers: Particulate organic matter.

To obtain information on the extent of the relationship between amounts of particulate organic matter and phytoplankton standing crop in Lake Michigan, a series of lake samples at three offshore stations were analyzed for particulate organic matter and for chlorophlls a, b and c. Chlorphyll a was the predominant pigment with chlorophyll c sometimes making up an appreciable fraction while chlorophyll b was always negligible. The seasonal distribution of chlorphyll a was unimodal with the peak in early summer. At a station on the west side, off Milwaukee, the chlorophyll a had a higher average than at the other two stations. A slightly greater average for clorophyll a was found in samples from the depth range from 0-25 meters than in samples from below 25 meters. Distributional patterns for particulate organic matter were quite similar to those for chlorophyll a. Estimates of seasonal changes in the ratio of chlorophyll a to organic matter in living phytoplankton indicated a peak in phytoplankton activity during summer. Living phytoplankton usually makes up an appreciable fraction of the seston in Lake Michigan as strongly suggested by estimates of detritus and other evidence. (See also W72-13640) (Jones-Wisconsin)
W72-13648

NUTRIENTS, PHYTOPLANKTON PRODUCTIVITY AND SPECIES COMPOSITION AS INFLUENCED BY UPWELLING IN LAKE MICHIGAN,

Michigan Univ., Ann Arbor. Great Lakes Research Div.
Claire L. Schelske, Eugene F. Stoermer, and Laurie E. Feldt.

In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 102-113. 7 fig, 5 tab, 5 ref. AEC C00-2003-7.

Descriptors: *Upwelling, *Nutrients, *Phytoplankton, *Primary productivity, Systematics, Lake Michigan, Silica, Nitrates, Hydrogen ion concentration, Diatoms, Cyanophyta, Chlorophyta, Eutrophication, Phosphorus, Physiococemical properties, Limiting factors.
Identifiers: Grand Haven (Mich.), Limiting nutrients.

July-September 1969 studies of onshore and offshore stations near Grand Haven, Michigan, indicated a large amount of variability in biological, chemical and physical conditions in the nearshore

environment, which lessened offshore. Maximum rates of primary productivity and highest cell counts were found after bottom water was upwelled at the inshore station. This water had greater concentrations of silica and nitrate nitrogen and lower values of pH than were found in the mixed layer during stratification and presumably provided nutrients for increased phytoplankton productivity and maintenance of diatoms as the dominant components of the phytoplankton. No upwelling was observed at the offshore station in late August and early September. Blue-green and green algae comprised a significant fraction of the phytoplankton assemblages in samples collected in August and September due to nutrient-poor water at the offshore station in late August to early September and at the inshore station in late September. Nutrients, particularly silica, supplied from upwelling at the inshore station in August were the main factor in maintaining diatoms as dominant taxa in the phytoplankton assemblages at the inshore station. (See also W72-13640) (Jones-Wisconsin)
W72-13649

PHYTOPLANKTON ASSEMBLAGE DIFFERENCES AT INSHORE VERSUS OFFSHORE STATIONS IN LAKE MICHIGAN, AND THEIR EFFECTS ON NUTRIENT ENRICHMENT EXPERIMENTS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. F. Stoermer, C. L. Schelske, and L. E. Feldt.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 114-118. 2 tab, 4 ref. AEC COO-2003-6.

Descriptors: *Phytoplankton, *Lake Michigan, *Nutrients, Eutrophication, Nitrogen, Phosphorus, Silica, Inhibitors, Limiting factors, Dominant organisms, Biological communities.
Identifiers: Cyclotella stelligera, Fragilaria crotonensis, Anabaena flos-aquae.

During the past two years experiments on chemical enrichment of natural waters as a tool for determining limiting element concentrations and for assessing probable effects of nutrient pollution have been carried out in Lake Michigan. Several cases occurred in which nutrient addition produced changes in phytoplankton standing crop quite different, and sometimes opposite, from the expected. The two most striking examples of grossly different effects produced by identical treatments in experiments at stations separated by only 5.5 km are given. The in situ enclosure experiments at these stations were enriched with nitrogen, phosphorus and silica. One experiment ran from July 17-28 1969 and the other from August 26-September 8, 1969. Possible explanations are suggested: some factor in the physiological history of the populations severely limited reproductive potential; exhaustion of some critical nutrient not added in the experiment; the presence of some inhibitory or toxic factor. The third possibility appears most likely. The differences in effect appeared to be related to species composition of the assemblages initially sampled. Results indicate that enrichment experiments utilizing natural phytoplankton assemblages, even under near natural conditions, should be interpreted with caution. (See also W72-13640) (Jones-Wisconsin)
W72-13650

DEVELOPMENT OF A THEORETICAL SEASONAL GROWTH RESPONSE CURVE OF CLADOPHORA GLOMERATA TO TEMPERATURE AND PHOTOPERIOD,
State University of New York, Buffalo, Dept. of Biology; and State Univ. Coll., Buffalo. Great Lakes Lab.
J. R. Storr, and R. A. Sweeney.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 119-127. 4 fig, 4 tab, 14 ref.

Descriptors: *Algae, *Seasonal, *Cladophora, *Temperature, *Photoperiodism, Great Lakes, Model studies, Nutrients, Plant growth, Analytical techniques, Water temperature.
Identifiers: *Cladophora glomerata, Growth curves.

Laboratory and field investigations ascertained effects of heat on Cladophora growth when this plant is cultured under spring and summer photoperiods. Results indicated that at the level of nutrients present, optimum growth was around 18C. Low growth levels occurred at the low temperature range (14.5C) but results were inconclusive. In the upper temperature range, growth cessation appeared at about 25C. Growth response to photoperiod levels in the experiments appeared to be exponential in character while the growth response curves generated by the temperature experiments were very similar in form at the different levels of photoperiod. A family of temperature related growth curves was constructed for different photoperiods throughout the May-October period. Recorded lake water temperature data was plotted on these curves for the same period and a seasonal growth response curve was generated relating seasonal photoperiod and temperature. This resultant plot appeared to be in close agreement with observed Cladophora growth throughout the season. A theoretical growth curve was also plotted using this technique and the temperature data for the same area and time period. The theoretical model of growth response rate may be useful in predicting probable seasonal growth and approximate standing crop, especially in localized areas around thermal discharges. (See also W72-13640) (Jones-Wisconsin)
W72-13651

PCBS IN FISH FROM THE MILWAUKEE REGION,
Wisconsin Univ., Madison. Water Chemistry Program.
Gilman D. Veith, and G. Fred Lee.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 157-169. 3 fig, 3 tab, 20 ref.

Descriptors: *Fish, *Chlorinated hydrocarbon pesticides, Lake Michigan, Aroclors, Toxicity, Pesticides, Water pollution effects, DDE, DDT, Sewage.
Identifiers: *PCB, *Chlorobiphenyl, *Milwaukee (Wis.), Milwaukee River (Wis.), Chlorinated biphenyls.

Fish from the Milwaukee River and nearshore (Wisconsin) region of Lake Michigan were examined for the presence of chlorobiphenyl mixtures to relate composition and quantities of these mixtures to known PCB sources or areas of the river which have been contaminated with PCB-containing wastes. The results of the investigation provided spectrochemical confirmations of the presence of chlorobiphenyls (PCBs) and estimates for their composition and concentration. The composition of the PCBs in fish varied with location of capture and its relation to PCB sources. Fish from the upper Milwaukee River contained from 2.3 to 15.4 micrograms/g of Aroclor 1260 equivalent. Major sources of Aroclors 1242 and 1248 were found in the city of Milwaukee, and the fish in this region contained 405 micrograms/g Aroclor 1248 equivalent. Lake Michigan fish contain residues resembling Aroclor 1254 at levels of approximately 18.6 to 22.4 micrograms/g. These results point out several interesting aspects of this study of the Milwaukee River. The first is the variability of the 'apparent PCB mixtures' and the second is the lack of any correlation between the PCB concentration in the fish and the size or lipid content of the fish. (See also W72-13640) (Jones-Wisconsin)
W72-13652

CHLOROPHYLL A - TOTAL PHOSPHORUS RELATIONSHIPS IN LAKE ERIE,
Ontario Water Resources Commission, Rexdale (Ontario).
Thomas G. Brydges.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 185-190. 5 fig, 4 ref.

Descriptors: *Chlorophyll, *Phosphorus, *Lake Erie, Nitrogen, Algae, Inorganic compounds, Standing crops, Limiting factors, Eutrophication.

Since 1966 an extensive water quality monitoring program has been conducted on the Great Lakes. Some lake water samples have been analyzed for chlorophyll a as a routine since 1967 to estimate algal standing crops. Examination of chorophyll results for 1967, 1968, and 1969 is presented with particular reference to their relationships with inorganic nitrogen and phosphorus concentrations. In 1967 average chlorophyll a and total phosphorus concentrations at 87 open lake stations (three to five measurements at each) were directly proportional. High total phosphorus and relatively lower chlorophyll a concentrations characterized the Detroit, Raisin, and Maumee River stations. Lake stations included the Western Basin and a five mile wide band along north shore from Point Pelee to Buffalo. There were no apparent trends between chlorophyll a and inorganic nitrogen concentrations. The concentrations of chlorophyll a and total phosphorus measured in 1968 and 1969 were directly proportional. Eight stations in Western Basin were sampled for nine successive days in July 1968. In 1969, 97 stations (422 measurements) were sampled over the full length of the lake. That phosphorus is an algal growth limiting factor in Lake Erie is concluded from these extensive empirical observations. (See also W72-13640) (Jones-Wisconsin)
W72-13653

AN INTENSIVE BIOCHEMICAL SURVEY OF WESTERN LAKE ERIE,
Ontario Water Resources Commission, Rexdale (Ontario).
T. G. Brydges.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 191-197. 2 fig, 2 tab, 9 ref.

Descriptors: *Physicochemical properties, *Phosphorus, *Iron, *Chlorophyll, Surveys, Lake Erie, Water quality, Inorganic compounds, Water pollution, Conductivity, Nitrates, Eutrophication.
Identifiers: *Western Lake Erie, Detroit River, Maumee Bay.

To determine the extent, causes and consequences of the wide variations in water quality with time observed in earlier surveys, eight stations in western Lake Erie were samped at two depths for nine consecutive days in July 1968. Thirteen chemical and four bacteriological tests were made on each sample. The total phosphorus and total iron concentrations were directly related and it is postulated that they coprecipitated removing the extremely high phosphorus load from solution. This results in less total growth than might be expected in the absence of iron inputs. Numerical comparison of Western Lake Erie and Lake Sebasticook with respect to both loadings and concentrations of phosphorus and the resulting chlorophyll a concentrations support this premise. The average chlorophyll a concentrations for the nine day survey were lowest in the Detroit River mouth and up to five times greater in the other parts of the Western Basin. The exact cause of the low values in the Detroit River, where nitrogen and phosphorus are present in high concentrations, was not determined. Chlorophyll a concentrations and bacterial numbers were inversely related suggesting that a symbiotic relationship is not present. (See also W72-13640) (Jones-Wisconsin)
W72-13654

Department of Energy Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.

In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 198-210. 1 fig, 4 tab, 7 ref.

Descriptors: *Chemical properties, *Model studies, *Lakes, *Water quality, Metals, Ions, Phosphates, Detergents, Great Lakes, Equilibrium.
Identifiers: *Nitrilotriacetate, Chemical equilibrium, Metal ions.

General use of tri-sodium nitrilotriacetate as a substitute for penta-sodium tri-polyphosphate in detergents would likely lead to the appearance of significant quantities of nitrilotriacetate in the Great Lakes. The speciation at equilibrium in a model lake water containing nitrilotriacetate is reported and is derived primarily from straightforward calculations with the aid of a computer program available in the literature. The speciation in a 'normal' lake water model, that is, one containing no nitrilotriacetate, has also been calculated, both for the pH 6-9. For total nitrilotriacetate concentrations in the range 1 x 10 to the minus 8th power to 2 x 10 to the minus 6th power moles/1 the copper (II) complex accounts for most of the nitrilotriacetate while in the range 2 x 10 to the minus 5th power to 2 x 10 to the minus 4th power moles/1, most is present as the calcium (II) complex. The major iron complexes are given. Significant amounts of many metal-ions exist in hydrolyzed forms, and as carbonate or sulphate complexes. The existence of mercury (II) in solution is described. These results should be considered only in the light of the discussion given. They probably provide a reasonably sound indication of the most important chemical species in a well-mixed lake, close to equilibrium, whose composition approaches that assumed for the calculations. (See also W72-13640) (Jones-Wisconsin)
W72-13655

RADIOACTIVITY IN LAKE MICHIGAN WATER AND BIOTA VICINITY OF BIG ROCK POINT NUCLEAR REACTOR, 1960-69,

Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
Carlos M. Fetterolf, Jr., and D. JamesSeedburger.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 211-218. 7 fig, 3 tab, 9 ref.

Descriptors: *Radioactivity, *Lake Michigan, *Biota, Nuclear reactors, Radioactive fallout, Surface waters, Great Lakes, Radioactive wastes, Gamma rays, Zinc radioisotopes, Food chains.
Identifiers: *Big Rock Point (Mich.), Nuclear weapons tests, Beta-radioactivity.

Consumers Power Company's Big Rock Point Reactor near Charlevoix on Lake Michigan became critical on September 12, 1962. On-site and area radioactivity monitoring programs for gross beta-radioactivity have been carried out by the company with various enforcement agencies at the discharge and at remote control stations. Background levels, which were similar at all stations prior to criticality, fluctuated due to atmospheric fall-out from nuclear weapon testing. Since criticality, radioactivity of aquatic biota at control stations has gradually decreased to near the minimum preoperation levels while radioactivity of biota in the discharge vicinity has gradually increased to near, or slightly above, the preoperational peaks caused by weapon testing. Surface water radioactivity in the reactor vicinity is similar to that at other Michigan locations. Because of the increasing beta-radioactivity in biota samples, a gamma scan was run on samples collected October 7, 1969. To date, the only specific isotope data received were on Zn-65; it does not result from fission, but is a neutron activation product resulting from impurities in the system. Zn-65 discharges should be lower because in 1968 components releasing Zn-65 were replaced. (See also W72-13640) (Jones-Wisconsin)
W72-13656

THE EFFECT OF DDT AND DIELDRIN UPON C-14 UPTAKE BY IN SITU PHYTOPLANKTON IN LAKES ERIE AND ONTARIO,

Department of Energy Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Walter A. Glooschenko.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 219-223. 6 fig, 12 ref.

Descriptors: *Pesticides, *DDT, *Dieldrin, *Phytoplankton, Carbon radioisotopes, Lake Erie, Lake Ontario, Adsorption, Agricultural runoff, Algae, Food chains, Chlorinated hydrocarbon pesticides, Fisheries.

Since previous work with chlorinated hydrocarbons has been mainly restricted to marine species of phytoplankton, this study investigated the effects of DDT and dieldrin upon C-14 uptake by natural phytoplankton communities in Lakes Ontario and Erie. In situ studies were performed, but the concentrations of DDT and dieldrin used were higher than normally found in the Great Lakes. The lowest concentration used, 1 ppb, is at least 200 times that found in situ. If depression of carbon fixation by phytoplankton in the Great Lakes is occurring, it will be negligible. Possibly agricultural runoff in local areas may be much higher in pesticide concentration which may lead to DDT or dieldrin limiting carbon fixation in localized inshore areas. The adaptation of algae to pesticides needs consideration. The most serious hazard resulting from pesticides in water is biological concentration; while algae themselves may not be seriously affected, they may concentrate high amounts of pesticide by active uptake on surface adsorption and transfer it to higher trophic levels. Concentration and transfer of these two compounds to higher trophic levels is of major concern to Great Lakes fisheries. (See also W72-13640) (Jones-Wisconsin)
W72-13657

ELECTRODIALYSIS: A METHOD FOR EXTRACTING AVAILABLE NUTRIENTS IN GREAT LAKES SEDIMENTS,

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
A. L. W. Kemp, and Alena Murdrochova.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 241-251. 10 tab, 25 ref.

Descriptors: *Electrodialysis, *Nutrients, *Great Lakes, *Lake sediments, Phosphates, Nitrates, Nitrites, Ammonia, Lake Ontario, Inorganic compounds, Analytical techniques, Manganese.
Identifiers: Hamilton Harbor (Ontario), Nutrient extraction.

The electrodialysis method for extraction of potentially available phosphorus, nitrate, nitrite, and ammonium ions from Great Lakes sediments, under mild extraction conditions, was evaluated, compared with other procedures used by soil scientists, and results presented for the major sediment types from Lake Ontario. No data are presently available on the forms of P in the Great Lakes sediments. Organic N and fixed ammonium N are the predominant forms of N in Lake Ontario sediments. Electrodialysis extracts less than 5% of the total P or N from Lake Ontario sediments, excepting glacial clays. Less than 1% P and N was extracted from eutrophic Hamilton Harbor muds. No relation is established between electrodialytic P and quantity of P that might be available to plants, organisms, and the lake waters. Evidence is presented that electrodialytic N is 1/4th to 1/7th that of N potentially available to plants, organisms and water from the Great Lakes silty clay muds. Electrodialysis is considered to extract conservatively P and N from the Great Lakes sediments in amounts that might be available to the waters if inputs of P and N were drastically reduced in the Great Lakes. (See also W72-13640) (Jones-Wisconsin)
W72-13658

HYPOTHESIS FOR DISSOLVED OXYGEN DEPLETION IN THE CENTRAL BASIN HYPOLIMNION OF LAKE ERIE,

Lake Erie Basin Office, Fairview Park, Ohio.
Conrad Kleveno, O. Braidech, E. Thomas, and Philip E. Gehring.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 252-255. 1 fig, 1 tab.

Descriptors: *Dissolved oxygen, *Hypolimnion, *Lake Erie, Benthic flora, Algae, Light penetration, Plankton, Nutrients, Biochemical oxygen demand, Inorganic compounds, Thermal stratification, Diatoms, Epilimnion, Eutrophication.
Identifiers: *Lake Erie Central Basin, *Oxygen depletion.

In 1968 a rapid depletion of dissolved oxygen in the hypolimnion of the central basin of Lake Erie was observed from 8.2 mgl on August 6 to 1.9 on August 8. In the summer of 1969 a study was initiated to determine the rate and describe the mechanics of dissolved oxygen depletion in the hypolimnion in the basin. The decline of the dissolved oxygen was gradual during early summer, but in August the rate of depletion increased rapidly. The death and decomposition of benthic algae, Tribonema utriculosum and Oedogonium may explain this relatively sudden decline. These algae were found growing in profusion at the bottom during the summer of 1969. It is postulated that they are killed by a reduction in light caused by an increase of plankton in overlying waters. The increased plankton is caused by an increased vertical circulation of nutrients when the lake begins to cool. The death of the benthic algae results in a tremendous increase in biochemical oxygen demand in hypolimnion waters, thus the rapid depletion of dissolved oxygen. (See also W72-13640) (Jones-Wisconsin)
W72-13659

FIVE TRACE ELEMENTS AND VITAMIN B-12 IN CAYUGA LAKE,

Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
Edward L. Mills, and Ray T. Oglesby.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 256-267. 4 fig, 3 tab, 27 ref.

Descriptors: *Spatial distribution, *Trace elements, *Vitamin B, Cobalt, Copper, Zinc, Lead, Cadmium, Phytoplankton, Nutrients, Limnology, Eutrophication, Limiting factors, Seasonal.
Identifiers: *Cayuga Lake (N.Y.).

Possible stimulatory or depressing effects of the trace elements cobalt, copper, zinc, lead, cadmium, and vitamin B-12 on phytoplankton in Cayuga Lake, New York, prompted this study leading to the hypotheses relative to their ecological significance. A large proportion of the trace elements entering Cayuga Lake through its tributaries is in the particulate form. Cayuga Lake appears to concentrate cadmium but toxic effects of both cadmium and lead seem unlikely since their levels are so low; however, limited experimental evidence indicates that lead may act as either a photosynthetic stimulant or respiratory inhibitor, at least for a short period of time. Cobalt, copper, and zinc may be limiting to phytoplankton production in Cayuga

Lake during late summer. Two in situ experimental studies and a comparison of the concentrations measured with those reputed to be necessary for optimal growth, suggest this hypothesis. Seasonal patterns of change in the soluble fraction of these trace metals show a marked summer decrease which would also substantiate the argument. Although vitamin B-12 did not stimulate photosynthesis in the experimental phase of this study, levels are low compared with those measured elsewhere. (See also W72-13640) (Jones-Wisconsin)
W72-13660

RADIONUCLIDE CONCENTRATIONS NEAR THE BIG ROCK POINT NUCLEAR POWER STATION,
Argonne National Lab., Ill.
Donald M. Nelson, Gerald P. Romberg, and William Prepejchal.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 268-276. 2 fig, 5 tab, 1 ref.

Descriptors: *Radioisotopes, *Lake Michigan, *Nuclear powerplants, Gamma rays, Sediments, Zinc radioisotopes, Cobalt radioisotopes, Cesium radioisotopes, Aquatic life, Hazards, Fish, Tritium, Radioactivity, Radiation, Radioactive wastes.
Identifiers: *Big Rock Point (Mich.), Charlevoix (Mich.), Cesium radioisotopes, Uranium, Thorium.

A survey was made during 1970 of gamma-ray emitting nuclides present in biota near the Big Rock Point power reactor on Lake Michigan which has been in operation since 1963. The radionuclide concentrations, therefore, may be at or near their equilibrium values for most isotopes. Reactor-produced Zn-65, Cs-137, Cs-134, and Co-60 were measurable at distances of up to a few kilometers along the shore in crayfish, water snails, Potamogeton, Ranunculus, Chara, Cladophora, and periphyton. In general, concentrations at 1 km are less than 1/10th those found in the same organism at the discharge point, with somewhat higher concentrations being found toward the east (into little Traverse Bay). Water and bottom samples were found to be quite variable; concentrations in bottom sands being somewhat lower than concentrations in organisms living at the same place. Several small fish samples were taken from the discharge channel. While the levels of gamma-ray emitting radionuclides near the plant are sufficiently high to be useful as tracers, they are well within safe limits. Caution should be exercised in extrapolating these values to other species, to these species at other times, or to large members of these same species. (See also W72-13640) (Jones-Wisconsin)
W72-13661

A CASE OF NUTRIENT ENRICHMENT IN AN INSHORE AREA OF GEORGIAN BAY,
Ontario Water Resources Commission, Rexdale (Ontario).
Denis M. Veal, and M. F. P. Michalski.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 277-292. 4 fig, 5 tab, 25 ref.

Descriptors: *Eutrophication, *Nutrients, Lake Huron, Effluents, Water quality, Phosphorus, Phytoplankton, Sewage treatment, Nitrogen, Physochemical properties, Diatoms, Algae, Cladophora, Productivity, Water pollution, Standing crops.
Identifiers: *Georgian Bay (Ontario).

Surveys and public complaints indicated that phytoplankton populations in Penetang Harbor, Georgian Bay, were reaching excessive levels. A gradation of water quality conditions not unlike those of Lake Erie were revealed in a study of the Penetanguishene to Waubaushene area in 1969. Major emphasis was placed on an evaluation of nitrogen and phosphorus concentrations, standing stocks of phytoplankton and algal productivity and an assessment of nutrient loading. Mean total phosphorus concentrations ranged from 0.02 mg/l (as P) over most of the study area to 0.03 mg/l in Midland Bay and 0.06 mg/l in the southern end of Penetang Harbor. Phytoplankton values increased with higher total phosphorus concentrations. The Midland and Penetang sewage treatment plants were responsible for approximately 53% of the net phosphorus leading. The flushing rate as well as exhange of high quality water from the open lake will promote rapid recovery when significant municipal nutrient sources are eliminated. It is evident that municipal waste discharges to small bays along the Upper Great Lakes will require an improved degree of treatment, including nutrient removal, in order to preserve water quality and to maintain high recreational potential of the shorelines. (See also W72-13640) (Jones-Wisconsin)
W72-13662

COMPREHENSIVE ABATEMENT PROGRAM FOR AN EUTROPHIC LAKE,
O'Brien and Gere, Syracuse, N.Y.; and Syracuse-Onondaga County Dept. of Public Works, N.Y.
Peter E. Moffa, F. J. Drehwing, John M. Karanik, and John J. Hennigan, Jr.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 690-705. 3 fig, 3 tab, 2 ref, 1 appendix.

Descriptors: *Pollution abatement, *Planning, *Eutrophication, *Lakes, New York, Costs, Recreation, Industrial wastes, Sewage treatment, Sewerage, Municipal wastes, Programs, Economic impact, Monitoring, Cost-benefit analysis, Storm water, Sampling, Sediments, Data collections, Chemical properties, Combined sewers, Nutrients.
Identifiers: *Onondaga Lake (New York).

To restore Onondaga Lake, near Syracuse, New York to a quality which would allow the highest recreational uses, anticipated expenditures will exceed $75 million and will include the following: Surveys and analyses of industrial wastes in the drainage basin; in-depth study of the ecology; feasibility studies of joint municipal-industrial wastewater treatment; construction of a new tertiary treatment plant to handle combined wastes; continuous monitoring of the lake before and after installation of the new treatment plant; determination of feasibility of treating storm waters at 96 overflow points; and economic evaluation of the impact on the community of the restoration program. The most significant evaluations made during the lake study were the influences of chemical gradients on stratification, bottom sediment sources of phosphorus, and oxygen demanding materials, and effects of input materials and their distribution on the water quality. Lake waters are strongly stratified due to high calcium chloride concentrations and the autumnal overturn took two months during the study period. As a result of the high calcium concentration and its tendency to maintain an over-saturation condition with respect to hydroxyapatite, calcite, and fluorapatite, it was determined that the lake sediments would remain an effective phosphorus trap and dredging should not be considered. (See also W72-13640) (Auen-Wisconsin)
W72-13663

A SURVEY OF HOUSEWIVES' ATTITUDES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Margaret Sinclair.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971. p 706-719. 6 tab, 10 ref.

Descriptors: *Surveys, *Attitudes, *Detergents, Water pollution, Phosphates, Social impact, Social participation, Statistical methods, Soaps, *Canada.
Identifiers: *Housewives, *Hamilton (Ontario).

The attitudes of 211 housewives in Hamilton, Ontario, concerning water pollution generally, and the detergent debate specifically, were studied. Detergent use patterns, as well as the socio-economic status of the respondent were determined. The survey disclosed that the strongest variable was education, particularly the education of the respondent's husband. Women whose husbands were more highly educated were more concerned about water pollution, more aware of the detergent debate, more likely to have seen the list of phosphate contents and to have heard about phosphate legislation, more willing to ban phosphates, more likely to have changed detergents, and more willing to pay a higher amount for a non-phosphate detergent. The occupation and income variables were also highly correlated with attitudes. In general, the housewives appear more concerned about water pollution than they are aware of its sources and abatement methods. While this concern may not be translated into action, any anti-pollution measures by government should enjoy wide support, if Hamilton housewives are representative of the population at large. (See also W72-13640) (Jones-Wisconsin)
W72-13664

SYMPOSIUM: PUBLIC INVOLVEMENT IN THE WATER MANAGEMENT PROBLEMS IN THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Terrence R. Lee, Thomas E. Borton, Ralph O. Brinkhurst, Desmond, Connor, and Kenneth E., McElroy, Jr.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 731-737. 6 ref.

Descriptors: *Social participation, *Decision making, *Great Lakes, Governments, Water resources, New York, Pennsylvania, Maryland, Legislation, Institutions, Administration, Planning.
Identifiers: *Public participation, Susquehanna River, Toronto (Ontario), New Brunswick (Canada), St John River (New Brunswick).

How to develop most effective public involvement in resource and environmental quality planning is discussed. Examples are drawn from the experiences of the Great Lakes Basin Commission, the Susquehanna Study of the Corps of Engineers, the Canada-New Brunswick St. John River study, and the non-governmental public involvement institution, Pollution Probe, based at the University of Toronto. There is demonstrably a need to develop a genuine partnership between the water resource planner and the water resource public. A suggested ideal form of a public participation program is to: identify the local social and cultural mores, carefully select and train a field staff specifically to handle the public participation program, collect preliminary data on community institutions and attitudes, establish an information exchange between the people and the planners, test alternative planning solutions through public discussions and workshop sessions, and provide political decision makers with consequences or alternative courses of action. Toronto Pollution Probe has also developed an environmental law association and makes available legal services for environmental cases on a low or no fee basis. (See also W72-13640) (Jones-Wisconsin)
W72-13665

SYNCHRONIZATION OF CELL DIVISION IN ESCHERICHIA COLI BY ELEVATED TEMPERATURES: A REINTERPRETATION,
Tel-Aviv Univ. (Israel). Dept. of Microbiology.

R. Lomnitzer, and E. Z. Ron.
Journal of Bacteriology, Vol 109, No 3, p 1316-1318, March 1972. 3 fig, 7 ref.

Descriptors: *E. coli, *Cultures, *Inhibition, Thermal stress, Temperature, Cytological studies, Amino acids.
Identifiers: *Synchronization, *Methionine, *Cell division.

Synchronization of cell division in E. coli exposed to elevated temperatures can be prevented if methionine is present during heat shock. Cells were grown at 37 degrees C on a minimal medium containing glucose, arginine, and thymine (methionine starvation). Cell numbers were determined by viable counts and by total cell counts in a Petroff-Hausser counting chamber after fixation with 6 percent formaldehyde. Exposure to elevated temperatures involved a transfer of 25-30 ml of culture to a 43.8 plus or minus 0.2 degree C water bath. Synchronization of cell division resulted from exposure to these elevated temperatures. That the amino acid methionine prevented synchronous growth at these temperatures suggested the elimination of endogenous methionine at higher temperatures which might be the reason for synchronization of cell division. (Long-Battelle)
W72-13666

HYPERTROPHIC GROWTH,
Microbiological Research Establishment, Salisbury (England).
E. O. Powell.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 1, p 71-78, January 1972. 5 fig, 15 ref.

Descriptors: *Cultures, *Deficient elements, *Mathematical models, *Eutroplication, Bioassay, Growth rates, Microorganisms, E. coli, Growth stages, Magnesium, Water pollution, Pollutant identification, Aerobic bacteria, Yeasts, Model studies, Mathematical studies.
Identifiers: *Hypertrophic growth, *Substrate utilization, Enrichment, Substrates, Bacillus subtilis, Aerobacter aerogenes, Chemostats, Culture media, Candida utilis.

A tentative mathematical model is presented of the microbiological hypertrophic growth phenomenon. Hypertrophic growth of a microbial organism occurs when two different media are used, and one is enriched with glutamic acid. Hypertrophic growth is illustrated by a series of mathematical equations of some simple specific assumptions using a chemostat culture of Bacillus subtilis growing under magnesium limitation and in a steady state as the representative microorganism for experimental study. (Byrd-Battelle)
W72-13668

A QUANTITATIVE COMPARISON OF PIGMENT EXTRACTION BY MEMBRANE AND GLASS-FIBER FILTERS,
Kent State Univ., Ohio. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W72-13673

NOTES ON THE AVIFAUNA OF THE MARSHY AREA OF PIERREPONT-SISSONNE (LAONNOIS-AISNE) II,
W. Schipper.
Alauda. Vol 39, No 3, p 204-208. 1971.
Identifiers: *Birds, Population, *Environmental effects, Buzzards, Ducks, Fauna, France, Marshes, Pesticides, Pheasants, Plants, Poplar D, Rabbits.

A reinventory (April-June 1970) of the avifauna of the Pierrepont-Sissone region revealed 75 spp. of nesting birds. An extreme moisture in the spring probably caused the low density of ducks and buzzards and the reduced productivity of pheasants. The productivity of the buzzards definitely suffered from the low density of rabbits and young plants. Various human-caused dangers menacing this region were also noted. They include an extensive amount of fishing, pesticide use, airplane noise, the cutting of reeds to make pathways before hunting season, and most of all, poplar plantings which increase in surface area each year transforming a marsh with a varied, rich flora and fauna into an artificial forest with a poor flora and fauna.--Copyright 1972, Biological Abstracts, Inc.
W72-13678

DEVELOPMENT OF LACTIC ACID BACTERIA DURING EARLY STAGES OF FERMENTATION IN FISH SILAGE,
Lantbrukhogskolan, Uppsala (Sweden). Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W72-13683

NUTRIENT STUDIES IN TEXAS IMPOUNDMENTS,
Texas Univ., Austin. Dept. of Environmental Health and Engineering.
V. H. Huang, J. R. Mase, and E. G. Fruh.
December 1970. 39 p., 10 fig, 11 tab, 6 ref. OWRR B-040-TEX (4).

Descriptors: *Phytoplankton, *Algae, *Nutrients, *Nitrogen fixation, Lakes, Nitrogen, Phosphorus, Iron, *Texas, Laboratory tests, Carbon radioisotopes, *Cyanophyta, Eutrophication, Water pollution effects.
Identifiers: *Lake Travis, *Lake Livingston, Field measurements, Carbon-14 measurements, Acetylene reduction measurements, Nutrient enrichment tests.

Blue-green algae became dominant in late summer 1970 in Lake Livingston on the Trinity River. Preliminary batch laboratory nutrient enrichment tests indicated nitrogen to be the limiting nutrient. Laboratory and in-situ carbon- 14 measurements substantiated the conclusions that nitrogen was the limiting nutrient. In-situ acetylene reduction measurements indicated that the nitrogen fixation rate was unmeasurable in August but was 0.74 millimicro moles C2H4/mg protein/ min in September. The rate of nitrogen fixation significantly increased with the addition of phosphorus after 2 weeks of incubation. Blue-green algae were also one of the dominant groups of phytoplankton in Lake Travis on the Colorado River. Preliminary batch laboratory nutrient enrichment tests indicated that nitrogen, phosphorus, and iron all could be limiting phytoplankton growth. Laboratory carbon- 14 analyses indicated iron to be most critical but field tests were inconclusive. In-situ acetylene reduction measurements indicated that no nitrogen fixation was occurring. Fixation in the laboratory did occur after 33 days of incubation of samples enriched with phosphorus and phosphorus and iron with the latter sample showing a higher rate. However, this rate was significantly lower than that found in Lake Livingston samples. (Galwardi-Texas)
W72-13692

LIMNOLOGICAL STUDIES OF BIG BEAR LAKE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
E. G. Pearson, and G. A. Irwin.
Geological Survey Open-file Report, February 2, 1972. 18 p, 9 fig, 6 tab, 17 ref.

Descriptors: *Limnology, *Lakes, *California, Chemical properties, Physical properties, Biological properties, Water temperature, Dissolved oxygen, Nutrients, Phytoplankton, Chemical analysis, Data collections.
Identifiers: *Big Bear Lake (Calif).

Big Bear Lake, California, exhibited seasonal changes in physical, chemical, and biological variables from June 1968 to June 1969. Dissolved-oxygen concentrations were depressed during the summer resulting in anaerobic conditions near the bottom of the lake. Water temperature decreased with depth in spring and summer, although classical thermal stratification was not observed. The nutrient standing crop was sufficient to maintain two distinct seasonal phytoplankton blooms. There were phytoplankton growth periods during the winter of 1968 and the summer of 1969, but the maximum populations were not excessive. Big Bear Lake exhibited periods of biochemical stress symptomatic of organically enriched lakes; however, no attempt was made to determine the magnitude or rate of the eutrophicational processes. (Woodard-USGS)
W72-13739

OSMOTIC STABILITY AND SODIUM AND POTASSIUM CONTENT OF L-FORMS OF STREPTOCOCCUS FAECALIS,
Wadsworth General Hospital, Los Angeles, Calif.
J. Z. Montgomerie, G. M. Kalmanson, E. G. Hubert, and L. B. Guze.
Journal of Bacteriology, Vol 110, No 1, p 624-627, May 1972. 4 fig, 6 ref.

Descriptors: *Osmosis, *Stability, *Cytological studies, Streptococcus, Aerobic bacteria, *Sodium, *Potassium, Cultures, Flame photometry, Digestion, Environmental effects, Pathogenic bacteria, Radioactivity techniques.
Identifiers: *Streptococcus faecalis, Sucrose, Hydrocarbons, Culture media, Survival.

A stable L-form of Streptococcus faecalis has been conditioned to grow in media without an osmotic stabilizer. The ability of this L-form to survive at different osmolalities and intracellular levels of Na and K ions has been compared with the L-form from which it was derived growing in media containing 0.5 M sucrose. L-form colonies and their stable derivatives were grown on BHI agar and BHI agar plus 0.5 M sucrose, respectively. Cells were obtained by centrifugation. Extracellular volume was determined with serum albumin (I-131). Na and K content were measured by flame photometry. The stable L-form of S. faecalis (T sub 53) was transferred in media containing decreasing concentrations of sucrose until it grew in medium without added osmotic stabilizer. This L-form (designated T sub 53I) was compared with T sub 53 from which it was derived. The survival of these two L-forms suspended at different osmalalities showed that maximal survival for T sub 53I was 350 to 400 milliosmolal and for T sub 53 was 900 to 1,000 milliosmolal. Both peaks were at the osmolality of their growth media. Measurement of intracellular potassium and sodium showed that the concentration of these ions was reduced in T sub 53I. (Long-Battelle)
W72-13764

EFFECT OF TEMPERATURE ON THE RESPIRATION AND CYTOCHROMES OF AN EXTREME THERMOPHILE,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
G. A. McFeters, and J. T. Ulrich.
Journal of Bacteriology, Vol 110, No 2, p 777-779, May 1972. 3 fig, 8 ref.

Descriptors: *Heat resistance, *Thermophilic bacteria, *Respiration, Aquatic bacteria, Aerobic bacteria, Spectrophotometry, Enzymes, Physiological ecology, Water temperature, Hot springs, Cultures, Dissolved oxygen.
Identifiers: Thermus aquaticus, *Cytochrome a, Cytochrome b, Cytochrome c.

An obligate aerobic, extreme thermophilic bacterium resembling Thermus aquaticus was isolated from a hot spring in Yellowstone National Park.

Since it grew optimally at 72 degrees C but repeatedly failed to grow anaerobically, the effect of temperature on respiration and the cytochromes was studied. Respiration was measured at different temperatures by using a Gilson differential respirometer. The culture was grown to mid-exponential phase in complete medium at the temperatures that were used for the oxygen uptake experiments (50, 60, and 70 C). Cells were grown to late-exponential phase at 50, 60, and 70 C in the complete medium, and their cytochrome content was determined. The difference spectra at ambient temperature were determined by using a Hitachi Perkin-Elmer model 356 spectrophotometer, and the cytochrome concentrations were estimated. The rate of oxygen uptake in the thermophile at 70 C was three times greater than at 50 C. Cytochromes a, b, and c were present in cells grown at 50, 60, and 70 C. The content of these electron transport system elements remained relatively constant as the growth temperature was raised. The concentration of dissolved oxygen also had no effect on the concentrations of respiratory enzymes. That the bacterium grew better at higher temperatures was postulated to be the result of increased availability of cofactors and increased dehydrogenase activity. (Long-Battelle)
W72-13765

LOSS OF VIABILITY BY STAPHYLOCOCCUS AUREUS IN ACIDIFIED MEDIA. I., INACTIVATION BY SEVERAL ACIDS, MIXTURES OF ACIDS, AND SALTS OF ACIDS,
Wisconsin Univ., Madison. Dept. of Food Science.
T. E. Minor, and E. H. Marth.
Journal of Milk and Food Technology, Vol 35, No 4, p 191-196, April 1972. 2 fig, 5 tab, 10 ref.

Descriptors: *Viability, *Acidity, Anions, Temperature, Water pollution, Pollutant identification, Aerobic bacteria, Hydrogen ion concentration, Organic acids.
Identifiers: *Staphylococcus aureus, *Culture media, Acetic acid, Citric acid, Hydrochloric acid, Lactic acid, Phosphoric acid, Survival, Mineral acids, Fate of pollutants.

Loss of viability by Staphylococcus aureus (100,000,000 cells per milliliter) was investigated after 24 hr of incubation at 37 C in Trypticase Soy broth acidified with acetic, citric, hydrochloric, lactic, and phosphoric acids. When the organism was exposed to the medium adjusted with hydrochloric acid to pH values of 5.2-3.6, 90-99.99 percent of the cells were inactivated. Acetic, lactic, and phosphoric acids were more active against S. aureus than was hydrochloric, whereas citric was equivalent to hydrochloric. Mixtures of lactic and hydrochloric acids inactivated more cells than did either acid alone but mixtures of other acids with hydrochloric, while superior to hydrochloric acid itself, offered no apparent advantage over the use of single acids. The undissociated acid molecule was responsible for enhanced inactivation of cells by partially dissociated acids since anions of these acids had no effect on cell survival. Cells were more susceptible to inactivation by hydrogen ions at high incubation temperatures (45 C) and when the number of bacteria was low. Cells of S. aureus were most sensitive to the effects of hydrogen ions between the 12th and 24th hr during a 120-hr incubation. (Byrd-Battelle)
W72-13777

CHRONIC EXPOSURE OF RATS TO METHYL MERCURY IN FISH PROTEIN,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
P. M. Newberne, O. Glaser, L. Friedman, and B. R. Stillings.
Nature, Vol 237, No 5349, p 40-41, May 5, 1972. 3 b, 12 ref.

Descriptors: *Toxicity, *Mercury, Foods, Animal pathology, Animal physiology, Reproduction, Fish, Protein, Laboratory tests, Urine, Diets, Heavy metals, Bioassay, Food chains.
Identifiers: *Methyl mercury, *Bioaccumulation, Histopathology, Mercury compounds, Rats, Tissue, Biological samples, Red hake, Utophycis chuss, Blood, Kidneys, Liver, Brain.

A two-year investigation has been completed on the effects of chronic exposure of rats to methyl mercury via diets of fish protein. Fish protein concentrate (FPC), extracted from red hake, was incorporated into a balanced, semisynthetic diet so as to supply 20 percent protein. This diet was fed to 30 male and 30 female rats and to their offspring totaling 5 generations. Measurements were recorded for all physical, reproductive, and feeding aspects for all generations. Two control diets of casein or lab chow were fed to similar groups of rats. Detailed histopathological studies were carried out on blood, liver, brain, kidney and urine samples. The control diets contained from 0.01-0.06 ppm total Hg while the FPC diet contained an average of 0.22 ppm total Hg, 90 percent of which was methyl mercury. In spite of greater concentrations of Hg in the tissues of the rats fed FPC, no gross, histologic or other noticeable effects were noted in the rats, the growth and reproductive performance of which were comparable with the performance of those fed control diets. (Mackan-Battelle)
W72-13780

HORIZONTAL AND VERTICAL DISTRIBUTION OF THE INTERSTITIAL HARPACTICOID COPEPODS OF A SANDY BEACH,
Marine Biological Association of the United Kingdom, Plymouth (England). Lab.
R. P. Harris.
Journal of the Marine Biological Association of the United Kingdom, Vol 52, No 2, p 375-387, May 1972. 5 fig, 2 tab, 26 ref.

Descriptors: *Ecological distribution, *Copepods, *Spatial distribution, Marine animals, Equipment, Crustaceans, Oxygen requirements, Water temperature, Environmental effects, Larval growth stage, Sampling, Intertidal areas, Marine bacteria, Aquatic populations, Beaches, Microscopy, Separation techniques.
Identifiers: Sample preparation, *Harpacticoids, *Copepodites, *Whitsand Bay, Elutriation technique, Arthropods, Arenosetella germanica, Intermedopsyllus intermedius, Kliopsyllus hosatica, Kliopsyllus constrictus, Remanea arenicola, Evansula pygmaea, Leptastacus laticaudatus, Paraleptastacus spinicauda, Arenocaris bifida, Arenopontia subterranea, Psammotopa vulgaris, Psammotopa phyllosetosa, Rhizothrix bocqueti.

Horizontal and vertical distributions were described for the interstitial harpacticoid copepods on a sandy beach of an intertidal transect at Whitsand Bay, Cornwall and compared to copepods on European beaches. Five core samples (50 cm long) were taken from each station with a perspex coring tube (2.6 cm diameter) and sectioned into ten vertical segments. Copepods, extracted from sand by an elutriation technique with a recovery of 90 percent, were stored in 5 percent neutral formalin and stained with Rose Bengal for microscopic examination. Most of the copepods showed distinct horizontal distribution patterns as evidenced by their restriction to narrow zones on the transect. In summer the copepods were concentrated at the sand surface. Deeper distributions were observed in winter when some species were found down to depths of 50 cm. When comparing the vertical zonation of males and females of a species the males were generally found at greater depths in the sand. In the spring there was evidence that ovigerous females were distributed at shallower depths relative to the total female population. The vertical distribution of the copepodites of a given species was usually somewhat shallower than that of the total population. These patterns were correlated with the copepods development. Distribution patterns probably resulted from temperature variations, oxygen availability, the local bacterial populations, and disturbance due to wave action. (Long-Battelle)
W72-13783

SALINITY TOLERANCES OF SOME COMMON PROSOBRANCHS,
Mount Allison Univ., Sackville (New Brunswick). Dept. of Biology.
D. C. Arnold.
Journal of the Marine Biological Association of the United Kingdom, Vol. 52, No. 2, p 475-486, May 1972. 7 fig, 2 tab, 17 ref.

Descriptors: *Ecological distribution, *Salt tolerance, Environmental effects, Water pollution effects, Salinity, Resistance, Gastropods, Marine animals, Geographical regions, Mollusks, Crustaceans, Distribution patterns, Spatial distribution.
Identifiers: *Prosobranchs, Littorina littorea, Patella vulgata, Gibbula cineraria, Nucella lapillus, Balanus balanoides, Littorina littoralis, Littorina saxatilis, Gibbula umbilicalis, *Bay of Fundy, Barnacles, *Gulf of St. Lawrence, Gaspe Peninsula, Cape Shemogue, Cape Breton, Passamaquoddy Bay, Chignecto Bay.

Ecological distributions which result from salinity tolerances have been investigated experimentally for some common prosobranchs. Gastropods (Patella vulgata, Littorina littorea, L. littoralis, Gibbula cineraria, Nucella lapillus) were collected close to high and low-water neap tides on the Castle Rocks, St. Andrews, Scotland, and at five sites on the shore of the Gulf of St. Lawrence, Atlantic coast of Nova Scotia, and Bay of Fundy. The responses of these species to water of different salinities was investigated by use of local inshore water diluted in 10 percent steps with local river water. Patella was studied on an individual basis, using animals of certain shell lengths. The response to local sea water was considered maximal and other responses were scored in proportion to this on a five-point scale. The mobile species were examined statistically by distributing each sample at random among small all-glass aquaria; sea water of appropriate dilutions was added, and after 1 h the movement of the animals was scored. In earlier experiments two species were maintained for a period of 28 days in water containing as much as 4.5 percent salt and were examined for mortality and daily activity. All experiments were carried out at 20-22 C and at low light intensity (13-25 ft-candles) during daylight hours. Salinity was measured by titration with silver nitrate using fluorescein as the indicator. Data showed that salinity tolerances increased with age and size of individuals while small specimens and Littorina spp. and Nucella showed a broad tolerance to diminished salinity at both tide levels. Littorina spp. was found to have adapted to salinity in particular areas of eastern Canadian waters. Gibbula showed a restricted tolerance to diminished salinity similar to Patella at low tide levels. (Long-Battelle)
W72-13795

SALMONELLA.
Defense Documentation Center, Alexandria, Va.

Available from the National Technical Information Service as AD 737 900. $3.00 in paper copy, $0.95 in microfiche. Report No. DDC-TAS-71-62, February 1972. 274 p, 171 ref.

Descriptors: *Salmonella, *Bibliographies, Biology, Epidemiology, Cultures, Methodology, Documentation, Abstracts, Data collections, Microbiology, Systematics, Pollutants, Pathogenic

bacteria, Coliforms, Toxins, Antibiotics (Pesticides), Enteric bacteria, Diseases, E. coli, Shigella, Viruses, Chromatography, Gas chromatography, Analytical techniques, Separation techniques, Temperature, Oxygen, Environment, Enzymes, Geographical regions, Algae, Microorganisms, Iron, Radiation, Metabolism, Instrumentation, Equipment, Laboratory equipment, Microbiology, Bacteriophage, Aerosols, Genetics, Water pollution, Radioactivity effects.
Identifiers: Detection, Fluorescent antibody techniques, Salmonella typhimurium, Ampicillin, Vibrios, Salmonella typhosa, Typhoid, Coliphage, Immunology, Pasteurella pseudotuberculosis, Penicillin, Drugs, Cortisone, Hormones, Chloramphenicol, Salmonella enterocolitis, Shigella dysenteriae, Shigella flexneri, Biochemical studies, Arthopods, Streptomycin, Salmonella paratyphi, Staphylococcus, Nuclear warfare, Cholera, Pasteurella pestis, Characterization, Biosynthesis.

This bibliography is a collection of unclassified references on Salmonella. The disease, the modes of transmission and the vectors are presented. Indexes for Corporate Author-Monitoring Agency, Subject, Title, and Personal Author are included. (Long-Battelle)
W72-13800

DDT: INHIBITION OF SODIUM CHLORIDE TOLERANCE BY THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
Wisconsin Univ., Madison. Dept. of Entomology.
J. C. Batterton, G. M. Boush, and F. Matsumura.
Science, Vol 176, p 1141-1143, June 9, 1972. 2 tab, 14 ref.

Descriptors: *DDT, *Sodium chloride, *Inhibition, *Salt tolerance, Water pollution effects, Chlorinated hydrocarbon pesticides, *Cyanophyta, Sodium, Potassium, Cultures, Resistance, Aquatic algae, Growth rates, Bioassay, Laboratory tests, Calcium.
Identifiers: *Anacystis nidulans, *Adenosine triphosphatase, Biochemical tests, Ouabain, Potassium chloride.

The effects of DDT on the sodium chloride tolerance of the blue-green alga, Anacystis nidulans were investigated by growth-rate studies. Algal cultures were grown at 30 degrees C on previously defined media with additions of sodium chloride (1 percent by weight) and/or DDT (800 ppb) and growth rate constants were calculated for each condition. A. nidulans was able to tolerate sodium chloride and DDT alone but not in combination. When NaCl was replaced by KCl, no growth was observed with KCl in combination with DDT. Growth did occur in cultures with lower concentrations of either KCl or DDT. That DDT lowered algal tolerance to salts by the inhibition of adenosine triphosphatase activity and the sodium-pump was substantiated by (1) additions of calcium, a transport inhibitor, to the growth cultures (the calcium reduced the permeability of the cells to NaCl, thus reducing NaCl stress) and (2) enzyme assays. Two types of ATPases were used in a comparison of inhibition by DDT and ouabain. The degree of inhibition by DDT was found to exceed that due to ouabain. Growth experiments carried out with glycerol indicated that the NaCl plus DDT inhibition is probably due to an ionic effect and not to osmotic stress. (Long-Battelle)
W72-13809

OIL POLLUTION: PERSISTENCE AND DEGRADATION OF SPILLED FUEL OIL,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-13810

VARIATION IN THE TOXICITY OF ARSENIC COMPOUNDS TO MICROORGANISMS AND THE SUPPRESSION OF THE INHIBITORY EFFECTS BY PHOSPHATE,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Forest Products.
E. W. B. Da Costa.
Applied Microbiology, Vol 23, No 1, p 46-53, January 1972. 2 fig, 5 tab, 11 ref.

Descriptors: *Toxicity, *Arsenic compounds, *Phosphates, *Inhibitions, *Microorganisms, Bacteria, Fungi, Methodology, Cultures, Bioassay, Environmental effects, Water pollution effects, Algae, Heavy metals, Growth, Pseudomonas, Potassium compounds, Pollutant identification, Chlorophyta, Chlorella.
Identifiers: Acremoniella, Dimethyl sodium arsonate, Arsenates, Sodium cacodylate, Culture media, Poria monticola, Poria cocos, Poria vaillantii, Coniophora olivacea, Lenzites trabea, Scopulariopsis brevicaulis, Cladosporium herbarum, Trametes versicolor, Fomes annosus, Fuscoporia contigua, Trametes lilacino-gilva, Xylobolus frustulatus, Aspergillus niger, Chaetomium globosum, Fusarium solani, Mucor microsporus, Penicillium spinulosum, Streptomyces griseus, Bacillus subtilis, Pseudomonas aeruginosa, Chlorella pyrenoidosa.

Two tests were used to measure the toxicity of arsenic compounds to microorganisms and the suppression of the inhibitory effects by phosphate. The toxicity phial test measured the growth of fungi on agar containing various concentrations of arsenates and phosphates. The second, a seeded plate inhibition zone test, measured the effects of phosphate on the arsenate growth inhibition zones. The toxicity of potassium arsenate, as measured by retardation or inhibition of growth on solid nutrient media, showed wide variation among different fungi but was consistently reduced by the addition of large amounts of potassium phosphate, with both arsenic-sensitive and arsenic-tolerant fungi. Poria monticola was completely inhibited by 0.0025 M arsenate but was progressively less inhibited as the phosphate content of the medium increased and grew slowly at 0.04 M arsenate when 0.16 M KH2P04 was added. Cladosporium herbarum showed 36 percent reduction in growth at 0.08 M arsenate in a low-phosphate medium, but when 0.01 M KH2P04 was added, arsenate concentrations up to 0.64 M (at which the medium contains 4.8 percent As) caused no reduction in growth rate. Addition of phosphate also reduced the toxicity of potassium arsenite but not that of dimethyl sodium arsonate (sodium cacodylate). The counteracting effect of phosphate on arsenate toxicity was found to occur with every one of a wide variety of microorganisms tested. The practical implications of the counter-inhibition phenomenon in laboratory investigations and standard tests of arsenical fungicides, in biochemical research, and in the commercial use of arsenical biocides are set out. (Long-Battelle)
W72-13813

EFFECT OF CYCLAMATES ON THE GROWTH OF PULLULARIA PULLULANS,
Roosevelt Univ., Chicago, Ill. Dept. of Chemistry.
E. Merdinger.
Canadian Journal of Microbiology, Vol 18, No 4, p 531-533, April 1972. 2 fig, 3 ref.

Descriptors: *Water pollution effects, *Growth, Soil fungi, Marine fungi, Aquatic fungi, Water pollution, Pathogenic fungi, Analytical techniques, Cultures, Gas chromatography, Metabolism, Methodology, Pollutant identification.
Identifiers: *Pullularia pullulans, *Substrate utilization, *Cyclamates, Cyclohexamine, Carcinogens, N-cyclohexylsulfamic acid, Sodium cyclamiate, *Cyclamic acid, Culture media, Glucose.

A description is given of the effect of N-cyclohexylsulfamic acid (cyclamic acid) and its sodium salt on the growth of the fungus, Pullularia pullulans, which can be isolated from air, seawater, and soil. Formation of the carcinogen, cyclohexylamine, was also assayed. Cells were cultured in flasks containing a basal medium with or without glucose as the carbon source. Cells grown in the absence of glucose were inoculated into media containing various concentrations of cyclamic acid and sodium cyclamate. The initial pH of all media was 5.4-5.6. Flasks were shaken at 28 degrees C and samples were removed at 24 hr intervals for determination of viable cell counts. Cyclohexylamine production was measured by an unpublished procedure of R.C. Sonders. Spent growth media of 8 days were extracted with methylene chloride and 2 liters of the extract was injected into a chromatograph fitted with a hydrogen ionization detector for product analysis. The data showed that increased concentrations of cyclamic acid and sodium cyclamate progressively depressed the growth of P. pullulans in the presence of various concentrations of glucose. Cyclohexylamine was produced in flasks containing 0.4 percent and 0.5 percent glucose and 0.6-1.0 percent cyclamic acid. (Long-Battelle)
W72-13814

CHANGES IN PLANKTON SPECIES COMPOSITION AND DIVERSITY IN A CONTROLLED NUTRIENT ENRICHMENT STUDY,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
W. J. O'Brien.
Transactions of the American Microscopical Society, Vol 91, No 1, p 77-91, January 1972. 2 fig, 3 ref.

Descriptors: *Phytoplankton, *Nutrient requirements, Nutrients, Bioindicators, Water pollution effects, Fertilizers, Nitrogen, Bioassay, Phosphorus, Cyanophyta, Oligotrophy, Chlamydomonas, Deficient elements, Mesotrophy, Eutrophication, Trophic level, Protozoans, Aquatic algae, Environmental effects, Chlorophyta, Primary productivity, Chrysophyta.
Identifiers: Enrichment, Chromulina, Cryptomonas erosa, Erkinia subequiciliata, Uroglenopsis americana, Cryptomonas pulsilla, Microcystis aeruginosa, Chroomonas caudata, Chlamydomonas pertusa, Pandorina morum.

An investigation was made of changes in plankton species composition and diversity as biological indicators by controlling the nutrient content/density of their environment. Controlled experimentation was carried out for two years at eight ponds which were organized into four treatment levels (control, low, medium, high) by adding specified amounts of high quality inorganic fertilizer. The control ponds were oligotrophic, the low and medium ponds mesotrophic, and the high ponds eutrophic. In the first year the phytoplankton density was quite variable in the treated ponds with the high treatment level ponds at times having the lowest phytoplankton density and at other times the highest. By mid-summer of the second year, however, the phytoplankton density increased proportionately with increasing treatment level. In 1969, the primary productivity was measured and its response to treatment level was similar to that of the phytoplankton density. In a laboratory study, water from each treatment level was collected and placed in flasks to which was added dissolved inorganic nitrogen or phosphorus or nitrogen and phosphorus together. The test organism, Pandorina morum, was incubated in these separate media for 2 weeks, after which the yield was measured. The final yield of P. morum increased with increasing treatment level. The addition of nitrogen stimulated final yield at all treatment levels but was proportionately less stimulatory with increasing treatment level. The addition of phosphorus did not stimulate final yield at all. (Byrd-Battelle)
W72-13816

GROWTH OF ENDOMYCOPSIS LIPOLYTICA ON HYDROCARBONS,
Regional Research Lab., Jorhat (India). Biochemistry Div.
For primary bibliographic entry see Field 05A.
W72-13817

EPIDEMIOLOGICAL AND ECOLOGICAL ASPECTS DUE TO THE CONSTRUCTION OF RIVER WEIRS IN THE TROPICAL REGIONS,
Institut Pasteur, Paris (France).
R. Deschiens.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). 273 (18): 1620-1622. 1971.
Identifiers: Ecology, Epidemiology, *Human diseases, *Invertebrates, River, Tropical, Vectors, Vegetation, *Weirs.

In the tropical regions, the biological composition of artificial retention lakes created by the erection of weirs is similar to that found in natural systems. Within 2-5 yr, the terrestrial vegetation is replaced by river vegetation. The creation of this particular biotype leads to the development of zoophytic associations containing invertebrate vectors carrying pathogenic agents as well as human and animal parasitic endemics which must be controlled by sanitary measures. The observations were made in Cameroun, Ghana, Ivory Coast and Morocco.--Copyright 1972, Biological Abstracts, Inc.
W72-13819

THE BIODEGRADATION OF ORGANIC SUBSTRATES UNDER ARCTIC AND SUBARCTIC CONDITIONS,
Alaska Univ., College. Inst. of Water Resources.
A. P. Murray, and R. S. Murphy.
Available from the National Technical Information Service as PB-211 999, $3.00 in paper copy, $0.95 in microfiche. Alaska Institute of Water Resources, Fairbanks, Report IWR-20, March, 1972, 56 p, 15 fig, 22 tab, 51 ref. OWRR A-014-ALAS (1).

Descriptors: *Biodegradation, *Organic matter, Cellulose, *Microorganisms, Arctic, Subarctic, *Alaska, *Temperature, Growth rates, Biochemical oxygen demand, *Oxygen requirements, Waste assimilative Capacity, Metabolism.
Identifiers: *Psychrophilic microorganisms, Metabolic reaction rates, Substrate utilization, *Cellulolysis.

Incubation of subarctic soil and water microorganisms in the psychrophilic temperature range hindered neither growth nor efficiency of substrate utilization in batch systems. Nevertheless, no direct relationship was observed between the temperature of incubation and kinetic constants. However, the initial food:microorganism ratio appeared to have more influence on the cell growth rate than did any variation in temperature. Values obtained for the reaction rates coefficients for oxygen consumption in subarctic waters indicated no special oxygen requirement for the decomposition of sewage in these waters at low temperatures. Here again temperature seemed to have less of an effect on the rate of oxygen depletion by indigenous microorganisms than did the amount of nutrient present. Initial availability of nutrients was also seen to be important in the bacterial decomposition of cellulose, Cellulolysis was found to be difficult to initiate in a well-mixed, aqueous environment in which no supplemental carbon and energy source was present. To isolate the effects of low temperatures on the metabolic reaction rates of microorganisms indigenous to cold environments from the effects of other variables, particularly those related to nutrient supply and population dynamics, was difficult. And, in fact, in the natural situation, where these variables remain uncontrolled, temperature need not be rate-determining.
W72-13822

WATER QUALITY PREDICTIONS BASED ON LIMNOLOGICAL PARAMETERS,
Clemson Univ., S.C. Water Resources Research Inst.
A. R. Abernathy, and H. R. Bungay, III.
Available from the National Technical Information Service as PB-212 004, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 32, August 1972, 165 p, 55 fig, 11 tab, 155 ref, append. OWRR A-016-SC (4).

Descriptors: *Primary productivity, Nutrients, Plankton, Mathematical models, Reservoirs, Bottom sediments, *Cycling nutrients, *Eutrophication, *South Carolina, Model studies, *Computer models, *Phytoplankton, Dissolved oxygen, Organic matter, Lake sediments, Water quality.
Identifiers: *Hartwell Reservoir.

A restricted sub-basin of Hartwell Reservoir in South Carolina was studied to collect limnological data useful in developing a computer model for predicting primary production and phytoplankton abundance in the reservoir. Physical characteristics of the basin were determined along with water chemistry, nutient budgets, rates of primary production and nutrient recycle from suspended detritus and bottom sediments. A model for predicting primary production with both location and time as independent variables was developed. Predictions agree well with field data. CSMP was used as simulation language for the model. Field data and information on the model are included.
W72-13825

ENDOSULFAN IN THE RHINE RIVER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
P. A. Greve, and S. L. Wit.
J Water Pollut Control Fed. Vol 43, No 12, p 2338-2348. 1971. Illus. Maps.
Identifiers: *Insecticides, *Water pollution treatment, *Pesticide removal, Bacteria, Degradation, Endosulfan, Fishkill, Rhine River.

Endosulfan proved to be the cause of a massive fish kill in the Rhine River in June 1969. Water samples showed concentrations up to 0.7 ppb. The insecticide was identified by gas chromatography and mass spectrometry. Its fate was studied for the rate of detoxification. Degradation was induced by bacteria under neutral, aerobic conditions. Endosulfan was found to be adsorbed by river silt, and up to 85% was removable by filtration and centrifugation. Other adsorbents found useful were ferric hydroxide gel and activated C.--Copyright 1972, Biological Abstracts, Inc.
W72-13847

LINMOLOGY OF ONEIDA LAKE WITH EMPHASIS ON FACTORS CONTRIBUTING TO ALGAL BLOOMS,
Geological Survey, Albany, N.Y.
P. E. Greeson.
New York State Dept of Environment Conservation, Albany, (Geological Survey Open-gile Report), 1971. 185 p, 51 fig, 32 tab, 145 ref, append.

Descriptors: *Limnology, *Lakes, *Eustrophication, *Hydrology, *New York, Water quality, Nutrients, Algae, Inflow, Discharge (Water), Water balance, Sediments, Chemical properties, Dissolved solids, Hydrologic data, Data collections, Lake morphology, Ecology, Biological properties.
Identifiers: *Oneida Lake (NY).

Oneida Lake, in the State of New York, is a naturally eutrophic lake that has existed for about 10,500 years. It has been in a eutrophic state for at least 350 years, and the geochemically derived dissolved materials entering the lake from the drainage basin are of sufficient quantity (449,700 tons per year) to support annual algal blooms. The lake retains 50,000 tons of dissolved solids each year. These materials become incorporated in the boottom sediments. Water in Oneida Lake represents a hydrologic equilibrium. Water entering the lake is from direct precipitation (149,600 acre-feet per year) and from surface water inflow (1,729,000 acre-feet per year (. Water leaves the lake by outflow through the Oneida River (1,730,400 acre-feet per year) and by evaporation (148,200 acre-feet per year). Sixty-seven percent of all water entering Oneida Lake originates in the northern part of the drainage basin. The four most important factors affecting the ecological processes in the lake are: (1) high fertility of the drainage basin, (2) physical position and shallowness of the lake, (3) mixing as caused by wind, and (4) fertility of the bottom sediments. (Woodard-USGS)
W72-13851

Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene.

Bull. Off. int. Epiz., Vol. 65, No. 5-6, p 663-669, 1966. 1 tab.

Descriptors: *Pesticide toxicity, *Herbicides, *Freshwater fish, *Aquatic animals, *Water pollution effects, *Lethal limit, Pesticides, Agricultural chemicals, Bioassay, 2-4-5-T, 2-4-D, Aminotriazole, Triazine pesticides, Dalapon, Carp, Trout, Pikes, Toads, Crayfish, Daphnia, Tubificids, Larvae.
Identifiers: MCPB, MCPA, DNOC, Monolinuron, Diuron, Simazin, Atrazin, Amitrol, Guppies, Tadpoles, Water fleas, Gammarids, Carlinogammarus spp., Water lice, Asellus spp., Tubifex spp., Gnats, Chirononus spp., Corethia spp., Aedes spp., Egyptian fever gnat.

Fifteen herbicides of a different chemical compound were tested for their toxicity in fish and fish feeding animals of fresh water. Only preparations which were on sale and for which evidence of application in the proximity of waterswas obvious were tested. A comparison of the values in fish and fish feeding animals shows that the fish feeding animals become injured with a much greater range of concentrations than do the fish. The limit of concentration at which the first fish feeding animals are dying will remain lower than that for fish in most cases, while the lethal limit of concentration is mostly to be found much above the limited values for fish. (Svensson - Washington)
W72-13864

PESTICIDE AND MERCURY LEVELS IN MIGRATING DUCK POPULATIONS,
Iowa Univ., Iowa City.
L. G. Johnson, R. L. Morris, and R. Bishop.
Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 6, p 513-516, 1971. 2 tab, 3 ref.

Descriptors: *Pesticide residues, *Ducks (Wild), *Mercury, *Chlorinated hydrocarbon pesticides, *Public health, Path of pollutants, Water pollution effects, Pesticides, Migratory birds, Mallard ducks, Lesser scaup duck, Shoveler duck, Pintail duck, Green-winged teal, Dieldrin, DDT, Heptachlor, Insecticides, American widgeon.

Because of the extensive hunting and human consumption of migratory ducks in Iowa, the mercury and pesticide levels in various tissues of these birds were measured. Mallard ducks were collected from seven locations and composite samples made of the breast muscle, liver and fat of the ducks taken at each individual location. Five other species were collected from various areas and the breast muscle, liver and fat from all the birds of a given species were prepared as composite samples. The pesticide data show that the pesticide concentrations are lowest in the breast muscle and highest in the fat for any of the sets of composites The mercury in the tissues has a distribution distinctly different from the chlorinated hydrocar

bons, being lowest in the fat and highest in the liver. Only two samples were significantly above the FDA established 0.5 mg/kg mercury concentration. The liver samples of the Lesser Scaup and the Shoveller ducts were 1.3 and 1.2 mg/kg, respectively. Except for the two values of mercury in the liver, the samples did not show evidence of significant contamination by pesticides abd mercury when evaluated against FDA tolerances for fish. (Svensson-Washington)
W72-13865

THE RIVER WEAR: INORGANIC CHEMISTRY RELEVANT TO A BIOLOGIST,
Durham Univ. (England).
For primary bibliographic entry see Field 02K.
W72-13866

ACTIVITY RESPONSE TO CHLORINE IN THE BROOK TROUT, SALVELINUS FONTINALIS (MITCHELL),
Manitoba Univ., Winnipeg.
J. W. T. Dandy.
Canadian Journal of Zoology, Vol. 50, No. 4, p 405-410, 1972. 1 fig, 3 tab, 10 ref.

Descriptors: *Chlorine, *Brook trout, *Toxicity, *Bioassay, *Fish physiology, Water pollution effects, Fish behavior, Lethal limit, Ventilation.
Identifiers: *Sublethal effects, Salvelinus spp.

Exposure of brook trout to chlorine evoked changes in activity, ventilation, the coughing reflex, and at lethal levels a heavy secretion of mucus. Locomotory activity increased initially and was subsequently depressed. Both responses were seen at 0.35 and 0.08 mg/l, but the initial increase was not seen at 0.04 or 0.005 mg/l. The initial increase lasted 2 hr, while the depressant response was still continuing after 7 days at the sublethal level of 0.005 mg/l. The results are discussed in relation to the different selection responses to different chlorine concentrations shown in rainbow trout by others. (Svensson-Washington)
W72-13867

GROWTH OF THE FATHEAD MINNOW (PIMEPHALES PROMELAS) IN TERTIARY TREATMENT PONDS,
Iowa State Univ., Ames.
J. L. Konefes, and R. W. Bachmann.
Proceedings of the Iowa Academy of Science, Vol. 77, p 104-111, 1970. 4 fig, 6 ref.

Descriptors: *Fish farming, *Aquiculture, *Sewage effluents, Fish hatcheries, Fish management, Fisheries, Fish reproduction, Growth rates, Animal growth, Fish behavior, Water reuse, Tertiary treatment, Ponds.
Identifiers: *Fathead minnows, *Fish growth, Pimephales spp.

A series of experimental ponds, utilizing treated sewage effluent as a water source, have been constructed at the Ames Water Pollution Control Plant. Fathead minnow fry were introduced into the ponds in the summer of 1969 and observations were made on their growth rates, reproduction, and food habits during the summer months. Growth was comparable to that previously reported for hatchery ponds. The fish matured by mid-summer and successfully reproduced a second crop of fry. The use of tertiary ponds for fish production seems to be a useful approach to the conservation of natural resources. (Svensson-Washington)
W72-13868

CONCENTRATION OF MERCURY IN THE MANUFACTURE OF FISH PROTEIN CONCENTRATE BY ISOPROPYL ALCOHOL EXTRACTION OF SHEEPSHEAD AND CARP,
Canisius Coll., Buffalo, N.Y.
T. A. Gasiewicz, and F. J. Dinan.
Environmental Science and Technology, Vol. 6, No. 8, p 726-727, August 1972. 2 tab, 10 ref.

Descriptors: *Mercury, *Water pollution effects, *Public health, *Foods, Heavy metals, Freshwater fish, Carp, Great Lakes, Lake Erie, Separation techniques.
Identifiers: *Fish protein concentrate, Niagara River, Sheepshead, Isopropyl alcohol extraction.

Levels of mercury in bottom feeding freshwater fish and their corresponding fish protein concentrates have been determined and found to correlate with a fish:fish protein concentrate enrichment factor of approximately 5. This finding indicates that no mercury is extracted from the fish used in this study during the concentrate manufacture via isopropyl alcohol extraction, and further suggests that only fish of low initial mercury concentration may be used as starting material in this process if the resultant fish protein concentrate is not to exceed the maximum allowable mercury concentration level. (Svensson-Washington)
W72-13869

SALINITY TOLERANCE OF YOUNG BLUEBACK HERRING, ALOSA AESTIVALIS,
Virginia Inst. of Marine Science, Gloucester Point.
M. E. Chittenden, Jr.
Transactions of the American Fisheries Society, Vol 101, No 1, p 123-125, January 1972. 6 ref.

Descriptors: *Herrings, *Salt tolerance, Anadromous fish, Fish physiology, Saline water, Bioassay, Saline water-freshwater interfaces, Lethal limit.
Identifiers: Alosa spp., Blueback herring.

The salinity tolerance of young blueback herring is of particular interest in view of the tendency of this fish to spawn in and near tidal water. All specimens exposed to gradual salinity increase and nine fish directly transferred to high salinity water suffered no mortality, fed avidly after the second day, and appeared to thrive throughout the experiments. The tenth fish transferred directly to high salinity water appeared in satisfactory condition shortly after transferral but died nine hours later. The death may have been due to handling stress rather than to the salinity change. These experiments indicate that the blueback herring is highly salinity tolerant early in life. Euryhaline tolerance allows this species to occupy both saltwater and freshwater nurseries. (Svensson-Washington)
W72-13870

DYNAMICS OF PHYTOPLANKTON PRIMARY PRODUCTION AND BIOMASS IN LOVIISA ARCHIPELAGO (GULF OF FINLAND),
Institute of Marine Research, Helsinki (Finland).
P. Bagge, and A. Niemi.
Merentutkimuslait. Julk./Havsforskningsinst. Skr., No 233, p 19-41, 1971. 7 fig, 2 tab, 35 ref, 1 app.

Descriptors: *Phytoplankton, *Primary productivity, *Eutrophication, *Biomass, *Hydrography, Algae, Aquatic algae, Oligotrophy, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Stratification.
Identifiers: Orthophosphate concentrations, Gulf of Finland.

Phytoplankton primary production and biomass at two sampling localities situated in the Loviisa archipelago were studied during 1967-1969. Primary production was measured mainly by the in situ carbon-14 technique and quantitative analyses of phytoplankton were usually made once a month during the growing season. No linear correlation was observed between production and biomass values. The data of primary production and phytoplankton obtained in the Loviisa area are compared with those available from other areas situated on the northern coast of the Gulf of Finland. The magnitude of production (ca. 30-40 g C (ass.)/square meter/year) and the succession and biomass of phytoplankton in the Loviisa area were found to be typical of the oligotrophic waters of the south coast of Finland, however the occurrence of some algal species points to a weak eutrophication of the waters studied. (Svensson-Washington)
W72-13871

SOME HAEMATOLOGICAL AND METABOLIC CHANGES IN FISH OCCURRING AFTER PESTICIDE INTOXICATION (NEKTERE HEMATOLOGICKE A METABOLICKE ZMENYU-RYB PO INTOXIKACI PESTICIDY),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
Z. Svobodova.
Bulletin VUR Vodnany, Vol 7, No 3, p 29-36, 1971. 3 tab, 32 ref. English summary.

Descriptors: *Pesticide toxicity, *Fish physiology, *Carp, Water pollution effects, Metabolism, Biochemistry.
Identifiers: *Hematological changes, Metation E 50, Nitrosan 50, Trifenox TM, Neren, Hemoglobin, Hematocrit, Erythrocytes, Glycogen, Glucose, Blood.

The changes in some hematological and metabolic indices were examined in the carp after pesticide intoxication. The cases were peracute Metation E 50, Nitrosan 50, Trifenox TM 1:1, and Neren intoxication, and chronic intoxication with Metation E 50. The hematological indices under study were the following: erythrocyte number, content of hemoglobin, mean color concentration color index; the examination of the glycide metabolism included glycogen content in the hepatopancreas and glucose level in blood. The nature of the hematological changes in fish after pesticide intoxication (with the exception of Nitrosan 50) was almost the same in all cases. The main response of the fish to the pesticide preparations was a large increase in the mean erythrocyte volume, increase of hematocrit, and a significant reduction of mean color concentration. The response of the fish to the effect of Nitrosan 50 was the release of erythrocytes from the blood deposits. Pesticide intoxication caused a decrease in the level of glycogen in the hepato-pancreas and a significant increase in the level of glucose in the blood. These effects cannot be considered specific for the effect of pesticides, but pesticide intoxication should be considered a cause evoking these changes. (Svensson-Washington)
W72-13873

OBSERVATIONS ON THE OXYGEN NEEDS OF SOME SPECIES OF EUROPEAN PLECOPTERA,
Limnologische Fluss Station, Schlitz (West Germany).
L. Benedetto.
Internationale Revue ges. Hydrobiologie, Vol 55, No 4, p 505-510, 1970. 5 fig, 1 tab, 19 ref.

Descriptors: *Stoneflies, *Oxygen requirements, Oxygen, Dissolved oxygen, Respiration, Animal physiology, Bioassay, Distribution.
Identifiers: Dinocras spp., Perlodes spp., Diura spp., Nemoura spp.

In order to evaluate the comparative sensitivity of a large gilled species of Plecoptera and some species without gills to lowered dissolved oxygen, four types of stonefly nymphs, one with gills and three without, were exposed to four different concentrations of dissolved oxygen. The gilled species showed a definitely superior ability to withstand reduced oxygen concentration, in agreement with work done previously by others. Distributions of the four species are considered in light of their oxygen requirements. (Svensson-Washington)
W72-13874

MORTALITY OF PACIFIC OYSTERS (CRASSOTREA GI-GAS): THE INFLUENCE OF TEMPERATURE AND ENRICHED SEAWATER ON OYSTER SURVIVAL,
Washington Univ., Seattle.
V. P. Lipovsky, and K. K. Chew.
In: Proceedings of the National Shellfisheries Association, Vol 62, p 72-82, June 1972. 13 fig, 41 ref. NSF GH-40.

Descriptors: *Oysters, *Mortality, *Bioassay, *Pathogenic bacteria, *Heated water, Commercial shellfish, Water temperature, Bacteria, Aquatic bacteria, Spawning, Aquatic environment, Animal physiology.
Identifiers: *Nutrient enrichment, *Invertebrate pathology, Crassostrea spp., Vibrio spp., Mesophilic bacteria, Gram negative bacteria.

Pacific oysters brought into the laboratory for conditioning studies experienced a high mortality of an unknown origin. Death was related to high temperature and enriched seawater from cultured algal food. Oysters in seawater at 9C had no mortalities; 14C--2% mortality; and 21C--100% mortality. Oysters periodically transferred between 9 and 21C showed reduced mortalities. Death were four to five times greater in nutrient-enriched seawater. Spawned oysters in non-enriched seawater had an increased mortality. Presumably, death results from a bacterial proliferation. Gram negative bacteria identified as mesophilic Vibrio spp. were monitored at 9 and 21C in the oysters and seawater. Histologically, cellular responses, tissue pathology and bacteria in the tissues increased progressively with a rise in temperature. There may be a connection between the laboratory deaths and some of the summer Pacific oyster mortalities in Washington State. (Svensson-Washington)
W72-13875

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.
For primary bibliographic entry see Field 05A.
W72-13903

THERMAL EFFLUENTS FROM ELECTRICAL POWER GENERATION,
Fisheries Research Board of Canada, West Vancouver British Columbia). Pacific Environment Inst.
W. H. Bell.
Technical Report No 262, April 1971. 59 p, 2 tab, 94 ref.

Descriptors: *Electric power demand, Thermal pollution, *Thermal powerplants, Steam, Water quality, Water pollution effects, *Biological communities, *Temperature, Forecasting, Oceanography, Coasts, Canada.
Identifiers: *British Columbia.

Steam electric plants are expected to be used more and more frequently to meet future demands for electrical power generation. When the heated water from these plants is discharged into natural bodies of water, changes in water quality, both adverse and beneficial, are bound to occur. Effects on biological species from thermal discharges are being studied along with attempts to predict the resulting temperature distributions. These studies should be considered prior to the establishment of future steam-electric plants. Part two of this study deals specifically with the effects of thermal effluents in the coastal waters of British Columbia. The various oceanographic conditions of a vertically mixed area, a partially enclosed embayment and a stratified estuary are studied and compared in their responses to thermal effluents. (Ensign-PAI)
W72-13905

DDT RESIDUES IN EIGHT CALIFORNIA MARINE FISHES,
Philadelphia Community Coll., Pa.
For primary bibliographic entry see Field 05B.
W72-13946

PROPOSED HYBRID PROTOTYPE DESALTING PLANT FOR BROWNSVILLE, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W72-13958

MUSSELS AND BARNACLES AS INDICATORS OF THE VARIATION OF MANGANESE-54, COBALT-60 AND ZINC-65 IN THE MARINE ENVIRONMENT,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 05B.
W72-13978

CONCENTRATIONS OF ZINC-65 IN MARINE FOODSTUFFS AND PACIFIC COASTAL RESIDENTS,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-13979

ENVIRONMENTAL RADIOACTIVITY AT THE NATIONAL NUCLEAR RESEARCH CENTRE, PELENDABA. REPORT FOR THE YEAR 1970.
Atomic Energy Board, Pretoria (South Africa).
For primary bibliographic entry see Field 05B.
W72-13984

EFFECTS OF TEMPERATURE ON THE RESPIRATORY METABOLISM OF THREE CHESAPEAKE BAY BIVALVES,
Maryland Univ., Solomons. Natural Resources Inst.
V. S. Kennedy, and J. A. Mihursky.
Chesapeake Science, Vol 13, No 1, p 1-22, March 1972. 23 fig, 13 tab, 61 ref. A-002MD (13) and A-011MD (4).

Descriptors: *Respiration, *Animal physiology, *Water temperature, *Metabolism, *Thermal pollution, *Clams, Temperature, Compensation, Water pollution, Heated water, Chesapeake Bay, Water pollution effects.
Identifiers: *Respiratory rates, Macoma spp., Mulinia spp., Mya spp., Bivalves.

Respiratory rates of Macoma balthica, Mulinia lateralis and Mya arenaria were determined under an experimental design using acclimation and exposure temperatures ranging from 1 to 30 C. Rates decreased with increasing size and in general varied directly with temperature. However, high temperatures (30C) depressed metabolism of cold-acclimated Mulinia and Mya. Very young Mya were less affected by high temperature (30C) than were Mya a few months older. Macoma was least affected by high or low temperature stress, followed by Mya, then Mulinia. All three species were able to compensate for temperature change to a varying extent. Unseasonal artificial warming of the benthic environment could elevate metabolism of the species studied, which could lead to starvation if food were scarce, especially in winter.
W72-13997

LIFE HISTORY OF THE EASTERN JOHNNY DARTER, ETHEOSTOMA OLMSTEDI STORER, IN COLD TAILWATER AND SEWAGE-POLLUTED WATER,
Maryland Univ., Solomons. Natural Resources Inst.
C. F. Tsai.
Transactions of the American Fisheries Society, Vol 101, No 1, p 80-88, January 1972. 5 fig, 3 tab, 21 ref. OWRR B-006-Md (4).

Descriptors: *Darters, *Fish populations, *Tailwater, *Sewage, *Water pollution effects, Freshwater fish, Fish eggs, Water temperature, Water pollution, Spawning, Fish reproduction, Animal growth, Fecundity, Streams, Rivers, Maryland.
Identifiers: *Eastern Johnny darter, Etheostoma spp., Condition factor, Patuxent River Maryland.

The life histories of two populations of E. olmstedi in the Patuxent River, Maryland, one in cold reservoir tailwater and the other in sewage-polluted water, were studied to determine the effects on this species of man-made modifications in the stream. The spawning season was in May and June with temperatures approximately 12.5-14.5 C in the cold tailwater and 16.0-18.5 C in the sewage polluted water. In the sewage polluted water, the fish grew faster in early summer of the first year than those in cold tailwater, but later growth decreased, even though the condition factor, or degree of well-being, continued to increase. Fecundity of the sewage-polluted water population was greater than that in the cold tailwater population because of larger body weight. In the sewage-polluted water, there were fewer males with a lower condition factor than females. It also had a higher percentage of fish in the II-year class and a lower percentage in the I-year class than the cold tailwater population. Males did not grow as rapidly as females in the cold tailwater. (Svensson-Washington)
W72-13998

CHLORINATED HYDROCARBON, MICROPARTICULATE EFFECTS ON MICROORGANISMS ISOLATED FROM LAKE ERIE,
Ohio State Univ., Columbus.
R. M. Pfister, J. I. Frea, P. R. Dugan, C.I. Randles, and K. Zaebst.
In: Proceedings of the 13th Conference on Great Lakes Research, International Association of Great Lakes Research, p 82-92, 1970. 10 fig, 3 tab, 13 ref. OWRR B-013-OHIO (5).

Descriptors: *Chlorinated hydrocarbon pesticides, *Water pollution effects, *Growth rates, *Bacteria, *Endrin, *Aldrin, *Heptachlor, *Dieldrin, Pesticides, Insecticides, Water pollution, Particle size, Lake Erie, Aquatic bacteria, Aerobic bacteria, Bioassay, Colloids.
Identifiers: *Lindane, Sublethal effects, Size analysis.

Water samples from the western basin of Lake Erie have been analyzed with regard to the distribution of colloidal microparticles. Size analyses of particulate samples revealed that the most common size particle was in the range of 0.1 micrometer. Chlorinated hydrocarbon pesticides such as endrin, aldrin, heptachlor and lindane were found in association with these particles and the data suggest that aldrin and heptachlor were found more frequently on the smaller, less dense particles, while lindane was associated with the larger, more dense fractions. Bacteria isolated from these water samples prior to chemical analyses were grown in the presence of clay microparticles freed of pesticides, microparticles containing known amounts of pesticides, and purified pesticides alone. Bacterial growth effects were measured, and results demonstrate that different bacteria in the presence of endrin, aldrin or dieldrin could be affected in different ways, i.e. stimulated or inhibited. (Svensson-Washington)
W72-13999

DESIGN AND SITING CRITERIA FOR ONCE-THROUGH COOLING SYSTEMS BASED ON A FIRST-ORDER THERMAL PLUME MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.

D. W. Pritchard, and H. H. Carter.
Chesapeake Bay Institute Technical Report No 75 (Reference 72-6), Johns Hopkins University, April 1972. 51 p, 1 fig, 5 tab, 16 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Water pollution effects, *Ecology, *Environmental effects, Aquatic life, Engineering structure, Design criteria, Data collections, Water temperature, Water cooling, Sites, Planning.

The distributions of excess temperature, and the time-temperature history of exposure of organisms entrained into the thermal plume resulting from the discharge of condenser cooling water from a nuclear powerplant, are given for several alternate sets of design criteria for the discharge structure. In order to minimize adverse effects on natural water bodies used to supply condenser cooling water flow for once-through cooling systems, the powerplant should be located on a waterway having large dilution capacity. The discharge structure should be designed to promote rapid dilution of the heated effluent by the cooler receiving waters. Intake structures should be designed to provide for low intake velocities, and to provide an effective means of diverting fish and other aquatic organisms away from the intake. Time of travel of the condenser cooling water flow from the condensers to the point of discharge should be kept small, in order to minimize the time of exposure of entrained organisms to the maximum temperature rise. (Woodard-USGS)
W72-14030

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Nevada Univ., Reno. Max C. Fleischmann Coll. of Agriculture.
R. E. L. Taylor.
Available from the National Technical Information Service as PB-212 045, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Bulletin 15, R 88, February 1972. 7 p, 1 fig, 4 tab. OWRR A-040-NEV (1) and A-042-NEV (1).

Descriptors: *Salinity, *Fishery, Sodium salts, Chloride, Carbonate, Bicarbonate, *Water level, *Trout, Water pollution effects, *Nevada.
Identifiers: *Pyramid Lake, *Lahontan cutthroat trout, Truckee River, Lake Tahoe, Winnemucca Lake.

Groups of Lahontan Cutthroat Trout were tested in Pyramid Lake Water which was altered with the addition of the sodium salts of sulfate, chloride, carbonate and bicarbonate, to simulate conditions in the lake as the lake volume decreases. Trout tested at 50 degrees F for 14 days would tolerate an environment representing up to 2 1/2 times the present salt concentration but would not tolerate 3 times the present salt concentration. The former environment (2.5X concentration level) represents what will occur when the lake reaches 3660 feet above sea level. Therefore, Pyramid Lake should be maintained as much above this elevation as possible to protect the fishery. (Clasen-Nevada)
W72-14054

COMPARATIVE EFFECTS OF AQUATIC BIOTOXINS ON CARDIAC SYSTEMS,
New Hampshire Univ., Durham. Dept. of Zoology.
F. P. Thurberg.
PhD Thesis, January 1972. 74 p, 9 fig, 3 tab, 100 ref. OWRR A-013-NH (6) and A-021-NH (3).

Descriptors: *Algal toxins, *Poisonous plants, *Cyanophyta, *Nuisance algae, *Aquatic algae, *Crustaceans, *Fish toxins, *Algal poisoning, Dinoflagellates, Beggiatoa, Phytoplankton blooms, Physiological ecology, Mortality, Red tide, Toxicity.
Identifiers: Aquatic biotoxins, *Biotoxins.

Toxins from 3 marine dinoflagellates, Gymnodium breve, Amphidinium carteri and Gonyaulax catenalla, and a freshwater blue-green alga, Aphanizomenon flos-aquae were obtained by laboratory culture, field collection and correspondence with other investigators. In vivo and isolated hearts of decapod crustaceans, Cancer irroratus and Carcinus maenus, the bivalve molluscs, Mya arenaria and Mercenaria mercenaria and the grass frog Rana pipiens were exposed to these toxins, and mechanical and electrical activity were measured. Gymnodinium breve toxin excited crustacean hearts, depressed frog hearts and had no effect on molluscan hearts. These observations and experiments with human blood cholinesterase and mammalian intestine suggest anticholinesterase-like activity as one action of G. breve toxin. Amphidinium carteri toxin excited crustacean hearts and depressed molluscan and frog hearts. This choline-like action was further demonstrated with mammalian intestine preparations and the use of the choline blocking compound, mytolon chloride. Aphanizomenon flos-aquae and Gonyaulax catenella toxins depressed frog and crustacean hearts but had no effect on molluscan hearts. This evidence supports reported physiological and chemical similarities of these two toxins.
W72-14056

A RE-EVALUATION OF THE ANAEROBIC ENDPRODUCTS OF FRESHWATER FISH EXPOSED TO ENVIRONMENTAL HYPOXIA,
Academy of Natural Sciences of Philadelphia, Pa.
D. T. Burton, and A. M. Spehar.
Comp Biochem Physiol A Comp Physiol, 40 (4): 945-954, Illus, 1971.
Identifiers: *Anaerobic conditions, Environmental effects, Fatty-Acids, Fish, *Hypoxia, Lactic-Acid, Pyruvic-Acid, Water pollution effects.

Lactic acid and free short-chain fatty acids were reported in the literature as anaerobic endproducts produced by fish when exposed to environmental hypoxia. A significant increase in lactic acid was found in skeletal muscle and liver of Salmo trutta exposed to sudden hypoxia and of S. gairdneri, Lepomis macrochirus and Ictalurus nebulosus exposed to gradual hypoxia. No free short-chain fatty acids were found in skeletal muscle or liver of control or experimental fish after being exposed to hypoxia. A significant reduction in pyruvic acid was found in skeletal muscle only of S. gairdneri and L. macrochirus after being exposed to gradual hypoxia. No changes in the types of anaerobic endproducts occurred as a result of thermal acclimation to warm and cold temperatures.--Copyright 1972, Biological Abstracts, Inc.
W72-14093

TENTATIVE EVALUATION OF INDUSTRIAL DAMAGE IN STANDS OF THE GOLONOG FOREST DISTRICT,
Feliks Nowak.
Sylwan, 114 (2): 41-45, Illus, 1970.
Identifiers: *Air pollution, Contamination, Damage, Forest, *Golonog forest, *Industrial pollution, Poland, Soils, Water pollution effects.

Air pollution and water and soil contamination reduced wood output of this Polish woodland by 50%. The use of quick-growing plants and fertilizers is recommended.--Copyright 1972, Biological Abstracts, Inc.
W72-14095

CONTAMINATION OF LETTUCE IRRIGATED WITH SEWAGE EFFLUENT,
Advisory Service, Exeter (England). Agricultural Development.
For primary bibliographic entry see Field 05B.
W72-14104

WATER PLANT COMMUNITIES IN EASTERN LOWER SAXONY (I AND II), (IN GERMAN),
D. W. Weber-Oldecop.
Int Rev Gesamten Hydrobiol. 55 (6): 913-967. 1970. and 56 (1): 79-122. 1971. English summary.
Identifiers: Communities, *Germany, *Lemna-M, Plant, Water pollution, *Potamogeton-M, Season, Temperature, *Aller River (Saxony).

In the drainage area of the Aller river, a tributary of the Weser stream (eastern Lower Saxony, W. Germany), 12 aquatic communities in rivers, brooks and ox-bow lakes were investigated. The plant communities are described and classified on the basis of the principles of Braun-Blanquet. Ecological factors of paramount importance to the aquatic vegetation were taken into account, such as chemical composition of the water, velocity of current, water pollution, soils, temperature of water in the seasons, fluctuations in the water level, and climate. The correlation between environment and distribution of the associations is discussed. The 12 vegetation units belong to the phytosociological classes Lemnetea and Potamotea.--Copyright 1972, Biological Abstracts, Inc.
W72-14117

PERPETUATION OF BACTERIAL BLIGHT DISEASE OF PADDY AND PRESERVATION OF ITS INCITANT: I. SURVIVAL OF XANTHOMONAS ORYZAE IN WATER,
Uttar Pradesh Agricultural Univ., Naini Tal (India). Dept. of Plant Pathology.
R. N. Singh.
Identifiers: *Bacterial blight, Culture, Disease, *Paddy-M, Preservation, *Xanthomonas-Oryzae.

X. oryzae (Uyeda and Ishiyama) Dowson cultures can survive in sterile tap and distilled water for a period of over 12 mo. clearly indicating that these can be used as inexpensive, reliable and practical medium for preservation of the pathogen without any loss of viability and virulence. Due to the survival of the pathogen for short periods only, 15 and 38 days in field and pond water, respectively, they were not found to play any role in the perpetuation of the disease.--Copyright 1972, Biological Abstracts, Inc.
W72-14118

PATTERNS OF LAKESHORE USAGE AROUND LAKE BEMIDJI,
Bemidji State Coll., Minn.
C. S. Holt, R. A. Schulz, and C. M. Hadland.
J Minn Acad Sci. 37 (2/3): 104-108. Illus. Map. 1971.
Identifiers: Algae, *Lake Bemidji (Minn), *Eutrophication, Lakes, *Lakeshore development, Minnesota, Plants, Soils.

The eutrophication of lakes has been the subject of much discussion in scientific journals and the popular press. Usually the eutrophication process is accelerated by human activities. This study evaluates the extent of lake shore development and recreational use of Lake Bemidji in north central Minnesota and examines the willingness of lakeshore residents to be assessed for corrective measures to halt deterioration of this valuable recreational lake. The shoreline of Lake Bemidji is highly developed, and the high density human habitation represents a potential source of nutrients from percolation through the sand and gravel soils which surround the lake. Residents around Lake Bemidji believe that growth of algae and aquatic vascular plants is not now severe and that it does not affect their use of the lake for recreational purposes. Although 75% of the residents favor regulation of lakeshore use and development, only 37% indicate willingness to be assessed for construction of a sewer line surrounding the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-14131

POLLUTANT CONCENTRATIONS IN ABNORMAL YOUNG TERNS FROM LONG ISLAND SOUND,
American Museum of natural History, New York.
H. Hays, and R. W. Risebrough.
Auk. 89 (1): Illus. 1972.
Identifiers: BI, DDT, Fish, New York, *Pollutant concentration, *Terns, *Great Gull Island (NY), *Polychlorinated biphenyls.

The incidence of abnormal chicks of common and roseate terns in the colony on Great Gull Island, New York, at the eastern end of Long Island Sound, was recorded during a productivity study in 1969 and 1970. Over 2000 young common terns and more than 800 young roseate terns were handled each year. In 1969, 0.1% of the young terns showed an abnormality and in 1970, the incidence of visible defects was 1.3%. Abnormalities included feather loss in juvenile terns, as well as eye, bill, and foot deformities in several newly hatched young terns. Abnormal young collected in 1970 and fish brought to the colony by adults were analyzed for the DDT and PCB compounds and in some cases for total Hg. Concentrations of Hg in the livers of the young terns ranged from 0.2 to 1.2 ppm on a fresh weight basis with arithmetic and geometric means of 0.76 and 0.68 ppm, respectively. Median concentrations of DDE and PCB in the breast muscle of the young terns were 2.1 and 25 ppm wet weight, respectively. Median concentrations of the sum total of the three principal DDT compounds p,p -DDE, p,p -DDD, and p,p -DDT and of PCB in collections of 8 spp. of fish brought to the colony by adult terns were 0.19 and 1.0 ppm wet weight, respectively. On a lipid basis, DDT residues ranged from 4.2 to 13.9 ppm and PCB ranged from 10 to 180 ppm in 6 of the fish species. Long Island Sound is much less contaminated with DDT compounds than are the coastal waters of California. The abnormalities recorded resemble those produced in young chickens under experimental conditions by the chlorinated dibenzo-p-dioxins and some preparations of the polychlorinated biphenyls.--Copyright 1972, Biological Abstracts, Inc.
W72-14134

EFFECT OF PUMPING FRESHWATERS INTO OIL STRATA OF THE PERM PRIKAMJE ON THE DISTRIBUTION OF MICROFLORA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
E. P. Rozanova, A. L. Baldina, V. N. Bykov, and T. A. Kosogorova.
Mikrobiologiya. 40 (4): 718-723. Illus. 1971. English summary.
Identifiers: *Heterotrophic bacteria, Flora, Micro organisms, *Oil strata, Perm Prikamje, *Pumping, Salinity, USSR.

Studies on microflora of the oil-bearing terrigenic stratum of coal-beds did not reveal the presence of sulfate-bearing, oil-oxidizing and heterotrophic bacteria. These groups of microorganisms were abundant in freshwaters enriched with sulfates and 02 and used for pumping into oil strata. The initial stage in the formation of biocenosis of the oil-oxidizing and sulfate-reducing bacteria was detected in the near-face zone of the stratum where freshwaters were pumped. These bacterial groups were detected only in the samples of diluted waters from the wells. Salinity of these waters did not exceed 14-32 g/l. The content of viable bacteria was low and fell to zero with an increase of salinity. Hydrogen sulfide was absent. These data can be explained by an insufficient duration of watering and the rate of transport of freshwaters in the stratum from the pumping region.--Copyright 1972, Biological Abstracts, Inc.
W72-14135

EFFECTS OF CULTURAL PRACTICES AND FERTILIZERS ON SUGAR BEET QUALITY,
Broom's Barn Experiment Station, Bury St. Edmonds (England).
A. P. Draycott, M. J. Durrant, and P. J. Last.
I I R B Rev Inst Int Rech Betteravieres. 5 (3): 169-185. Illus. 1971. French and German summary
Identifiers: *Beet-D, *Fertilizers, Harvest, Irrigation, Nitrogen, Rainfall, Sugar beets.

Effects of plant population, length of growing period (by varying the time of sowing and harvesting), irrigation, rainfall before harvest and fertilizers on sugar beet quality are summarized from 350 field experiments. Sugar percentage and juice purity increased significantly with increasing plant population every year. Effects of length of growing period were less consistent but increasing it always increased juice purity in the range tested (March-Dec.). On average, lengthening the growing period at 1st increased and then decreased sugar percentage but the effect was largely governed by rainfall before harvest. Irrigation decreased sugar percentage but increased juice purity. Of the fertilizers tested, only N changed the quality greatly, 225 kg/ha decreasing sugar percentage by 1.0% and juice purity by 1.5%. Applications of phosphate had little effect on sugar percentage and the cations K, Na and Mg increased it slightly. Neither phosphate nor the cations had much effect on juice purity. The quality changes established were used to investigate optimum plant population, length of growing period and N application both for total sugar and extractable white sugar and the corresponding changes in the value of the crop. The optima were remarkably similar, suggesting that practices which gave maximum total sugar also gave near-maximum extractable white sugar.--Copyright 1972, Biological Abstracts, Inc.
W72-14139

RESPIRATORY AND CIRCULATORY RESPONSES OF RAINBOW TROUT LARVAE TO CARBON MONOXIDE AND TO HYPOXIA,
Toronto Univ. (Ontario). Dept. of Zoology.
G. F. Holeton.
J Exp Biol. 55 (3): 683-694. 1971.
Identifiers: *Carbon monoxide, Circulatory response, *Hypoxia, Mon., Oxide, *Rainbow trout, Respiration, *Tachy cardia, *Trout larvae.

The respiration and circulation in rainbow trout larvae was examined for the first three weeks after hatching. Breathing became steadily stronger, heart rate first increased then decreased probably due to establishment of inhibitory control. Larvae exposed to hypoxia or CO responded to both with tachycardia and an increase in breathing. It is proposed that the bradycardia response of adult trout to hypoxia is a superimposed response relating circulation to the quantity of oxygen presented to the gills, and that this reflex is not functional in larvae for at least 8 days after hatching.--Copyright 1972, Biological Abstracts, Inc.
W72-14146

THE INFLUENCE OF ZALA RIVER ON THE BACTERIOLOGICAL CONDITION IN KESZTHELY-BAY (LAKE BALATON),
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
Janos Olah.
Ann Inst Biol (Tihany) Hung Acad Sci, 38: 161-166, 1971, Hungarian summary.
Identifiers: Bacteriological conditions, Bays, Hungary, *Keszthely-Bay, Lake Balaton, *Planctomyces, Zala River, *Zoogloea, *Heterotrophs.

In Zala River at the time of the water bloom, the number of heterotrophs was very low (1.5-2.7 1000 cells/ml). In the Keszthely-Bay receding from the inflow, the quantity of both the heterotrophic and the total microbial plankton decreased. The high numbers of Planctomyces bekefii (3 . 10000 colonies/ml) and Zoogloea (1.5 . 10000 colonies/ml) detected in Zala River was absent from the plankton of the Keszthely-Bay. In the lake, the microbial biomass transported by the river decomposed quickly. Together with the mineralization of the algal biomass, the number of heterotrophs was very high (13-20 . 10000 cells/ml) in Zala River. In the Keszthely-Bay the number of heterotrophs was also high (3.1-12 . 10000 cells/ml) owing to the decreased mineralization capacity of the water indicating that the decomposition of the high microbial biomass originating from Zala River was slow and prolonged. Colonies of Planctomyces and Zoogloea were absent from the plankton.--Copyright 1972, Biological Abstracts, Inc.
W72-14154

REACTION OF SOIL FUNGI AND OTHER MICROORGANISMS TO VARIOUS LEVELS OF NITROGEN FERTILIZATION AND IRRIGATION OF COCKSFOOT (DACTYLIS GLOMERATA L.). (IN POLISH),
Z. Maciejowska-Pokacka.
Acta Mycol, 7 (1): 41-57, Illus, 1971, English summary.
Identifiers: *Cocksfoot-M, Dactylis-Glomerata-M, Fertilization, *Fungi, Irrigation, Microorganisms, *Nitrogen, Organisms, Penicillium-Janthinellum, Penicillium-Nigricans, Soil, Trichoderma, Yeast like fungi.

The soil was maintained at 2 different levels of humidity and fertilized with high rates of N. Soil fertilized with 90 kg N/ha x 4 had more microorganisms than the control. In May on non-irrigated plots and in March on irrigated plots fertilized with 270 kg N/ha x 4 the number of microorganisms increased much. Most microorganisms were most active in May. There were no great differences in the number of microorganisms on irrigated and non-irrigated. The fungal flora was least numerous in May. Fungi reacted strongly to N fertilization. Development on non-irrigated plots was better than on irrigated plots. On non-irrigated plots fertilized with 2 higher rates of N (180 and 270 kg N/ha x 4), a particularly high increase of the number of fungi was observed. Most frequent were the species Penicillium janthinellum and P. nigricans. A similar situation occurred on fertilized and irrigated plots. On plots with a higher level of humidity best development occurred at the fertilization level of 90 kg N/ha x 4. P. janthinellum and P. nigricans were most frequent in the autumn. Trichoderma and yeast-like fungi developed best in spring. Reaction of various fungi to various rates of N was different. Reddish-yellow isolates of P. janthinellum, which occurred frequently in fertilized soil are described.--Copyright 1972, Biological Abstracts, Inc.
W72-14158

CLADOCERA STUDIES ON LAKE BALATON: IV. SUBFOSSIL REMAINS IN THE SEDIMENTS OF LAKE BALATON II,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 02H.
W72-14160

GLASS EFFECT AND THE MICROBIAL PLANKTON-SESTON RELATION IN THE WATER OF LAKES BALATON AND BELSO,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
Janos Olah.
Ann Inst Biol (Tihany) Hung Acad Sci, 38: 153-160, 1971, Hungarian summary.
Identifiers: Bacteria, *Lake Balaton, *Lake Belso, *Glass effect, Hungary, Lakes, *Trophic level, Microbial plankton, Seston, Water pollution effects.

The water of lakes Balaton and Belso with different trophic levels and the significance of the glass effect were indicated by the values of S; the proportion between the highest number of bacteria and the initial number of bacteria were measured during incubation. In the filtered water the values of S were always larger than those in the unfiltered

water and increased together with the increasing organic matter content in the media employed in detecting the glass effect. In the filtered water of Lake Balaton the values of S were higher by 2 orders of magnitude, than those in the water of the highly eutrophic Lake Belso. This suggests a direct relation between the significance of the glass effect and the trophic level. In Lake Balaton 56% of the total microbial plankton was attached to the seston. For heterotrophic microorganisms this percentage increased to 96. In Lake Belso the seston-attachment was smaller (45 and 84%). The differences between the 2 lakes were even higher in the case of the attachment to inorganic seston.--Copyright 1972, Biological Abstracts, Inc.
W72-14161

THE HORIZONTAL DISTRIBUTION OF ROTIFERA PLANKTON IN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
Nora P. Zankai, and Jeno E. Ponyi.
Ann Inst Biol (Tihany) Hung Acad Sci, 38: 285-304, Illus, 1971, Hungarian summary.
Identifiers: Asplanchna-Girodi, *Lake Balaton, Encentrum-Wiszniewszki, *Hungary, Lakes, Plankton, Records, *Rotifera plankton, Trichocerca-Rousseleti.

The Rotifera plankton of the open water of the lake was composed by 40 spp., varieties and forms during 2 yr (1966-67). Three of them (Encentrum wiszniewszki Wulfert, Trichocerca rousseleti (Voigt) and Asplanchna girodi de Guerne) are new to the fauna of Hungary whereas Brachionus diversicornis (Daday) is new for that of Lake Balaton. Qualitative investigations proved that 5 spp. (Keratella cochlearis, K. cochlearis tecta, K. quadrata, Polyarthra vulgaris, Pompholyx sulcata) can be considered as the main elements of the open water in Lake Balaton. On the basis of their horizontal distribution, the species were classified into 4 groups: a = those found in the open water of the whole lake, being of nearly uniform in distribution; b = those found only in the north-eastern basin and showing a higher percentage there, respectively; c = those found only in the southwestern basin and showing a higher percentage there, respectively; d = those living in the Keszthely-Bay. On the basis of percentage distribution of the dominant species as well as of Marczewski-Steinhaus index, 3 areas can be distinguished in the open water of Lake Balaton: (a) north-eastern basin ('E-A' sections), (b) Keszthely-Bay and Szigliget-Bay ('M-K' sections), (c) 'G' section of the south-western basin can sometimes be assumed to belong to the north-eastern part while at other times to the 'K' section. The richest region in species was the Keszthely-Bay and its surrounding. Taxa found here are characteristic mainly for the strongly eutrophic waters.--Copyright 1972, Biological Abstracts, Inc.
W72-14163

THE EFFECT OF CERTAIN CHLORINATED ORGANIC PESTICIDES ON HYGIENIC INDICATORS OF WATER,
G. Zamfir, A. Simona, M. Filipiuc, L. Alexa, and C. Melinte.
Z Gesamte Hyg Grenzgeb, 17 (10): 734-740, Illus, 1971, Russian summary.
Identifiers: Bacteria, *Chlorinated pesticides, Daphnia, Hygienic indicators, Pesticides, Water pollution effects, *Detox, *Lindatox.

The effect of small concentrations (0.02 mg, 0.2 mg, and 2 mg active substance/l) of Detox and of Lindatox on hygienic water indicators was determined. These pesticides raised the values of certain water pollution indicators like the biological O2 demand, oxidability and bacterial flora. A short initial period of inhibition of algal growth is followed by their accelerated growth. The pesticides were simultaneously found highly toxic to Daphnia. In view of these findings the maximal permissible concentration of these pesticides in water must be set lower.--Copyright 1972, Biological Abstracts, Inc.
W72-14164

FUNCTIONAL MODEL OF THE LAKE ECOLOGICAL SYSTEM (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
V. V. Menshutkin.
Zh Obshch Biol, 32 (2): 163-168, Illus, 1971, English summary.
Identifiers: *Bacteria, *Computer models, Ecology, Fish, *Lake models, Plankton, Heat balance, Thermal regime.

A generalized model of the lake ecological system was made on a digital computer. The model involves the elements of heat balance, the thermal regime and pattern of biogenic elements as well as the characteristics of the activity of phytoplankton, predatory and non-predatory zooplankton, bacteria, benthic organisms, fishes, planktophages and benthophages, and predatory fishes. The function of the model is exemplified in changes in the wind regime over the lake surface and intensification of fishery of benthophages. In the former case, the transitory period duration is limited by 2 yr and in the latter, is prolonged beyond 10 yr. The suggested method of modelling is convenient for summarizing data on separate elements of the lake ecosystem. Such models are suitable for qualitative prognosis of after-effects in the lake ecosystem.--Copyright 1972, Biological Abstracts, Inc.
W72-14167

THE HYDROLOGICAL CONDITIONS OF AMBARO BAY (NORTHWESTERN MADAGASCAR): CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
B. Piton, and Y. Magnier.
Cah O.R.S.T.O.M. (Off Rech Sci Tech Outre-Mer) Ser Oceanogr. 9 (2): 149-166. Illus. 1971. English summary.
Identifiers: *Ambaro Bay, *Eutrophication, *Madagascar, Seasonal, *Tropical bays, Salinity, Estuarine environment.

The results of a 2 yr survey in Ambaro Bay suggest that the circulation changes from estuarine to anti-estuarine pattern according to the meteorological influences of the wet or dry season. Net fluxes of salt and water were calculated.--Copyright 1972, Biological Abstracts, Inc.
W72-14182

ECOLOGIC STUDY OF TWO SMALL PONDS IN THE ENVIRONS OF WEVELGEM (WEST FLANDERS),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Oecologie.
P. Sorgeloos.
Biol Jaarb. 38: 188-208. Illus. Map. 1970.
Identifiers: *Belgium, Cladocera, Copepoda, Ecology, Environment, Flanders, *Lepocinclis-Texta, *Phytoplankton, Ponds, *Trachelomonas-Sp, Wevelgem.

Samples were taken monthly of the water in the 2 nearby ponds and these were examined for temperature, transparency, pH, dissolved O2, plant and animal plankton. The 'Park' pond was low in O2, which was probably because of the low phytoplankton content. Cladocera and Copepoda were dominant in the zooplankton. The presence of these crustacean organisms depends, not on physical and chemical characteristics of the water, but on the presence of food such as Lepocinclis texta and Trachelomonas spp. Phytoplankton predominated in the 'College' pond.--Copyright 1972, Biological Abstracts, Inc.
W72-14187

OIL AND THE ECOLOGY OF THE ARCTIC,
Alberta Univ., Edmonton. Dept. of Botany.
L. C. Bliss.
Trans R Soc Can. 8: 361-372. Illus. 1970.
Identifiers: *Arctic, *Ecology, *Oil pollution, Environmental effects.

The ecological problems presented by large-scale arctic operations and the means of lessening the impact of these operations so as to maintain a favorable arctic environment for future generations are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-14188

5D. Waste Treatment Processes

SWINE WASTE CHARACTERIZATION AND EVALUATION OF ANIMAL WASTE TREATMENT ALTERNATIVES,
North Carolina Water Resources Research Inst., Raleigh.
F. J. Humenik.
Available from the National Technical Information Service as PB-211 807, $3.00 in paper copy, $0.95 in microfiche. North Carolina State Water Resources Research Institute, Raleigh, Report No 61, June 1972 (UNC - WRRI-72-61), 152 p. 19 fig, 41 tab, 48 ref, 3 append. OWRR A-048-NC (3).

Descriptors: *Farm wastes, *Waste water treatment, *Waste identification, Analytical techniques, *Farm lagoons, *Denitrification, Waste treatment, *Biochemical oxygen demand.
Identifiers: *Swine wastes, *BOD5.

The influence of feed additives chlorotetracycline, copper and zinc concentrations and sample dilution on BOD5 analysis was investigated for swine feces, lagoon influent and lagoon effluent. Variation of BOD5 with sample concentration was also investigated for synthetic sewage and animal waste samples without inhibitory feed additives. Analyses of experimental data showed that BOD5 results depend upon sample history, type and amount of seed organisms, incubation conditions and sample size. Work was conducted to correlate BOD5 results with other chemical or instrumental tests and develop tehcnically sound methods for evaluating the oxygen demand or pollutional potential of animal waste. Data correlations and characterization values for instrumental chemical oxygen demand analyzer and organic carbon analyzer were developed. Recommendations for obtaining accurate and consistent characterization data for animal waste and suggestions for obtaining the most reliable BOD5 results are presented. Laboratory work was conducted on suitability of procedures outlined in Standard Methods for Examination of Water and Wastewater (1971) and alternative analytical techniques for the characterization of animal wastes. Animal waste treatment alternatives were investigated. Operation data for single unaerated swine waste lagoon, two unaerated lagoons in series, and packed soil lysimeters for land disposal of lagoon effluent were anlyzed. Lysimeter work on the land application of liquid dairy manure also initiated. Lysimeters were operated as natural flow-through soil profiles and with a controlled water table. Nitrate formed in the acrobic soil layers could be removed without supplemental organic addition by biological denitrification in the anaerobic zone provided by the controlled water table.
W72-13635

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES-VOL. I.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.

Copy available from GPO Sup Doc EP2.10:17050 $2.50; microfiche DDY 12/71, from NTIS as PB-211 909, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 341 p, 8 fig, 6 tab. EPA Program 17050 DDY 12/71.

Descriptors: *Trickling filters, *Bibliographies, *Biological treatment, Aerobic treatment, Filters, Treatment facilities, Industrial wastes, Municipal wastes, Theoretical analysis, Construction, Operation and Maintenance, Patents, Pollution abatement, *Waste water treatment, Chemical wastes, Pulp and paper industry, Radioactive wastes.
Identifiers: Biological filters, Biofilters, Percolating filters, Sprinkling filters, Brewery and distillary wastes, Gas and coke plant wastes, Food processing wastes, Institutional and military wastes, Milk processing wastes, Pharmaceutical wastes, Meat and poultry wastes, Tannery and textile wastes, Metal working and production wastes.

A compilation, review and critique of the literature on biological trickling filter studies and related pollution abatement processes have been made. Volume I, the literature review and critical analysis, is divided into: (a) Introduction, Definitions, History and Background Theory of the Trickling Filter Process; (b) Plant Design, Materials of Construction, Operation, Maintenance and Performance; (c) Trickling Filter Research and Development Approaches, Ecology, and Patents, and (d) Application of Trickling Filter to Specific Industrial Wastes. Based on the review, several general conclusions were drawn. There is no well-defined theory of design and operation. Much published work was redundant, and European efforts were not readily accepted in the United States, and vice versa. The literature reflects cycles of interest in trackling filters. The value of much of the early work was ignored. Solutions to complex pollution problems will be made by industry strongly supported by local, state and Federal governments. The filter will be used in high efficiency, modern wastewater treatment plants. The process is not applicable to all pollution problems, but its shock survival capabilities and rapid flow-through time are definite advantages which cannot be overlooked in any design of a waste treatment facility. (See also W72-13639) (Galwardi-Texas)
W72-13638

VIRUS REM OVAL BY CHEMICAL COAGULATION,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
S. P. Shelton, and W. A. Drewry.
Available from University of Tennessee. Dept. of Civil Engineering, Knoxville, Price: $3.00, Water Resources Research Center, Report No. 15, December 1971, 111 p., 28 fig, 42 tab, 23 ref.

Descriptors: *Viruses, *Chemical precipitation, *Coagulation, *Bacteriophage, *Waste water treatment, Performance, Laboratory tests, Economic feasibility.
Identifiers: Aluminum sulfate, Ferric chloride, Ferric sulfate, Sodium, Aluminate, Cationic polyelectrolytes, f2 bacteriophage.

The removal of f2 bacteriophage by chemical coagulation was investigated. Aluminum sulfate, ferric chloride, and ferric sulfate were the most effective coagulants tested, all removing over 99% of the virus in at least one of the two waters tested. Cationic polyelectrolytes were unsatisfactory as primary coagulants because of their inability to form a good floc. Cationic, nonionic and anionic polyelectrolytes with aluminum sulfate improved coagulation bust were not economically feasible. Sodium aluminate when used in conjunction with aluminum sulfate was effective for virus removal. However, the optimum dosages required for turbidity and COD reduction did not correspond to the optimum dosage required for virus removal. (Galwardi-Texas)
W72-13684

AN EXAMPLE OF ECONOMIC PLATING WASTE TREATMENT BY REVERSE OSMOSIS,
Ontario Research Foundation, Sheridan Park. Dept. of Physical Chemistry.
A. Golomb.
Preprint, presented at 6th International Water Pollution Research Conference, Session 2, Hall B, Paper No. 3, June 19, 1972, 11 p, 3 fig, 3 tab, 6 ref.

Descriptors: *Reverse osmosis, *Industrial wastes, *Reclaimed water, *Estimated costs, Efficiencies, Performance, Laboratory tests, Pilot plants, Membranes, Cellulose, Dissolved solids, Treatment facilities, *Waste water treatment.
Identifiers: Electroplating industry, Nickel, Rinse waters, Closed loop system, Dragout losses, Product recovery.

On the basis of laboratory studies and subsequent plant trials on an industrial plating line, Watts nickel plating rinse waters were effectively treated by reverse osmosis to reclaim reusable materials. Cellulose acetate membranes were used to recover greater than 99% of nickel values from the waste rinse streams. For nickel dragout losses associated with the plating operation of 15, 50 and 500 gal/day projected cost estimates indicated capital investment payback periods of the order of 39, 13, and 4 months, respectively. Cost estimates were arranged in tabular form. In addition to the favorable economic aspects, the 'closed loop' reverse osmosis reclamation system can make a significant contribution toward eliminating unnecessary discharge of contaminants and total dissolved solids into the environment. (Galwardi-Texas)
W72-13687

HIGHER BOD REMOVAL VIA CHEMICAL ADDITIVES.

Chemical Engineering, Vol 78, No. 16, July 12, 1971, 1 p.

Descriptors: *Treatment facilities, *Municipal wastes, *Chemical precipitation, Activated carbon, Settling basins, Vacuum drying, *Virginia, *Biochemical oxygen demand, Waste water treatment.
Identifiers: Ferric chloride, Polyelectrolytes.

A new wastewater treatment system installed at the Westgate Sewage Plant in Fairfax County, Virginia, has enabled the plant to comply with standards set by the Virginia State Water Control Board requiring BOD5 removal to be upgraded to at least 75%. The process involved adding powdered activated carbon, ferric chloride, and organic polyelectrolytes to the effluent of the primary clarifiers. Since little or no construction was required, the process is cheaper in the short run than building conventional or tertiary treatment plants. (Galwardi-Texas)
W72-13689

MACRORETICULAR RESINS-A SOLUTION TO AGGRESSIVE CONDITIONS,
W. A. Segar.
Effuent and Water Treatment Journal, Vol 9, No 8, August 1969, p 433-438. 4 fig, 2 tab, 11 ref.

Descriptors: *Ion exchange, *Resins, *Industrial water, *Chemical degradation, Colloids, Size, Water treatment, *Waste water treatment.
Identifiers: *Macroreticular resins, Pore size, Aggressive conditions, Acrylic matrices, Industrial applications.

The development of a macroreticular resin has facilitated the application of ion exchange under conditions where standard gel materials would undergo chemical or physical degradation. In addition it has made possible the preparation of certain types of ion exchange resins which could not be satisfactorily manufactured using a gel matrix or were not previously capable at all of being prepared. An example of the former is Amberlite IRA-93, a tertiary amine weak base resin, and an example of the latter is Amberlite XE-238, a resin having pore sizes of the order of 100,000 Angstrom units. Amberlite XE-238 has been prepared for the removal of colloids including colloidal silica from water and shows much promise in the production of pure water for food preparation, power generation, and transistor washing. Another approach to the problem of aggressive conditions is the use of anion exchangers based on acrylic matrices such as Amberlite IRA-68 which has been applied in the food, pharmaceutical, and chemical processing industries as well as for the treatment of water and tertiary sewage. (Galwardi-Texas)
W72-13690

SPRINKLER IRRIGATION SYSTEM SOLVES WASTE WATER PROBLEMS.

Journal of Technical Association of Pulp and Paper Industry, Vol 55, No. 7, p 1016, July 1972.

Descriptors: *Industrial wastes, *Pulp and paper industry, *Irrigation systems, *Waste water disposal, Size, Cost comparisons, Capital costs, Operating costs, *Michigan.
Identifiers: *Sprinkler irrigation system, Watervliet paper company.

The Watervliet (Michigan) Paper Company plans to install a sprinkler irrigation system which will handle 900,000 gallons per day of wastewater. The project calls for wastewater to be pumped through underground pipes and spray irrigated over 90 acres. This irrigation method is slightly less expensive than development of a waste treatment plant. However, yearly operating and maintenance costs will be substantially less. (Galwardi-Texas)
W72-13691

PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
Texas Univ., Austin. Dept. of Chemical Engineering.
D. M. Himmelblau, and E. F. Gloyna.
Available from the National Technical Information Service as AD-739 992, $3.00 in paper copy, $0.95 in microfiche. Final Report, U. S. Army Medical Research and Development Command, March 10, 1972. 76 p., 26 fig., 13 tab, 59 ref. DADA 17-69-C-9073

Descriptors: *Biological treatment, *Mathematical models, *Mixing, *Kinetics, Aeration, *Waste water treatment, Tracers, Laboratory tests, Laboratory equipment, Statistical methods, Model studies, *Aerated lagoons.
Identifiers: *Residence time distribution functions, Radioactive counting, Steady state operations, Transient responses.

Work was undertaken to represent and identify mathematical models of biological waste treatment as applied to a laboratory sized aeration basin. Studies were carried out with respect to both the mixing and to the kinetics of biological oxidation reactions. Estimation schemes other than least squares were essential because least squares in many instances could not evaluate the model parameters. The proposed treatment of the microbial reactions was one that accounted for the individual components of the substrate but not the components of

the microbial population. Validity of the suggested model was demonstrated in both batch and continuous laboratory aeration tanks. When introduced into models of wastewater treatment processes the kinetic portion of the model represented the laboratory data quite well. The proposed model not only represented steady state operations, but also transient responses caused by changes in plant loading and process upsets. (Galwardi-Texas)
W72-13694

INTERPRETATION OF TRACER TESTS ON SEDIMENTATION TANKS,
Michigan Univ., Ann Arbor. Dept. of Water Resources.
G. W. Brumo.
Journal of the Technical Association of Pulp and Paper Industry. Vol 55, No. 7, July 1972, p 1097-1102, 11 fig, 7 ref.

Descriptors: *Sedimentation, *Settling basins, *Waste water treatment, *Tracers, Mathematical models, Mathematical studies, Hydraulics, Mixing.
Identifiers: Clarifiers, Plug flow, Step input technique, Pulse input technique, Short circuiting, Dead spaces.

The gross hydraulics and the reasons for inefficiency of solids removal in wastewater clarifiers were investigated by introduction of a tracer. Theoretical responses to a step tracer input to a number of plausible flow models of continuous flow settling basins were reviewed. Models of simple and multistage basins which exhibit various degrees of plug flow, mixing, short circuiting, dead spaces, or combinations of these modes were examined. The use and interpretation of the pulse input technique was also treated. Possible causes for departure from ideal plug flow behavior were discussed from a hydraulic viewpoint. The usefulness of the theoretical flow models was illustrated by comparison with an actual tracer test on a clarifier using step input method. (Galwardi-Texas)
W72-13696

OXYGEN UPTAKE AND MECHANISM OF SUBSTRATE PURIFICATION IN A MODEL TRICKLING FILTER,
Cornell Univ., Ithaca, N.Y.
P. Monadjemi.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 69-7291, Microfilm $3.00, Xerox $7.00. Ph. D. Dissertation, September 1968, 146 p.

Descriptors: *Trickling filters, *Mathematical model, *Dissolved oxygen, *Depth, Flow rate, Chemical oxygen demand, Slimes, Laboratory tests, Laboratory equipment, Performance, *Waste water treatment.
Identifiers: Molecular diffusion coefficient, Oxygen uptake rate, Slime-liquid interface, Removal coefficient.

The trickling filter was considered in terms of individual elements of the filter media over which laminar flow occurs. The flow of liquid waste from one element to another was assumed to be accompanied by mixing at the point of contact of various elements. An equation which takes into account the importance of the number of mixings which occur in a vertical chain of the filter was proposed. This equation incorporated such factors as total depth, depth of individual elements in the filter, molecular diffusion coefficient, hydraulic flow rate and the removal coefficient across the slime-liquid interface. It was observed that oxygen uptakes per unit weight of slime were less in trickling filters than in activated sludge. A linear relationship was observed between oxygen uptake and COD removal. Dissolved oxygen profiles in the filter resembled that of oxygen sag in streams with lowest D.O. occurring in mid-portion of the filter. The experimental results were applied to the mathematical model and the coefficient of removal of substrate across the slime-liquid interface was calculated. (Galwardi-Texas)
W72-13697

THE REMOVAL OF RADIONUCLIDES FROM WATER BY HYDROUS FERRIC OXIDE,
Rensselaer Polytechnic Inst., Troy, N.Y.
W. M. McLellon.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-12,840, Microfilm $4.80, Xerox $16.90. Ph. D. Dissertation, 1967, 374 p.

Descriptors: *Colloids, *Iron oxides, *Radioisotopes, *Hydrogen ion concentration, *Electrophoresis, Cesium, Iodine radioisotopes, Sodium, Sulfur, Efficiencies, *Waste water treatment.
Identifiers: Hydrous ferric oxide, Removal efficiencies, Ferric chloride coagulant, Freundlich isotherm, Electrophoretic mobility.

Colloidal properties of hydrous ferric oxide, prepared under a variety of system conditions, were investigated. Additionally, the use of hydrous ferric oxide in the removal of radioactive solution ions was examined, using 137Cs (+), 22Na (+), (131)I (-), and 35S (as SO4 (-2)). Removal of radioactive ions was correlated with pH and with the electrokinetic properties of colloidal particles formed. The maximum 137Cs (+) removal was 2.1%, the maximum sodium removal was 1.3%. These occurred at maximum negative electrophoretic mobility. The maximum (131)I (-) removal was 40% at pH 4.0. Iodide removal using a FeCl3 coagulant conformed to a Freudlich isotherm for concentrations of 10 to the minus 13th power and 10 to the minus 7th power molar. The maximum 35S (as SO4 (-2)) removal was 9.4% at pH 4.0. A linear relation was found to exist between cation removal and electrophoretic mobility of hydrous ferric oxide particles with a sharp break occurring at the pH of change from stable colloid to flocculant state (pH 9-10). (Galwardi-Texas)
W72-13699

BIODEGRADATION OF SYNTHETIC DETERGENTS EVALUATION BY COMMUNITY TRIALS: 1. LINEAR ALKYLBENZENE SULFONATES,
Shell Research Ltd., Egham (England). Egham Research Labs.
A. H. Mann, and V. W. Reid.
Journal of American Oil Chemist's Society, Vol 48, No 10, October 1971, p 588-594. 2 fig, 8 tab, 17 ref.

Descriptors: *Biodegradation, *Linear alkylate sulfonates, *Trickling filters, Aeration, Effluents, Degradation (Decomposition), Laboratory tests, *Waste water sampling, Treatment, On-site tests.
Identifiers: Open-bottle die-way test, Molecular weight, Paraffins, Olefins.

The biodegradability of a number of linear alkylbenzene sulfonates (LAS) has been evaluated by field trials with a trickling filter sewage plant serving a small community. All the LAS material examined showed a satisfactory order of biodegradability, however, aeration of the sewage effluent resulted in further biodegradation to a degree corresponding to 96 to 99% degradation in the LAS present in the settled sewage. The results of laboratory scale biodegradation tests were largely in agreement with those obtained in the field trials. However, with tests of the simple open bottle type, misleading indications of low biodegradability were sometimes obtained on products of higher molecular weight. Such products did not appear to acclimatize rapidly to bacteria under the conditions of the open bottle test. There were only minor differences in biodegradability between as LAS derived from paraffins and those derived from cracked olefins. (See also W72-07148 and W72-07149). (Galwardi-Texas)
W72-13703

PROCEEDINGS OF THE LAND SPREADING CONFERENCE AT ORLANDO, FLORIDA ON JULY 15, 1971.
East Central Florida Regional Planning Council, Winter Park.

Available from the National Technical Information Service as PB-204 176, $3.00 in paper copy, $0.95 in microfiche. 1971 P. B. Rhoads and C. W. Sheffield, editors, 137 p.

Descriptors: *Conferences, *Tertiary treatment, *Municipal wastes, Education, Research and development, Infiltration, Percolation, Permeability, Filtration, Soil texture, Forage grasses, Grains (Crops), Nutrient requirements, *Waste water treatment, *Florida, *Waste disposal.
Identifiers: *Effluent land spreading.

The primary factors in land disposal of secondary municipal effluent include: (a) soil characteristics; (b) cover crop characteristics; (c) depth of the water table; and (d) soil-water-plant relationships. At present, 1300 installations in the United States are practicing land spreading of treated municipal effluent, of which one-third rely principally on filtration, and the other two-thirds utilize both filtration, and percolation. Effluent or drainage from land spreading operations has been used for industrial or agricultural pruposes, groundwater recharge, and other uses. Although permanent design criteria have not been established, this fact has been due mainly to the need for individual evaluation and testing of each individual installation occasioned by the wide variation in environmental conditions from one location to another. However, results of investigations presented have indicated careful, planned management of natural purification processes to be a viable and economical alternative to in-plant tertiary treatment. (See W72-13705 thru W72-13712). (Lowry-Texas)
W72-13704

BASIC PRINCIPLES OF ADVANCED WASTE TREATMENT,
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Sciences.
W. M. McLellon.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 2/1-2/8, 8 ref.

Descriptors: *Tertiary treatment, *Water reuse, *Water purification, *Suspended solids, Adsorption, Separation techniques, Biochemical oxygen demand, Nutrients, Stream assimilative capacity, Disinfection, Chlorination, Bacteria, Viruses, Recreation, *Waste water treatment.

Public interest concerning the degradation of the nation's waterways has stimulated much interest and investigation in the water cycle. Realization that the water resource is no longer infinite with respect to waste inputs has initiated first a demand for primary, then secondary, and now tertiary treatment stages for municipal wastes. Interest is also focusing on re-use of wastewater for both non-potable and potable uses. Tertiary treatment systems fall into the categories of physical, chemical or biological, as do secondary treatment systems. The main objectives in tertiary treatment have been enhanced BOD and SS removals, nitrogen and phosphorus removals, and bacteria and viral removals. Recent interest has been manifested in the use of natural processes for tertiary treatment, in the form of polishing ponds. However, natural processes must be rididly controlled and uncertainties arise concerning the relation of hydraulic and organic loadings, as well as cover crop type or organism type in nutrient

removal. The transmission and fate of viruses are also important factors which will require considerable research effort to determine. (See also W72-13704). (Lowry-Texas)
W72-13705

SOIL SUITABILITY FOR SPRAY IRRIGATION,
Soil Conservation Service, Cocoa,Beach, Fla.
H. F. Huckle.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971. p 3/1-3/11, 4 fig, 5 ref.

Descriptors: *Sprinkler irrigation, *Waste water treatment, *Soils, Sands, Silts, Clays, Porosity, Soil texture, Soil-water-plant relationships, Rooting zone, Wilting point, Vegetation effects, Infiltration, Permeability, Percolation, Seepage, Water table, Temperature, Florida.
Identifiers: *Available water capacity.

Factors determining the suitability of a particular soil for spray irrigation treatment of wastes include the infiltration rate of the soil, permeability of the soil profile, available water capacity of the soil, slope, and drainage or depth of the water table. Infiltration rate, permeability, and available water capacity are largely a function of the soil texture. As silt and clay content in a soil increases, pores become blocked, causing decreased permeability and infiltration rates, but increased available water capacity. In system design, frequency of application of the irrigation water is a function of the vegetative cover or crop, depth of the rooting zone, and available water capacity of the root zone. Several examples comparing sands and loams with varying levels of silt and clay as to their spray irrigation applicability are presented. (See also W72-13704). (Lowry-Texas)
W72-13706

PLANTS AND WASTEWATER RENOVATION,
Florida Univ., Gainesville. Dept. of Soil Science.
C. Hortenstine.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971. p 5/1-5/6, 14 ref.

Descriptors: *Sprinkler irrigation, *Waste assimilative capacity, *Vegetation effects, *Rates of application, Nutrients, Phosphorus, Nitrogen, Infiltration, Percolation, Eutrophication, Research and development, Municipal wastes, Tertiary treatment, *Waste water treatment, Suspended solids.

1300 WASTEWATER TREATMENT SYSTEMS USING WASTEWATER APPLICATIONS TO CROPLANDS ARE CURRENTLY OPERATING IN THE United States. Cover crops which are being irrigated include sorghum, wheat, barley, cotton, oats, citrus, corn, soybeans, and pasture grasses. The main objectives of spray irrigation tertiary treatment include: (a) removal of organic particles and plant nutrients from the return water; (b) provision of water for plant growth; and (c) provision of nutrients for plant growth. In applying 2 inches of wastewater per week on a silty clay loam, Pennsylvania State University researchers reported deposition of 700 lbs of nitrogen, 372 lbs of phosphorus, and 942 lbs of potassium on the soil annually. Numerous other studies are discussed, with varying loading rates on the soil, but each investigation further demonstrated that a spray irrigation system, with periodical harvesting of the cover crop, can be operated indefinitely under proper management. (See also W72-13704). Lowry-Texas)
W72-13707

ENGINEERING DESIGN CRITERIA FOR SPRAY IRRIGATION,
Bishop (William), Talahassee, Fla.
M. Bishop.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971. p 7/1-7/7.

Descriptors: *Sprinkler irrigation, *Design criteria, *On-site investigations, Research and development, Municipal wastes, Vegetation effects, Infiltration, Percolation, Eutrophication, *Waste water treatment.

The first spray irrigation wastewater treatment installation for tertiary treatment of secondary municipal effluent in Florida was designed in 1964. The soil consisted of fine to medium grain quartz sand to a depth of at least 22 ft., and the water table was below 22 ft. Cover on the site was black jack oak and pine trees. Design loading of 125,000 gallons/acre/day was based on the recommended loading on a relatively slow sand filter. Two 8 acre fields were provided, so that they might be alternated at 24 hrs dosage and 24 hrs resting. A holding pond was also included with 2 1/2 days detention time, for use as a holding pond or polishing pond in the event of a malfunction. Because of the variability in local conditions, there are no standard design procedures to follow, but each individual installation must be designed specifically for each application. (See also W72-13704). (Lowry-Texas)
W72-13709

ACTUAL SPRAY FIELD OPERATIONS,
T. P. Smith.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 8/1-8/4.

Descriptors: *Sprinkler irrigation, *On-site investigations, *Cost analysis, Operation and maintenance, Infiltration, Percolation, Vegetation effects, Nutrients, Municipal wastes, Nozzles, Water quality control, *Waste water treatment.

The Tallahassee spray irrigation fields, for the treatment of secondary municipal effluent, became operative in 1966 with an initial flow of 0.25 mgd. Because of seepage through the bottom of a holding pond, no effluent was available for irrigation until the pond was by-passed. Loading rates were then set at 300,000 gallons/acre/day. At high loading rates, orthophosphate concentration dropped from 25 ppm at the surface to 0.04 ppm at a depth of 24 inches, while conversion of ammonia nitrogen to nitrate was essentially complete at the same depth. Experiments with undisturbed forest and plowed ground demonstrated the tendency of the plowed ground to pond very easily. Costs of irrigation at 1 mgd flow averaged $25.00/mg of which $15.00 went for electric power and $10.00 for pump, sprinkler system, and field maintenance. (See also W72-13704) (Lowry-Texas)
W72-13710

WASTEWATER RENOVATION AT TALLAHASSEE - EXPERIMENTAL STUDIES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 9/1-9/8. 3 fig, 1 tab.

Descriptors: *Sprinkler irrigation, *Soil texture, *Water table, Root zone, Absorption, Municipal wastes, Percolation, Infiltration, Permeability, Nutrients, On-site investigations, Forage grasses, Cattle, Nutrient requirements, Tertiary treatment, *Waste water treatment, *Florida.
Identifiers: *Tallassee (Fla).

Factors controlling the successfulness of land spreading of secondary municipal effluent include crop variety, depth to water table, and soil type. Crop variety determines the maximum capacity of the cover crop to absorb nutrients. Soil type has effect through permeability and capacity to hold water and nutrients. Water table depth influences the rooting zone of the plants and the buffer capacity of the soil for heavy rainfall. Field studies at the Tallahassee plant are now being directed towards development of management information for several crops, including sorghum-sudan, kenaf, and Argentine bahiagrass. Application rates of 1,2,4, and 8 inches per week of secondary effluent are being used. Intense harvesting has been necessary to keep up with crop production, and the crops have been proven to be excellent cattle feed. Other experiments, including some with infiltration basins are currently in progress. However, the basic concept of the utilization of natural processes for tertiary treatment is well established. (See also W72-13704) (Lowry-Texas)
W72-13711

SOME ASPECTS OF EFFLUENT LAND-SPREADING,
Dawkins and Associates, Inc., Orlando, Fla.
M. E. Dawkins.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 10/1-10/11.

Descriptors: *Waste water treatment, *Infiltration, *Percolation, Irrigation, Filtration, Permeability, Nutrients, Forage grasses, Growth rates, Design criteria, Tertiary treatment.
Identifiers: *Effluent landspreading, *Inundation, Flow distribution.

Although there are as yet few definitive parameters for land spreading of municipal secondary effluent, many investigations into the process are continuing. However, the instances reported here are mainly land inundation or grass filtration techniques rather than sprinkler irrigation. An experimental, one acre plot at Lakeland, Florida has been in operation for approximately 2 months with promising results. The plot has a slope of one foo in 200 feet, sloping down from a 200 foot distribution header, piped to allow flow measurement and control, as well as shutting of the entire flow to either side at will. Soil is a mixture of sand and clay, consisting of overburden from a phosphate mining operation, with a very low percolation rate. Hermarthia Altissima, known as African grass was sprigged on one foot centers and started with the effluent. This particular grass is known to adapt well to wet soil conditions, grow rapidly and contain sufficient nutrients to make excellen cattle feed. The grass grew well to 2 feet in height was mowed, and resumed growth at 1 inch/day These and other field studies have led to widespread interest in land spreading, and design are proceeding even as information as to design parameters are still being sought. (See also W72-13704) (Lowry-Texas)
W72-13712

REMOVAL OF IMPURITIES FROM TRICKLING FILTER EFFLUENTS BY COAGULATION,
Clemson Univ., S.C. Water Resources Researc Inst.
T. M. Keinath.
Available from the National Technical Informa tion Service as PB-212 006, $3.00 in paper copy $0.95 in microfiche. South Carolina Wate Resources Research Institute, Clemson Report N 31, July 1972. 70 p, 27 fig, 1 tab, 33 ref. OWRR A 012-SC (6).

Descriptors: *Waste water treatment, *Coagula tion, Chemical precipitation, *Trickling filter Treatment facilities, Design, Iron compound Aluminum, Chemical oxygen demand, *Colloid Pilot plants, Estimated costs.
Identifiers: *Iron coagulant, *Aluminum coag lant.

The results of this investigation lucidly demo strated that chemical coagulation with salts of F (III) and Al (III) can complement and can substa

tially enhance the treatment efficiencies of existing wastewater treatment facilities. Effective removals of the hydrophilic organic colloids present in trickling filter effluents were achieved with the Fe (III) coagulant when the pH was adjusted to levels nominally below 6.45 (pHc). Complete restabilization was noted for pH values less than 4.00 (pHs). Similarly, the range of zeta potential over which destabilization occurred was broad and extended from -15 to +10 millivolts, which corresponded closely with the pHc and pHs, respectively. Both laboratory and pilot-plant scale studies showed that consistent removals of COD of 70 to 90 percent could be obtained, despite variations in waste strength and composition. Bacterial cells were destabilized and removed from solution concurrent with coagulation of other colloidal matter. Approximately 89 percent of the viable bacteria initially present were removed at the optimum coagulant dose in the pilot studies. The continuous-flow studies showed removals of total nitrogen and total phosphate of 16 and 85 percent, respectively. Projected chemical costs for this process were estimated at 3 cents per 1000 gallons.
W72-13826

FLOW STABILIZING THROUGH LAMINAR SEPARATION APPARATUS,
Rederi A.B. Nordstjernan, Nynashamm (Sweden) (Assignee).
G. Olgard.
U.S. Patent No 3,552,554, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 171, January 5, 1971.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Sedimentation, Equipment, *Flotation, *Sewage treatment, *Pollution abatement, Separation techniques, Water pollution, Water pollution treatment.

The invention provides for the continuous separation of material suspended in a liquid, either by sedimentation or flotation. The sewage or industrial waste passes down through a series of parallel inclined units formed of parallel spaced inclined plates on which sediment deposits and then slides down as a layer with a layer of clarified liquid above it. Pockets set at the underside receive the clarified liquid which is drawn off by discharge pipes. (Sinha-OEIS)
W72-13877

LIQUID TREATING APPARATUS,
Wastech, Inc., Houston, Tex.
A. W. Busch.
U. S. Patent No 3,552,570, 4 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 175, January 5, 1971.

Descriptors: *Patents, *Liquid wastes, *Biological treatment, *Waste water treatment, Water pollution, Microorganisms, Water pollution treatment, *Aeration, Pollution abatement, Equipment, Separation techniques.
Identifiers: Biochemical treatment.

In this equipment there is a large mixing and reaction chamber. The chamber is able to float by reason of the aeration of the liquid in the chamber. There is a clarification and sedimentation section outside the chamber. Rotating arms are provided to create a secondary internal recirculation from the sedimentation section into the mixing chamber for controlling the rate of reaction in the chamber. When the reaction is biological oxidation and excess of micro-organisms is produced and removed under controlled conditions. (Sinha-OEIS)
W72-13878

ACCELERATION UNITS,
Future Products Development Corp., McLean, Va. (Assignee).
B. Ray.
U. S. Patent No 3,552,725, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 213, January 5, 1971.

Descriptors: *Patents, *Aeration, *Evaporation, *Oxidation, *Sewage treatment, Waste treatment, *Waste water treatment, Water pollution, Water pollution treatment, Pollution abatement, Separation techniques, Equipment.

The device for accelerating evaporation and oxidation in a sewage system consists of a frame containing a cylindrical housing, a motor driven fan and a floatable hood attached to the lower end of the housing. The hood maintains the distance between the water level and an air deflector flange at a constant height. A 10-12 inch air inlet extends around the periphery of the hood. A wind velocity of more than 5 miles per hour is simulated allowing evaporation rates of specified gallons per hour. Air is drawn by suction across the surface of the pond and the flange directs the suction so that horizontal motion of air is achieved. (Sinha-OEIS)
W72-13880

RADIATION TREATMENT OF MATERIALS,
A. I. Mytelka, and R. M. Manganelli.
U. S. Patent No 3,553,089, 5 p, 10 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 294, January 5, 1971.

Descriptors: *Patents, *Liquid wastes, *Dyes, Ionization, *Oxygen, *Gamma radiation, Chlorides, *Biodegradation, Organic wastes, Hydrogen ion concentration, *Waste water treatment.
Identifiers: Ferrous sulfate.

Liquid wastes discolored by azo dyestuff material and carrying organic compounds are treated with a water-suluble salt of a multivalent metal such as ferrous sulfate to adjust the pH to range from about 9 to 12. The effluent is then subjected to gamma radiation in the presence of oxygen. A chloride ion should be added to the effluent during treatment. (Sinha-OEIS)
W72-13883

EXTRACTING OIL WASTE,
N. H. Wolfe.
U. S. Patent No 3,554,906, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 772, January 12, 1971.

Descriptors: *Patents, *Oil pollution, *Oil wastes, Pollution abatement, Water pollution control, *Industrial wastes, *Waste water treatment, Water pollution treatment.
Identifiers: *Refinery wastes, Oil refinery wastes.

The waste water is passed through a packing medium consisting of sand and gravel and then through a solvent which is insoluble in water. The solvent to be used may be acetylene tetrabromide, acetylene tetrachloride and xylene. After passing through the solvent the waste water is then passed through a semiporous mass which is permeable to water but not to the solvent and oil. The water is ready to be discharged without causing pollution of the body into which it is admitted. (Sinha-OEIS)
W72-13888

FLUID SEPARATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
For primary bibliographic entry see Field 05G.
W72-13890

SEWAGE TREATMENT APPARATUS AND METHOD,
Allis Chalmers Mfg. Co., Milwaukee, Wis. (assignee).
F. M. Welch.
U. S. Patent No 3,557,954, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1490, January 26, 1971.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, *Biological treatment, *Dissolved oxygen, *Waste water treatment, Water pollution treatment, Equipment.

Provides a biological treatment tank having a rotating biological contactor. The mixed liquor is lead into a clarifier or settling tank where effluent and sludge are separated. Both are recycled in series with a reactivating device. The reactivating device may comprise a rotatable two-phase contactor or other suitable means for aeration. The dissolved oxygen content is measured as control on the speed of rotation of the two-phase contactor. (Sinha-OEIS)
W72-13893

CONTROL SYSTEM FOR WASTE WATER TREATMENT PLANTS,
Keene Corp., New York (assignee).
T. A. Rose.
U. S. Patent No 3,558,255, 8 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1563, January 26, 1971.

Descriptors: *Patents, *Waste water treatment, *Treatment facilities, *Control system, Pollution abatement, Water pollution, Water pollution treatment, *Activated sludge, *Aeration, Suspended solids.

In this system a device in one tank detects and measures the concentration of suspended solids and provides an output signal representative of the amount of solids. System components respond to the signals and selectively control operation of a pump and valve in a line interconnecting two of the tanks for returning activated sludge at required flow rates, from one tank to another to aid in the sewage decomposition process, and/or pumping the activated sludge to waste. The control components also control the delivery of air to the tank being treated. (Sinha-OEIS)
W72-13895

TREATMENT OF WASTE LIQUORS FROM PULP AND PAPER MILLS,
Texaco Inc., New York (assignee).
H. V. Hess, and E. L. Cole.
U. S. Patent No 3,558,426, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1595, January 26, 1971.

Descriptors: *Patents, *Industrial wastes, *Pulp wastes, Liquid wastes, Pulp and paper industry, *Waste water treatment, Water pollution, Pollution abatement, Treatment, Equipment, Water pollution treatment, *Wood wastes, Chemical oxygen demand.
Identifiers: *Paper mill wastes, *Wood pulping wastes.

Waste cooking liquor from a pulping process is treated with a hot hydrocarbon liquid to effect rapid coking of water-soluble organic material contained in the waste liquor and drastic reduction in its COD. Five experimental examples are given. (Sinha-OEIS)
W72-13896

CHEMICAL TREATING PROCESS FOR SEWAGE SYSTEMS,
P. T. Dodgson.
U. S. Patent No 3,558,483, 3 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1607, January 26, 1971.

Descriptors: *Patents, *Sewage treatment, *Domestic wastes, *Soil contamination, *Emulsifiers, Sulfonates, *Waste water treatment,

Water pollution, Pollution abatement, Separation techniques, Water pollution treatment.
Identifiers: *Chemical treatment, Chlorinated benzene, Sulfonate ethoxylate.

Provides a process for treating the earthen walls of passageways which are employed for dispersing digested sewage into the soil. The sewage disposal system consists of a sewage digestion tank and a cesspool connected to the top of the tank for dispersing the digested sewage for absorption into the soil. Chlorinated benzene is emoulsified with sulfonate ethoxylate to reduce the specific gravity of the benzene. The emulsion is added to the contents of the sewage digestion tank and floated out into the cesspool for dispersing the digested sewage. (Sinha-OEIS)
W72-13899

SEWAGE TREATING APPARATUS AND METHOD,
B. B. Reilly.
U. S. Patent No 3,559,807, 4 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 883, No 1, p 166-167, February 2, 1971.

Descriptors: *Patents, *Sewage treatment, Sewage sludge, Waste treatment, Pollution abatement, Separation techniques, *Filtration, *Waste water treatment, Treatment, Equipment.

An aqueous sewage sludge slurry is continuously filtered through a filter unit carried by a travelling foraminous conveyor. The filter, with its deposit, is carried through a heated gaseous downdraft. The dried sludge and the filter unit are removed from the conveyor and disposed of, preferably by passage into a furnace. (Sinha-OEIS)
W72-13900

METHOD AND APPARATUS FOR USE IN THE ACTIVATED SLUDGE TREATMENT OF SEWAGE,
Metropolitan Sanitary District of Greater Chicago, Ill. (assignee).
R. W. Heil.
U. S. Patent No 3,560,376, 4 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 883, No 1, p 296, February 2, 1971.

Descriptors: *Patents, *Sewage treatment, Activated sludge, Pollution abatement, *Waste water treatment, Equipment, Treatment, *Microorganisms, *Dissolved oxygen, *Aeration.

This system utilizes a pressure aeration tank for treating a continuous flow of sewage influent. The tank is held at pressures up to 60 psi and aeration is continuous. In the aeration tank there is an intermixing with return-activated sludge (living microorganisms). The microorganisms feed upon the sewage nutrients consuming them by adsorption and absorption. The mixed liquor then passes into a clarifier held at the same pressure as the treatment tank. The flocculate is skimmed off and returned to the sludge line. The clarified effluent liquid is ready for designated discharge. (Sinha-OEIS)
W72-13901

METHOD AND APPARATUS FOR TREATING WATER,
Passavant Werke (Germany) (assignee).
J. Muskat.
U. S. Patent No 3,560,379, 4 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 883, No 1, p 297, February 2, 1971.

Descriptors: *Patents, *Water treatment, *Pollution abatement, *Waste water treatment, Water pollution, Equipment, Treatment, Separation techniques, Water pollution treatment, *Aeration.

A narrow elongated aeration tank receives the liquid to be treated. An aeration device is mounted on the bridge and is moved longitudinally as it introduces air into the tank. Lack of motion in one part of the tank allows flocculation to take place. A sludge scraper attached to the bridge moves along with it to scrape the flocculent sludge from the bottom of the tank. (Sinha-OEIS)
W72-13902

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 05G.
W72-13931

REQUIREMENTS FOR APPROVAL OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
For primary bibliographic entry see Field 05G.
W72-13943

AWARD OF P.L. 660 GRANT FOR CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES AND OUTFALL SEWERS--PROJECT NO. WPC-TEX-722 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Air and Water Programs Div.

Available from the National Technical Information Service as PB-205 921-D, $3.00 in paper copy. January 21, 1972. 65 p, 5 map, 10 tab, 1 append.

Descriptors: *Texas, *Waste water treatment, *Sewage treatment, *Grants, Sanitary engineering, Sewage effluents, Financing, Water quality control, Stream improvement, Administrative agencies, Water pollution sources, Water pollution control, Interceptor sewers, Sewers, Non-structural alternatives.
Identifiers: *Pittsburg (Tex), *Environmental impact statement.

The proposed action consists of offering grant assistance to the city of Pittsburg, Texas, for the following projects: (1) additions to the existing Sparks Branch wastewater treatment plant, (2) construction of a new wastewater treatment plant on Dry Creek, and (3) construction of interceptor sewers to the proposed Dry Creek wastewater treatment plant. The principal environmental effect of the proposed action will be the immediate improvement in the quality of the Sparks Branch Plant effluent and a reduction in the volume of raw wastes reaching Dry Creek. Unavoidable adverse impacts include land-use restrictions and destruction of certain beneficial organisms from chlorination. The alternatives considered include: construction of a single new treatment plant, construction of a temporary plant on Dry Creek with minimum improvements to the Sparks Branch Plant, and make necessary improvements to Sparks Branch to satisfy the requirements of the Texas Water Quality Board and construct a 2000 PE plant on a site 3/4 miles downstream from the proposed Dry Creek site. The improvements at Sparks Branch will provide immediate improvements to water quality for downstream uses. (Waldron-Florida)
W72-13949

BIOLOGICAL DENITRIFICATION USING FLUIDIZED GRANULAR BEDS,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
J. S. Jeris, J. A. Mueller, and C. Beer.
Technical Paper Number 11, June 1972. 46 p, 18 fig, 11 tab, 19 ref.

Descriptors: *Sewage treatment, *Denitrification, *Tertiary treatment, *Nutrient removal, *Nitrogen, Nitrates, New York, Municipal wastes, Filter stones, Water pollution control, Activated carbon, Laboratory tests, Waste water treatment.
Identifiers: *Fluidized granular beds, *Biological denitrification.

The concern for controlling water pollution through the removal of nitrogen has included the use of biological techniques. In experiments, 12-foot-long plastic tubes, 3 inches in inside diameter, were filled with activated carbon and granulated sand (effective sizes 0.65 mm and 1.0 mm, respectively) to a height of 9 feet. The influent was pumped in through the bottom of the tubes, fluidizing the beds. The growth of biological organisms was accomplished by seeding. The completed reactor beds removed up to 95 percent of the nitrogen. Flow rates were varied from 8.0 gpm per square foot to 23.5 gpm per square foot, with corresponding detention times varying from 10.5 minutes to 3.5 minutes. Nitrogen removal rates were found to be independent of flow rates, but they were dependent on temperature and the settled height of the column. The major difficulty encountered was the eventual removal of excessive biological growths. Various methods were tried, although none proved successful. It is reported that backwashing with air might be a practical method. The experiments were performed with laboratory test samples. (Poertner)
W72-14047

THE NORTHERN MAINE REGIONAL TREATMENT SYSTEM, AROOSTOOK RIVER--PRESTILE STREAM, A PLAN FOR CLEAN WATER, SUMMARY REPORT.
Northern Maine Regional Planning Commission, Presque Isle.

April 26, 1972. 24 p, 8 fig, 2 tab.

Descriptors: *Maine, *Waste water treatment, *Planning, *Water quality, Municipal wastes, Industrial wastes, Water pollution, Regional analysis, Regional development, Stream pollution, Water pollution control.
Identifiers: *Joint waste water treatment, Regional waste water treatment.

Recognizing the serious pollution problems of the Aroostook River and the Prestile Stream, the Northern Maine Regional Planning Commission undertook this study to develop a regional plan for the area. After identifying the pollution sources as municipal, industrial (primarily food processors, of which the potato is the major crop), and point sources (such as urban and agricultural runnoff), alternate solutions were recommended. It is recommended that industrial and municipal wastes by treated jointly with user charges based on the relative usage of the treatment system. Implementation of the recommendations would result in the completion of treatment plants by 1973 and 1976. (Poertner)
W72-14049

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 05A.
W72-14051

5E. Ultimate Disposal of Wastes

GEOLOGICAL CONSIDERATIONS OF SANITARY LANDFILL SITE EVALUATIONS,
Geological Survey, Morgantown, W. Va.
For primary bibliographic entry see Field 05B.
W72-13719

EXPERIMENTAL INJECTION OF TERTIARY--TREATED SEWAGE IN A DEEP WELL AT BAY PARK, LONG ISLAND, N. Y.--A SUMMARY OF EARLY RESULTS,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 05B.
W72-13839

THE EVALUATION OF PUBLIC RADIATION EXPOSURE FROM THE CONTROLLED MARINE DISPOSAL OF RADIOACTIVE WASTE (WITH SPECIAL REFERENCE TO THE UNITED KINGDOM),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W72-13977

EXPLORATORY STUDY OF BRINE DISPOSAL USING FLUID-BED EVAPORATION,
Allied Chemical Corp., Idaho Falls, Idaho.
P. E. Lamont.
For sale by Supt. of Documents, U. S. Government Printing Office, Washington, D. C. 20402 for $1.00. Office of Saline Water Research and Development Progress Report No. 743, November 1971. 88 p, 12 fig, 12 tab, 10 ref, 4 append. Agreement No. 14-30-2729.

Descriptors: *Brine disposal, *Brines, *Waste disposal, Desalination, *Evaporation, Evaporators, Solid wastes, Salts, Desalination apparatus.
Identifiers: *Fluid-bed evaporators, Inland plants.

To facilitate brine disposal at inland sites, as well as to protect the environment, it may be necessary to convert the waste brine to solid salts. A new process using fluid-bed evaporation to obtain solid salts is presented. This process differs from ordinary fluid-bed evaporators in that the salt particles are fluidized by superheated steam. The steam is condensed to furnish additional product water. Experimental data from a four inch fluid-bed evaporator is discussed. Cost estimates are given for a 2.5 million gpd vertical tube evaporator or reverse osmosis plant combined with a fluid-bed evaporator. (OSW abstract)
W72-14063

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14064

DISPOSAL OF BRINE BY SOLAR EVAPORATION,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 02D.
W72-14077

A STUDY OF THE DISPOSAL OF THE EFFLUENT FROM A LARGE DESALINATION PLANT,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 05B.
W72-14086

5F. Water Treatment and Quality Alteration

VIRUS AND WATER QUALITY: OCCURRENCE AND CONTROL.

Available from Engineering Publications Office, 112 Engineering Hall, University of Illinois, Urbana 61801, Price: $4.50. Proceedings, Thirteenth Water Quality Conference conducted by University of Illinois and Illinois Environmental Protection Agency Feb 15-16, 1971, Urbana, Illinois (1971). 222 p.

Descriptors: *Water treatment, *Water quality, *Public health, *Diseases, *Viruses, *Coliforms, *Enteric bacteria, *Disinfection, Sanitary engineering.

Thirteen scientific papers pertinent to viruses and water supplies were presented. Topics included water transmission of viruses, detection of viruses in water, concentration of viruses, enteric viruses in ground and surface waters, and virus-sized particle adsorption on soil. Other topics were the coliform test: a criterion for the viral safety of water, removal of virus, the survival of poliovirus in algal-bacterial wastewater treatment plants, effects of some treatment methods, relative resistance of twenty human enteric viruses to free chlorine in the Potamac waters, and the enhancement of viral inactivation by halogen. The speakers agreed that there is insufficient technical data to conclude that virus-free water can be attained with present wastewater and water treatment processes and practices. (See W72-13611 thru W72-13616) (Bean-AWWARF)
W72-13610

ENTERIC VIRUSES IN GROUND AND SURFACE WATERS: A REVIEW OF THEIR OCCURRENCE AND SURVIVAL,
Gulf Coast Water Hygiene Lab., Dauphin Island, Ala.
E. W. Akin, W. H. Benton, and W. F. Hill, Jr.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 59-74. 3 fig, 3 tab, 51 ref.

Descriptors: *Water quality, Sanitary engineering, *Public health, *Viruses, *Epidemics, *Groundwater, *Surface waters.

Enteric viruses have been isolated from an average of 36 percent of samples of surface waters collected throughout the world. These viruses are held in the feces of infected man and animals and may enter water systems by way of soil runoff and treated and untreated sewage. The increased frequency of water reuse for domestic purposes has increased the probability of human contact with contaminated surface waters. Viruses tend to adsorb on soil particles and be removed before they reach groundwater, or soon thereafter. However, epidemiological studies have implicated both contaminated surface water and groundwater as the transmission routes in a limited number of infectious hepatitis outbreaks. No widespread waterborne epidemic of viral disease other than infectious hepatitis has been substantiated. The amount of endemic disease caused by contact with virus-contaminated surface waters is unknown. Enteric viruses survive in water for a significant length of time; water should be considered as a potential route of viral disease transmission. Two to 100 days are required for various members of the enteric virus family to lose 99.9 percent of their initial infectivity in different surface waters at 20C to 25C. (See also W72-13610) (Bean-AWWARF)
W72-13611

THE COLIFORM TEST: A CRITERION FOR THE VIRAL SAFETY OF WATER,
Bureau of Water Hygiene, Cincinnati, Ohio.
E. E. Geldreich, and N. A. Clarke.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 103-113. 1 fig, 23 ref.

Descriptors: *Water quality, Sanitary engineering, *Public health, *Coliforms, *Viruses, *Standards, *Water treatment.

Much data exist which permit the conclusion that the absence of total coliforms in a treated water is evidence of a bacteriologically safe supply. Insofar as bacterial pathogens are concerned, the coliform group is considered a reliable indicator of the adequacy of treatment. Whether these considerations can be extended to include rickettsial and viral organisms has not been determined. The observation that certain enteric viruses are more resistant to chlorine than are the indicator bacteria has raised questions as to whether drinking water that meets the USPHS drinking water standard is free from disease-producing levels of virus. Also, the susceptibility of enteric viruses to chlorine is unpredictable. Additional studies on the methods of detecting virus in water are needed as well as definitive studies on the coliform level in large volumes of treated water which are coliform free by conventional tests. Epidemiological studies are also needed. Only when these and other investigations are completed will it be possible to state with positive assurance that the coliform test is a reliable test in indicating the biological safety of water. (See also W72-13610) (Bean-AWWARF)
W72-13612

REMOVAL OF VIRUSES FROM WATER AND WASTEWATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
G. Berg.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 126-136. 4 fig, 5 tab, 24 ref.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Public health, Coliforms, Viruses, *Waste water treatment.

No single method or combination of methods completely recovers all viruses from sewage. Primary settling, which constitutes the whole sewage treatment for most communities, removes little of the viruses from sewage. Several biological treatment methods such as activated sludge, stabilization ponds, and trickling filters may be used for virus removal but with widely varying results. The most efficient and consistently effective of these is activated sludge treatment. Where land is available stabilization ponds often serve secondary treatment needs. Viruses are subjected here not only to the effects of adsorption and the chemical insults that are a part of other treatment processes but also to the destructive effects of sunlight and time. Virus removal is highly variable. Trickling filters pass from 22 to 100 percent of the viruses. As quality of water becomes more important, the costs will become relatively less important, and chemical and physical methods will find increasing application in the treatment of secondary effluents, particularly when total renovation is the goal. Coagulation with alum or ferric chloride removes high percentages of bacteriophages; also coagulation with lime can do the same; activated carbon is less efficient and needs more study. Some cationic polyelectrolytes removed over 99 percent of the viruses, though when used with the usual coagulants they did not increase the percentage of removal. (See also W72-13610) (Bean-AWWARF)
W72-13613

VIRUSES IN WATER AND WASTEWATER: EFFECTS OF SOME TREATMENT METHODS,
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. O. Cliver.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 149-159. 3 fig, 3 tab, 12 ref.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Public health, *Viruses, Activated carbon, Polyelectrolytes.

Enteroviruses, some of which had been labeled with radioactive phosphorus were added to samples of water and wastewater. A polycation prima-

ry coagulant did not remove significant quantities of virus from these samples. Virus was removed by activated carbon treatment, but a good deal was still present in the effluents from the carbon columns. The use of radioactive tracer proved quite helpful in some of these experiments. It might well be very valuable in future studies of methods for removal of viruses as physical particles. (See also W72-13610) (Bean-AWWARF)
W72-13614

RECENT RESEARCH RESULTS ON VIRUS INACTIVATION BY WATER TREATMENT PROCESSES,
Maine Univ., Orono.
O. J. Sproul.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 159-169. 5 tab, 24 ref.

Descriptors: *Water treatment, *Public health, Sanitary engineering, *Viruses, Adsorption, Coagulation, Chlorination, Diatomaceous earth, Filtration, Ozonation, Hydrogen ion concentration.

Research data collected within the past five years on virus inactivation by water treatment processes are reviewed. The processes examined are water softening and alkaline pH conditions, coagulation, filtration, and adsorption. Research efforts presently under way are examined to indicate what research results will be forthcoming within the next several years. Present known worldwide research in virus inactivation by water treatment is listed on these processes (some projects cover more than one process): Adsorption (2), Coagulation (3), Chlorination (2), Diatomaceous earth (1), Filtration (2), Ozonation (2), and pH (1). Nine projects are in the U.S., one each is in England, France, Israel, and South Africa. (See also W72-13610) (Bean-AWWARF)
W72-13615

RELATIVE RESISTANCE OF TWENTY HUMAN ENTERIC VIRUSES TO FREE CHLORINE IN POTOMAC WATER,
Northeastern Water Hygiene Lab., Narragansett, R.I.
O. C. Liu, H. R. Seraichekas, E. W. Akin, D. A. Brashear, and E. L. Katz.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 171-195. 4 fig, 24 tab, 19 ref.

Descriptors: *Water quality, *Water treatment, Sanitary engineering, *Public health, *Viruses, Coliforms, Chlorination.

Twenty strains of human enteric viruses were tested for chlorine resistance when suspended in Potamac estuarine water partially purified by conventional water treatment processes. These included three types of poliovirus, five coxsackieviruses, six echoviruses, three adenoviruses, and three reoviruses. A wide range of resistance was observed among the viruses tested. The least resistant virus was a reovirus requiring 2.7 min for a 99.9 percent devitalization by 0.5 mg/l of free chlorine and the most resistant virus was a poliovirus requiring 40 min for the same percent devitalization. The findings are in general agreement with those reported in the literature. These results indicate that the degree of chlorine resistance in any given virus is unpredictable. Among those tested, several viruses showed an obvious retardation of the initial inactivation rate in the later portion of the inactivation curve. Theoretically, this could be explained by the presence of viral aggregates. Although the number of aggregates in each preparation was very small, 0.1 percent or less, the increase in resistance to chlorine and time for inactivation was considerable. (See also W72-13610) (Bean-AWWARF)
W72-13616

MACRORETICULAR RESINS-A SOLUTION TO AGGRESSIVE CONDITIONS,
For primary bibliographic entry see Field 05D.
W72-13690

EVALUATION OF THE HYPOIODOUS IODINE TABLET - PHASE II,
Naval Medical Field Research Lab., Camp Lejeune, N.C.
N.S. Hurst, and E. L. Gitin.
Avaiable from the National Technical Information Service as AD-741 256, $3.00 in paper copy, $0.95 in microfiche. Naval Medical Field Research Laboratory, Vol 22, No. 9, May 1972. 4 p., 2 tab, 6 ref.

Descriptors: *Disinfection, *Potable water, Solubility, Humidity, Bactericides, *Water treatment.
Identifiers: *Hypoiodous acid tablets, Storage conditions, Disinfecting agent, Amoebicidal potency.

The results of a study on the feasibility of utilizing hypoiodous acid (Hol) tablets as an agent for microbial decontamination of water were presented. Characteristics which were evaluated included: disinfectant capabilities, solubility, and the influence of storage on these parameters. Hol tablets were stored for one year at 4 deg. C, ambient conditions, and 29 deg. C with a relative humidity of 85%. Storage conditions adversely influence the iodine content, coloration, and solubility of the Hol tablet. Fresh tablets or those stored at 4 deg. C maintained high bactericidal and amoebicidal potency. It was recommended that Hol tablets should not be adopted as the standard disinfecting agent for water used by the U. S. Marine Corps. (Galwardi-Texas)
W72-13701

VIRUS INACTIVATION BY WATER TREATMENT,
Maine Univ., Orono. Dept. of Civil Engineering.
O. J. Sproul.
Journal of the American Water Works Association, Vol 64, No 1, p 31-35, January 1972. 5 tab, 24 ref.

Descriptors: *Water treatment, *Data collections, *Water supply, *Viruses, Investigations, Filtration, Water softening, Alkalinity, Coagulation, Absorption, Research and development.
Identifiers: *Virus inactivation, *Research literature, Virus-removal capacity.

Data within the last five years which deal with virus inactivation by water-treatment processes are reviewed. The processes examined are: water softening, alkaline pH conditions, coagulation, filtration, and absorption. This survey of recent research literature demonstrates that nearly all water-treatment processes in present use are under research investigation in order to define their virus-removal capacity. If the virus problem in water supplies is really as severe as recent scientific and popular literature indicates, then the research needs and research efforts in this field are totally uncorrelated. No research effort in the past ten years has been concerned with virus removal by filtration. Over the same period, this process has become the only treatment unit in some plants, performing the roles of flocculation chamber, sedimentation tank and filter. (Strachan-Chicago)
W72-13741

RESPONSIBILITY FOR PLANT OPERATIONS,
Maryland State Dept. of Health and Mental Hygiene, Baltimore.
W. M. Bingley.
Journal of the American Water Works Association, Vol 64, No 3, p 132-135, March 1972. 1 photo, 10 ref.

Descriptors: *Operations, *Planning, *Decision making, *Coordination, *Water supply, Contract administration, Management, *Treatment facilities.
Identifiers: *Water treatment plant operations, *Cooperation, Ownership.

The responsibility for provision of a safe water supply is discussed. Effective treatment is the result of coordinated and cooperative efforts of the persons that control the operations. The levels of responsibility are outlined. (1) The owner guards the raw-water supply, by hiring competent personnel to operate his plant. (2) The consulting engineer plans the treatment facility with strict attention to the economics of the situation. (3) The contractor constructs the plant in accordance with the engineer's plans and specifications. (4) The equipment supplier instructs the operator in the proper manner in which each unit should be used. (5) The operator has primary responsibility, and he provides routine lubrication, maintenance, and conducts laboratory tests. (6) The regulatory agency reviews reports and plans concerning treatment facilities to insure that local regulations are followed. Frequently, these levels of responsibility are not clearly outlined. (Strachan-Chicago)
W72-13742

METHOD AND MEANS FOR DETECTING COLIFORM BACTERIA IN WATER,
Hach Chemical Co., Ames, Iowa. (Assignee)
For primary bibliographic entry see Field 05A.
W72-13881

ION EXCHANGE APPARATUS FOR TREATING LIQUIDS,
Maschinenfabrik Augsburg-Nuernberg A.G., Essen (West Germany).
For primary bibliographic entry see Field 03A.
W72-13885

PROCESS FOR TREATING WATER WITH A POLYHALIDE RESIN USING A SEMIPERMEABLE MEMBRANE BARRIER,
Dow Chemical Co., Midland, Mich. (Assignee).
J. Place, and R. D. Goodenough.
U. S. Patent No 3,554,905, 2 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 772, January 12, 1971.

Descriptors: *Patents, *Water treatment, Resins, *Membranes, *Semipermeable membranes, *Microorganisms, *Anion exchange, *Halogens.
Identifiers: Polyhalide, Polybromide.

A semipermeable membrane is interposed between the liquid and a water-wet polyhalide resin having a higher equilibrium concentration of halogen or interhalogen than the liquid to be treated. The membrane reduces the polyhalide resin instability arising from the influence of water-soluble anions and alkalinity in the water supply. (Sinha-OEIS)
W72-13887

METHOD AND APPARATUS FOR TREATING WATER,
Passavant Werke (Germany) (assignee).
For primary bibliographic entry see Field 05D.
W72-13902

POTABLE WATERS.
For primary bibliographic entry see Field 05G.
W72-13940

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 05A.
W72-14051

THE REMOVAL OF COXSACKIE VIRUS FROM WATER BY SAND OBTAINED FROM THE RAPID SAND FILTERS OF WATER--PLANTS,
I. Nestor, and L. Costin.
J Hyg Epidemiol Microbiol Immunol (Prague). 15 (2): 129-136, 1971, French, German and Spanish summary.
Identifiers: Amberlite, *Coxsackie virus, Saccharomyces-Cerevisiae, *Sand filters, Waterworks, Water treatment, Filtration.

The capacity of fresh filtering sand and of sand used in operating filters in a water plant to remove Coxsackie virus was investigated. Fresh, dry sand has less removal capacity than does moistened sand. The highest virus removal was obtained with sand samples collected from the functioning filters, both experimentally and in field studies. In these samples, 3 virus strains were detected. Two more strains were isolated from filtered and chlorinated H2O. The concentration method of using Saccharomyces cerevisiae give much better results than the Amberlite-IR 45 method.--Copyright 1972, Biological Abstracts, Inc.
W72-14156

HYGIENIC STANDARDIZATION OF PHENOL IN WATER BODIES (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
Y. I. Kostovetskii, and Z. I. Zholdakova.
Gig Sanit, 36 (7): 7-10, 1971, English summary.
Identifiers: Algae, *Chlorination, Hygienic standards, *Phenol, Water treatment, *Water quality standards, Odor.

A differential standardization of phenol in water bodies is suggested. Besides the previously determined hygienic standard of 0.001 mg/l, based on the specific smell imparted by phenol to H2O during its chlorination, phenol at concentrations within 1 mg/l may be considered permissible when drinking water treatment processes do not include chlorination. These standards can also be applied to surface water containing large amounts of algae, as the phenols formed in these waters do not produce a chlorphenol smell.--Copyright 1972, Biological Abstracts, Inc.
W72-14157

5G. Water Quality Control

VIRUS AND WATER QUALITY: OCCURRENCE AND CONTROL.
For primary bibliographic entry see Field 05F.
W72-13610

ENTERIC VIRUSES IN GROUND AND SURFACE WATERS: A REVIEW OF THEIR OCCURRENCE AND SURVIVAL,
Gulf Coast Water Hygiene Lab., Dauphin Island, Ala.
For primary bibliographic entry see Field 05F.
W72-13611

THE COLIFORM TEST: A CRITERION FOR THE VIRAL SAFETY OF WATER,
Bureau of Water Hygiene, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W72-13612

REMOVAL OF VIRUSES FROM WATER AND WASTEWATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
For primary bibliographic entry see Field 05F.
W72-13613

OZONATION REACTIONS OF SELECTED PESTICIDES FOR WATER POLLUTION ABATEMENT,
Washington State Univ., Pullman.
G. R. Brower.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-9384, Microfilm, $3.00, Xerox $9.70. Ph. D. Dissertation, 1967, 211 p.

Descriptors: *Aldrin, *Chemical degradation, *Ozone, *Oxidation, Analytical techniques, Tracers, Radioactivity techniques, Chromatography, Toxicity, Laboratory tests, Laboratory equipment, *Pollution abatement.
Identifiers: Bluegill fingerlings, Carbon-14, Labelling, Physical stripping.

Saturated solutions of the pesticide aldrin were chemically oxidized by ozone. The results of gas chromatographic analyses showed that 95% of the aldrin was degraded to other compounds within five minutes. Aldrin was soluble in the fat solvents n-hexane and benzene. A technique was developed to study the oxidation products of aldrin in water at a concentration in the parts per billion range. Instrumentation and methodology including infrared spectroscopy, thin-layer chromatography, radioactive tracer techniques, purification procedures, volatility studies, column chromatography, wet chemical methods and physiological tests were used to further study the degradation products. A carbon- 14 labelled sample of aldrin showed that no physical stripping occurred through the ozonation procedure. The physiological tests indicated that a staurated solution of aldrin dissolved in a water supply can be rendered less toxic by ozonation. The ozonated products of aldrin oxidation were less toxic than aldrin to bluegill fingerlings. (Galwardi-Texas)
W72-13685

A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-13688

INVESTIGATION OF SINKING METHODS FOR REMOVAL OF OIL POLLUTION FROM WATER SURFACES. PHASE II. METHODS OF TEST FOR LABORATORY EVALUATION OF OIL SINKING MATERIALS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. C. Roshore.
Available from the National Technical Information Service as AD-741 247, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Office of Research and Development, February 1972. 59 p., 22 fig, 1 tab.

Descriptors: *Oil wastes, Oily water, *Pollution abatement, *Laboratory tests, Efficiencies, Performance, *Oil pollution, Water pollution control, Separation techniques, Water treatment (Pollution).
Identifiers: *Oil spills, Oil sinking materials, Talcs, Chalks, Asbestos, Sinking efficiency.

Laboratory tests were developed to evaluate the effectiveness of oil sinking materials under varying conditions. Tests were developed to determine: optimum oil sinking material retention potential, sinking efficiency, dynamic retention capability, and volatile loss-time characteristics of oil retained on glass wool. The tests developed were not applicable to Bunker C fuel oil due to its semisolid state at laboratory conditions. No significant difference was noted in results obtained due to water composition-fresh water or simulated sea water. Tables were presented evaluating the reproducibility of tests. Screening tests indicated that very fine materials such as talcs, and materials such as chalks and asbestos do not act as effective sinking agents without addition of surfactants which were not included. (Galwardi-Texas)
W72-13702

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.
For primary bibliographic entry see Field 06D.
W72-13740

EFFECTS OF LAND USE ON MUNICIPAL WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 04C.
W72-13759

COMPLEXATION OF METAL IONS WITH NATURAL POLYELECTROLYTES (REMOVAL AND RECOVERY OF METAL IONS FROM POLLUTED WATERS),
Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13776

OIL POLLUTION CONTROL AND FIRE EXTINGUISHING APPARATUS AND METHOD,
S. M. Verdin.
U. S. Patent No 3,554,290, 3 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, P 633, January 12, 1971.

Descriptors: *Patents, *Pollution abatement, *Oil pollution, Leakage, Sea water, Water pollution control, Water pollution treatment, Equipment, Treatment, *Oil wells.
Identifiers: Fire, *Oil fires.

This invention provides a special hoodlike structure which can be lowered over a well site. The interior of the hood faces downward and has a concave deflecting surface. The oil is directed into a catch basin in the hood. The collected oil is pumped to a storage structure. (Sinha-OEIS)
W72-13884

EXTRACTING OIL WASTE,
For primary bibliographic entry see Field 05D.
W72-13888

FLUID SEPARATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
F. A. Harrington.
U. S. Patent No. 3,556,297, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 882, No 3, p 1106, January 19, 1971.

Descriptors: *Patents, Separation techniques, Oil wastes, *Oil pollution, Oily water, Pollution abatement, *Liquid wastes, *Waste water treatment, *Industrial wastes, Water pollution control, Water pollution treatment.
Identifiers: *Gas injection.

Immiscible liquids are separated by injecting an insoluble gas beneath the surface of the liquids to create a zone of lower density and causing this zone to move across the surface and to move the superimposed liquid with it toward a point from which the superimposed liquid is removed. (Sinha-OEIS)
W72-13890

FLOATING FLEXIBLE SKIMMING DEVICES,
M. F. Smith.

U. S. Patent No 3,556,301, 5 p, 10 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 3, p 1107, January 19, 1971.

Descriptors: *Patents, Oil pollution, Equipment, Pollution abatement, Separation techniques, *Oil spills, Water pollution control, Water pollution treatment, *Flotsam, *Industrial wastes.
Identifiers: *Oil skimmers.

This skimming device consists of two flexible sheets for an elongate intake portal positioned at or slightly below the surface of the water. Negative pressure is created at the portal by a flexible conduit supported along the surface of the water. The conduit is connected to a diaphragm vacuum pump or other negative pressure source. Oil or other flotsam is drawn between the two flexible sheets through the conduit into a storage vessel. (Sinha-OEIS)
W72-13891

OIL SKIMMING APPARATUS,
Ocean Pollution Control, Inc., Dallas, Tex. (assignee).
H. J. Fitzgerald, and E. H. Koepf.
U. S. Patent No 3,557,960, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1492, January 26, 1971.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, Separation techniques, Pollution abatement, Water pollution control, Water pollution treatment.
Identifiers: *Oil skimmers.

The skimming device consists of a pair of lateral coextensive funnels positioned one behind the other along the same central axis and a harness to connect the funnels to a towing vessel. The funnels have a cover of flexible sheet material impervious and impermeable to oil. Skirts are arranged to trap the oil and channel it inward toward the apex. A sump trailing behind the apex receives the oil and a flexible conduit directs the oil to a storage vessel. (Sinha-OEIS)
W72-13894

OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY,
University of Southern California, Los Angeles.
C. Q. Christal.
Committee on Public Works, United States Senate, Washington, D.C., Serial No 92-1, January 1971. 102 p, 1,055 ref. U.S. D. of C., S.G.P. (GH-89).

Descriptors: *Bibliographies, *Legal review, *Water law, *Water pollution, *Oil pollution, Jurisdiction, Damages.
Identifiers: *International rights, *National rights, *States rights, *Public rights, *Private rights, Territorial waters, High seas, Deep sea bed, Continental shelves.

A wide-ranging legal bibliography touching on the functions of nation-states, international organizations both public and private, and the role of the legal practitioner in relation to oil pollution of the marine environment has been compiled. Legal rights and duties are emphasized, however, enough data on scientific and economic problems has been defined so that matters of jurisdiction, proof of facts, damages, and judgments would be available to counsel engaged in litigation. The bibliography identifies current developments concerning national rights in territorial waters, continental shelves, the high seas, and deep sea-bed and ocean floor areas beyond the limits of national jurisdiction. The many decisions of Federal and State courts were not collected for this bibliography as these may be found in the 'United States Code Annotated' and the 'Environment Reporter.' (Ensign-PAI)
W72-13904

A FRAMEWORK FOR IDENTIFICATION AND CONTROL OF RESOURCE DEGRADATION AND CONFLICT IN THE MULTIPLE USE OF THE COASTAL ZONE,
California Univ., Berkeley. Dept. of Landscape Architecture.
J. C. Sorensen.
Masters Thesis, June 1971. 71 p, 5 fig, 130 ref.

Descriptors: *California, *Coasts, *Resources, *Deterioration, *Resource development, Planning, Future planning (Projected), Water resources planning, Multiple-purpose projects.

Identification and control of conflict among competing uses for coastal resources and the accompanying deterioration of the resource base of the coastal zone are discussed. Development of an impact system framework is described and applications of the framework both as seen and foreseen are outlined. Future tasks for the improvement of the procedure are suggested. (Ensign-PAI)
W72-13906

STUDY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVE LONG ISLAND SOUND BRIDGE SITES,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 06G.
W72-13907

FISH AND WILDLIFE IN THE MARINE AND COASTAL ZONE, PART A, SUMMARY PLANNING INFORMATION, AND RECOMMENDATIONS,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 06G.
W72-13908

SULFURIC ACID: ITS POTENTIAL FOR IMPROVING IRRIGATION WATER QUALITY,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
H. L. Bohn, and R. L. Westerman.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings, Arizona Section-American Water Resources Association, and the Hydrology Section-Arizona Academy of Science, April 22-23, Tempe, Vol 1, p 43-52, 1971. 1 tab, 6 ref. Rockefeller Foundation Grant 70073.

Descriptors: *Alkaline soils, *Air pollution, *Sulfur compounds, *Irrigation water, *Arid lands, Southwest U.S., Colorado River, Groundwater, Economic feasibility, Arizona, Sodium, Bicarbonates, Carbonates, Sulfur, Calcium, Soil chemical properties, Water quality, Ion exchange.
Identifiers: *Sulfuric acid, *Sulfur dioxide.

The 2 major environmental problems of Arizona and the Southwest are the alkalinization of soil and water by irrigation and air pollution from copper smelting. It is proposed that the amelioration of both problems may be solved through a common process. This is the production of sulfuric acid from sulfur dioxide, which is the main pollutant of smelter effluent gases. The conversion process is cheap and easy, and the sulfuric acid could then be added to irrigation waters to increase the solubility of Ca carbonate in the soil, thereby decreasing alkalinity. Lower alkalinity results in increased soil permeability and increased water use efficiency by plants. The potential market for sulfuric acid in irrigation was calculated, on the basis of neutralizing 90% of the bicarbonate ion concentration in Colorado River water and Arizona well water, to be about 1.6 million tons annually, representing about 1/3 of the sulfur now dissipated by smelters as air pollution. This market includes both the Imperial Valley of California and the Mexicali Valley of Mexico, both of which are currently experiencing mounting salinity problems. Salinity itself is not amenable to this treatment, but the cumulative increase in Na and bicarbonate may be slowed and reversed, leading to gradual soil stabilization. (Casey-Arizona)
W72-13920

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
G. Graves.
Copy available from GPO Sup Doc for $1.00; microfiche from NTIS as PB-212 008, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 82 p, 10 fig, 7 tab, 15 ref. EPA Program 16110 EGQ 04/72.

Descriptors: *Water quality control, *Regional analysis, *Optimum development plans, *Water pollution treatment, Computer models, Model studies, Networks, Systems analysis.
Identifiers: *Nonlinear programming.

The objective is to develop a general practical planning tool to provide optimal solutions for the complex choices involved in balancing alternative methods for attaining water quality goals. Extended is the earlier work, 'Mathematical Programming for Regional Water Quality Management.' A mixed integer, continuous variable nonlinear programming model is developed which promises to be much more realistic and effective in selecting an optimal configuration of regional treatment plants and pipe juncture nodes. A new Bender's type decomposition for the non-linear model is also presented as an appropriate and feasible solution technique. In the area of the physical response of the environment the earlier work linked the dissolved oxygen profile and the control options through a constant transfer matrix obtained as a steady state solution to a system of differential equations. This work shows how the transfer coefficients can be recalculated periodically in the course of the system optimization. Full scale computations are carried out demonstrating this capability. The theoretical framework for including two additional treatment methods, mechanical re-aeration and flow augmentation via reservoirs is also developed. (See also W72-01659) (Bell-Cornell)
W72-13931

A MULTILEVEL APPROACH TO DETERMINING OPTIMAL TAXATION FOR THE ABATEMENT OF WATER POLLUTION,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
Y. Y. Haimes, M. A. Kaplan, and M. A. Husar, Jr.
Water Resources Research, Vol 8, No 4, p 851-860, August 1972. 3 fig, 4 tab, 16 ref.

Descriptors: *Water quality control, *Pollution abatement, *Pollution taxes (Charges), *River basins, Optimization, Waste water treatment, Costs, Digital computers, Simulation analysis, Biochemical oxygen demand, Mathematical models, Systems analysis, Dissolved oxygen.
Identifiers: *Regional water quality management, *Miami River basin, Cost functions, Plant capacity, Treatment level, Polluters.

A three-level optimization approach is developed for regional water quality management. The problem of simultaneously finding an optimal waste water treatment configuration for meeting water quality standards along a river basin and determining optimal effluent charges to achieve this configuration is solved by decomposition and the multilevel approach. The optimal regional plant capacity and the regional treatment level are also found, depending on which polluters decide to use the regional facilities. (1) The individual polluters, (2) the regional treatment plant, and (3) the central authority are the three levels of optimization that are introduced for solution of the regional

problem. It is assumed that the central authority does not need to know the local cost functions. Numerical results from simulated use of the technique with data for the Miami River basin reveal the efficiency and the effectiveness of the multilevel, hierarchical approach in the modeling, control, and management of regional water quality problems. Considerable savings over local treatment alone can be realized by employing regional treatment facilities. (Bell-Cornell)
W72-13935

PRIVATE REMEDIES TO ABATE WATER POLLUTION IN VIRGINIA AND NEW THEORIES IN ENVIRONMENTAL LAW,
L. J. Roos.
William and Mary Law Review, Vol 13, p 477-518 (1971). 42 p, 267 ref.

Descriptors: *Virginia, *Legal review, *Water pollution, *Riparian rights, Legal aspects, Judicial decisions, Navigable waters, Constitutional law, Reasonable use, Natural use, Natural flow doctrine, Artificial use, Competing uses, Percolating water, Underground streams, Subsurface waters, Surface-groundwater relationships, Tidal waters, Lakes, Common law.
Identifiers: *Nuisance (Legal aspects), *Damages (Legal aspects), *Public trust doctrine.

Common law theories of water rights are discussed as they relate to water pollution abatement in Virginia. Virginia case law incorporates both the natural use and reasonable use theories of riparian rights, although the latter is more generally preferred. Rights pertaining to percolating groundwater and underground watercourses are distinguished. The absolute ownership doctrine of underground waters is criticized as preventing suits for pollution of such waters. The substantive law relating to the following is discussed: diffused surface water; tidal waters; natural lakes, ponds, and springs; navigable waterbodies; interference with land; and public nuisance. The author explains some of the problems of proof involved in common law pollution abatement actions such as balancing the equities, proximate cause, and the burden of apportionment among contributing polluters. Common law defenses are also explained. The public trust doctrine, its application to water pollution, and a potential constitutional right to a clean environment are analyzed. Finally the author explains some of the procedural aspects of environmental litigation such as standing to sue, qui tam actions, and class actions. The author concludes that the reasonable use rule should be universally followed and that rules of joinder should be liberalized for contributing polluters. (Grant-Florida)
W72-13937

THE LAW AND THE CORPORATE POLLUTER: FLEXIBILITY AND ADAPTION IN THE DEVELOPING LAW OF THE ENVIRONMENT,
H. S. Laughran.
Mercer Law Review, Vol 23, No 2, p 571-601 (1972). 31 p, 207 ref.

Descriptors: *Institutions, *Water quality control, *Legal aspects, *Common law, Law enforcement, Economic justification, Political aspects, Legal review, Water quality standards, Water management (Applied), Water resources development, Water law, Water pollution control, Institutional constraints, Political constraints, Social aspects, Social adjustment, Social impact, Environmental effects, Economic impact, Social values.
Identifiers: *Corporate pollution, *Quo warranto.

The author describes the nature of the environmental problems--particularly pollution--in the economic, cultural, and political contexts, and he discusses how the legal system came to be concerned with these problems. The author concludes that the problem should be viewed in the common law tradition and familiar legal theories may be necessary, at least during the period of adjustment and pending the development of workable new approaches. The author deals specifically with the problem of the corporate polluter and some of the ways in which the legal system has approached and attempted to deal with that problem. Finally the author considers two new, and as yet untested, applications of established legal doctrine which might be brought to bear on the corporate pollution problem. These approaches, quo warranto and shareholder derivative actions, are new only in their possible applicability to environmental problems and contribution to environmental law. The author concludes that everyone is responsible for pollution, but that business corporations are able to control pollution, however uneconomic this may be, and that corporations must be forced to obey the law. (Widman-Florida)
W72-13938

POTABLE WATERS.

Hearing on Amendment 410 to S.1478--Comm. on Commerce, U.S. Senate, 92d Cong, 2nd Sess, March 20, 1972. 214 p.

Descriptors: *Water purification, *Potable water, *Water quality standards, *Legislation, Water pollution effects, Water pollution treatment, Research and development, Environment, Environmental effects, Pollutants, Quality control, Government finance, Local government, Natural use, Sewage bacteria, Viruses, Political aspects, Water pollution control, Legal aspects, Law enforcement, Federal government, Grants, Water supply.
Identifiers: *Environmental Protection Agency.

Proposed amendment 410 to S.1478 would establish within the Environmental Protection Agency a Water Hygiene Advisory Council and an Office of Water Hygiene, the purpose of which would be to publish national standards to insure that adequate quantities of safe and aesthetic water for drinking and other human uses are provided to the public. The statements of 13 witnesses generally approved of the amendment's provisions and its nationwide applicability. The Environmental Protection Agency stressed the immediate need for such provisions, but emphasized that primary enforcement responsibility shall remain at the local level. Opposition was expressed to the provisions making available planning and improvement grants for state water hygiene programs as not being necessary or desirable and to the establishment of a Water Hygiene Advisory Council and as limiting needed administrative flexibility. It was also the Agency's opinion that certain provisions were duplicative of the Federal Water Pollution Control Act and should be omitted. Ralph Nader stressed the need for stronger enforcement procedures including adequate public notice of failure to meet the standards and the need to allow citizens the right to institute legal actions against those in noncompliance. Opinions preferring the inclusion of an explicit timetable for the revision of the drinking water standards were expressed. Also included is a discussion of the contaminants found in drinking water and the need for the imposition of nationwide standards. (Ellis-Florida)
W72-13940

PROPOSED RECLASSIFICATIONS OF CERTAIN WATERS IN THE BROAD, CATAWBA, FRENCH BROAD, HIWASSEE, LITTLE TENNESSEE, NEW, AND WATAUGA RIVER BASINS TO BE CONSIDERED AT A PUBLIC HEARING TO BE HELD ON JUNE 29, 1972, IN HICKORY, NORTH CAROLINA.
North Carolina Board of Water and Air Resources, Raleigh. Water and Air Quality Control Committee, North Carolina Board of Water and Air Resources, (1972). 64 p, 7 tab.

Descriptors: *North Carolina, *River basins, *Classification, *Water resources, Water pollution, Water management (Applied), Water quality, Water quality control, Standards, Regulation, Administrative agencies, Fishing, Recreation, Water supply, Water utilization, Adoption of practices, Boating, Industrial water, Agriculture.

Proposed classifications of certain waters in the state of North Carolina is made by the Water and Air Quality Control Committee of the North Carolina Board of Water and Air Resources. The following waters are included in the classification: Hiwassee River Basin, Little Tennessee River Basin, French Broad River Basin, Broad River Basin, New River Basin, Watauga River Basin, and the Catawba River Basin. The classification process has been undertaken in consideration of requests for classifications by other agencies. All evaluations have been carefully made in accordance with the quality of the waters and the best usage of the waters in the public interest. The classifications which have been assigned include the following: suitable as a source of drinking water; suitable as a source of drinking water after treatment; suitable for outdoor bathing; suitable for fish and wildlife propagation, boating and wading; and suitable for agriculture, industrial process water supply, fish survival, and navigation. (Grant-Florida)
W72-13942

REQUIREMENTS FOR APPROVAL OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
New Mexico Environmental Improvement Agency, June 27, 1972. 2 p.

Descriptors: *New Mexico, *Sewage disposal, *Septic tanks, *Water quality standards, Water pollution sources, Sewage treatment, Regulation, Administrative agencies, Environmental sanitation, Waste water (Pollution), Public health, Environmental engineering, Soil contamination, Groundwater recharge, Groundwater movement, Aquifer characteristics, Sewage effluent.
Identifiers: *Individual sewage disposal systems.

The authority of the New Mexico Environmental Improvement Agency to regulate individual sewage disposal systems extends to all such systems to be constructed within the state. Sewage disposal systems will not be permitted where they constitute a potential public health hazard or nuisance condition. Information which is required from the applicant prior to approval of a sewage system includes: suitability of the soil for effluent percolation; depth to and characteristics of the bedrock; slope of the ground surface; depth, rate, and direction of groundwater flow; flooding potential; type of system used; density of treatment systems in the area; and type and density of vegetation. Minimal conditions for approval of sewage system installation are defined in relation to the proximity of the sewage system from a source of community water supply. Minimal conditions for septic tank installation in proximity to a private water supply are also explained. The listed criteria are not applicable to waste water facilities which will discharge more than 1000 gallons per day or which will be unable to meet selected minimal requirements. Effluent must be certified to conform to Water Quality Control Commission Regulations in these situations. (Grant-Florida)
W72-13943

ANALYSIS--FLORIDA WATER RESOURCES ACT OF 1972, (CHAPTER 72-299, LAWS OF FLORIDA).
For primary bibliographic entry see Field 06E.
W72-13944

NATURAL RESOURCES AND RECREATION AGENCIES, 1971 ANNUAL REPORT.
For primary bibliographic entry see Field 06E.
W72-13945

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT, APRIL 15.

Dept. of State Bulletin, Vol LXVI, No 1715, p 652-657, May 8, 1972. 6 p.

Descriptors: *Great Lakes, *International Joint Commission, *Water quality control, *Pollution abatement, Eutrophication, Oil pollution, Sludge, Waste treatment, Industrial wastes, Phosphates, Phosphorus, Ships, Agriculture, Thermal pollution, Environment, Environmental effects, Government finance, Political aspects, Environmental control, Water pollution control, Water pollution treatment, Legal aspects, Legal review, Water pollution sources.
Identifiers: *Great Lake Water Quality Agreement, *Boundary Waters Treaty.

The Agreement includes specific measures to more effectively implement the 1909 Boundary Waters Treaty between the United States and Canada. The Agreement marks the first major effort by two nations to jointly solve a serious environmental problem affecting a shared resource. General water quality objectives to be reached by both the United States and Canada are described in terms of freedom from the following: toxic substances; accelerated eutrophication; oil and other floating materials; materials producing odor, color, or other nuisance conditions; and sludge deposits. The parties agree to provide for the construction of waste treatment facilities providing levels of treatment consistent with specific water quality objectives. Similar provisions for the control of pollution from industrial, agricultural, and shipping sources are included. Measures to reduce the input of nutrients into the lakes to stem the complex and massive problem of eutrophication are also included. Other measures emphasize a reduction in the amount of phosphates flowing into the lakes, the prevention of discharges of oil and other hazardous polluting substances, and requirements controlling thermal discharges. The International Joint Commission is charged with the responsibility of assisting the parties in implementing the commitments. The brief statements of Prime Minister Trudeau and President Nixon are included. (Ellis-Florida)
W72-13947

POWERS AND DUTIES OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES, ITS OFFICERS AND DEPARTMENTAL AND ADVISORY BOARDS AND COMMISSIONS.
For primary bibliographic entry see Field 06E.
W72-13948

SANDUSKY HARBOR, ERIE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 795-D, $3.00 in paper copy. November 23, 1971. 10 p, 2 map, 1 dwg.

Descriptors: *Ohio, *Dredging, *Harbors, *Environmental effects, Channel improvement, Channel morphology, Lake Erie, Watercourses (Legal), Water pollution sources, Water pollution effects, Turbidity, Sedimentation, Spoil banks, Disposal, Eutrophication, Operation and maintenance, Maintenance.
Identifiers: *Environmental impact statement, *Sandusky (Ohio).

The project involves annual channel maintenance dredging of approximately 600,000 cubic yards of spoil in the deep-draft navigation project in Sandusky Harbor, Ohio. Additionally the project involves maintenance and repair of harbor jetties, protection works, and a rock dike as needed. The dredge spoil is dumped in an open, one mile square area of Lake Erie. Adverse environmental effects of this action include the following: noise and dust during structural repair work, short-term turbidity and sedimentation, accelerated algae growth in disposal areas due to increased oxygen availability, possible adverse fish effects from polluted spoil, and further contamination of the already polluted lake from dumping polluted spoil. No quantitative measurements have been made of these effects. The only practical alternative at present is to use other dumping sites. This was considered. A plan is currently being discussed with local officials to construct an enclosed area for permanent confinement of spoil. This would be environmentally beneficial since it would prevent polluted spoil from further contaminating the lake. Also the filled area would ultimately be usable for agriculture or recreation. (Grant-Florida)
W72-13950

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.

Available from the National Technical Information Service as PB-202 651-D, $3.00 in paper copy. September 10, 1971. 7 p.

Descriptors: *Pollution abatement, *Soil conservation, *Environmental effects, *Project planning, *Government supports, Government finance, Governmental interrelations, Decision making, Alternate planning, Non-structural planning, Administration, Federal project policy, Land management, Agricultural runoff, Erosion control, Wildlife habitats, Sediment control, Waste disposal, Farm wastes, Retention, Drainage practices.
Identifiers: *Environmental impact statement, *Rural Environmental Assistance Program.

Under the Rural Environmental Assistance Program, the federal government shares with farmers and ranchers the cost of carrying out approved soil, water, woodland, and wildlife conservation and pollution abatement practices on their land. This program will accelerate and make possible needed conservation and environmental protection in rural America. Favorable economic effects will include: reduction in wind and water erosion and land runoff; reduction in pollution of streams, lakes, and estuaries by animal waste and sediment; more food and better habitat for wildlife; and improved water quality because of water retaining and retarding measures such as dams and ponds, grass cover, waterways, terraces, diversion structures, and buffer or filter strips around fields. No adverse environmental effects would be anticipated under this redirected and improved program if good management is carried out by all program participants. Several precautions have been taken. Several alternatives were considered, however, it was concluded that environmental quality would suffer under such alternatives. (Widman-Florida)
W72-13953

DIKED DISPOSAL AREA PROGRAM, DULUTH-SUPERIOR HARBOR, ST. LOUIS COUNTY, MINNESOTA AND DOUGLAS COUNTY, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from the National Technical Information Service as PB-204 456-D, $3.00 in paper copy. September 30, 1971. 13 p, 1 plate.

Descriptors: *Lake Superior, *Environmental effects, *Dikes, *Spoil banks, Barriers, Disposal, Environmental sanitation, Isolation, Water pollution, Adoption of practices, Waste disposal, Wisconsin, Minnesota, Project planning, Recreation, Waterfowl, Habitats, Dredging, Benthos, Soil contamination, Pollution abatement, Water pollution control, Project purposes, Pollutants.
Identifiers: *Environmental impact statement, *Duluth-Superior Harbor.

The authorized project provides for diked disposal of polluted maintenance dredge spoil from Duluth-Superior Harbor. Polluted dredge spoil, previously dumped in open waters of Lake Superior, will be confined in two diked disposal areas. Beneficial impacts include the elimination of adverse effects of polluted spoil in the lake and the creation of about 35 acres of new land at each site. The cities of Duluth and Superior plan to install public recreation facilities on the sites after they have been filled. Undesirable impacts include turbidity of harbor water during construction of the diked areas, unsightliness during construction and filling, loss of some duck habitat, and possible noxious odors. The areas which have been selected for disposal are not especially aesthetic and there are no significant values which might be impaired. Alternatives to the proposed method of dredge disposal include continued in-lake disposal of polluted dredge spoil, discontinuance of maintenance dredging in the harbor, disposal at alternate sites, treatment of polluted dredge spoil, and modification of current methods and equipment which might reduce the interface contact between water and polluted spoil. (Widman-Florida)
W72-13954

LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-13965

AQUATIC PLANT CONTROL PROGRAM, HUDSON AND MOHAWK RIVERS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-13967

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 03E.
W72-13969

RADIOACTIVE WASTE MANAGEMENT PRACTICES IN WESTERN EUROPE.
European Nuclear Energy Agency, Paris (France); and Organization for Economic Co-Operation and Development Paris (France).

Available from OECD Publications Center, 1750 Pennsylvania Ave. N.W., Washington, D.C., 20006,for $3.25. European Nuclear Energy Agency, Organisation for Economic Co-operation and Development, July 1971. 126 p, 9 fig, 6 tab, 18 ref, 5 annexes.

Descriptors: *Nuclear powerplants, Effluents, *Management, *Radioactivity, *Radioisotopes, *Radioactive waste disposal, *Nuclear wastes, Environment, Air pollution, Water pollution, Soil contamination, Regulation, Control, Management, Monitoring, Standards, Europe.

A simplified general review of practices applied to management of radioactive wastes in Western Europe is presented. Both the complexity and the magnitude of the problem is indicated but have proven to be manageable and at a very high standard of safety for the personnel and the environment. Means are provided whereby public health authorities may regulate, in the public interest, radioactive waste management. The whole scope of waste management practices are discussed and encouragement given for periodic reviews to adequately maintain the high standards of environmental and public protection. (Houser-ORNL)
W72-13983

A STUDY OF PHOSPHATE INDUCED ALGAL GROWTH IN ORDER TO SUPPRESS OR ELIMINATE THIS PHENOMENON,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05A.
W72-13992

GROUNDWATER RESOURCES OF SALINE COUNTY, MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-14011

THE BIODEGRADATION OF OIL IN SEA-WATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 05B.
W72-14012

WATER FOR ALABAMA, THE ALABAMA WATER-RESOURCES SPECTRUM--SECOND PROGRESS REPORT,
Geological Survey, University, Ala.
H. C. Barksdale, and L. B. Peirce.
Alabama Geological Survey Report, July 1972. 74 p, 2 tab.

Descriptors: *Water resources development, *Alabama, *Water supply, *Water quality, Reviews, Planning, Surface waters, Groundwater, Water utilizations, Hydrology, Geology, Water pollution, Environmental effects, Ecology, Fish, Wildlife, Irrigation, Industrial water, Municipal water, Navigation, Powerplants, Flood control, Recreation, Water quality control.

The Alabama Water-Resources Spectrum (second progress report) includes a wide variety of constituent parts, each of which involves physical factors that have an impact upon or involve human activities, and hence must be considered in comprehensive planning for the waters and related lands of the State. The inclusion of physical factors (or their measurement and evaluation) in the definition of the spectrum distinguishes it from other elements of the planning procedure that are concerned primarily with legal, economic, or administrative matters. The spectrum forms the physical foundations upon which these other elements must be based if the resulting plans are to be effective and viable. The breadth of this concept of the spectrum has introduced difficulties in its description and analysis while at the same time making it imperative that they be attempted and be as complete as possible. If present trends continue, the quality of Alabama's water will become a serious problem long before any actual statewide shortage of water occurs. With this in mind, emphasis is placed upon water-quality factors and effects. (Woodard-USGS)
W72-14024

AIR CODE AND WATER QUALITY CRITERIA FOR INTERSTATE STREAMS FOR STATE OF ARKANSAS.
Arkansas Pollution Control Commission, Little Rock.
For primary bibliographic entry see Field 06E.
W72-14044

PHOSPHORUS IN WASTEWATER,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05B.
W72-14046

BIOLOGICAL DENITRIFICATION USING FLUIDIZED GRANULAR BEDS,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05D.
W72-14047

THE DISPOSAL WELL ACT.
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 06E.
W72-14050

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 05A.
W72-14051

FERTILIZER TECHNOLOGY AND USE.
For primary bibliographic entry see Field 03F.
W72-14101

MAN AND HIS ENVIRONMENT: CLIMATE,
For primary bibliographic entry see Field 06G.
W72-14137

HYGIENIC STANDARDIZATION OF PHENOL IN WATER BODIES (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 05F.
W72-14157

THE PERSISTENCE OF ENDOSULFAN IN SURFACE WATER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
For primary bibliographic entry see Field 05B.
W72-14193

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

FUTURE WATER USE MODEL OF UTAH VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W72-13928

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.

Copy available from GPO Sup Doc EP 2.10:16110 FRU 12/71-13 for $2.00. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 270 p, 29 fig, 15 tab, 309 ref. EPA Program 16110 FRU 12/71-13. 14-12-959.

Descriptors: *Urban sociology, *Education, *Regional analysis, *Decision making, *Computer models, Computer programs, Social aspects, Political aspects, Governments, Economics, Water resources.
Identifiers: Gaming-simulation.

The RIVER BASIN MODEL delineates an entire regional system and its interaction with water, one of its subsystems. Presented is a gaming-simulation, City Model, designed by individuals who later founded Environmetrics, Inc., to provide college-level social science students with an educational technique which reverts to a more personalized education (computer assisted laboratory) and at the same time allows society to remain undisturbed by the learning process. Students are interested in actively participating in the solutions of our social ills. In the model, participants are decision-makers in one of three sectors: economic, social or governmental. A starting scenario briefly describes problems, issues, growth characteristics, housing, schools, etc. in the simulated metropolitan area. When the model is underway, the characteristics of the city will reflect the actions and interactions of the participants. The computer records participant decisions for each round and regularly provides printouts showing the interaction of decisions and their influence during the run. The model will respond to, and the play canbe enhanced by, a nearly infinite variety of player actions generated by curiosity, imagination, innovation or planning, programming, and budgeting. The City Model is described in detail and full reports of its successful implementation in several American colleges are presented. (See also W72-10307) (Bell-Cornell)
W72-13929

THE RIVER BASIN MODEL: CHAIRMAN AND COUNCIL.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-5 for $0.70; microfiche from NTIS as PB-212 007, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 80 p, 15 fig, 3 tab, 1 append. EPA Program 16110 FRU 12/71-5. 14-12-959.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Political aspects, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Model studies, Human population, Systems analysis.
Identifiers: *Governmental processes, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a subsystem realistically interacting with all the other major subsystems, such as housing and transportation. A gaming format is employed; model users provide inputs to the computer programs on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. The Governmental (provides public services) Sector and the model required by its Chairman team, and the computer printed output are described. Each political jurisdiction has a chief executive called the Chairman. Depending upon the local situation, these political jurisdictions may or may not have a council that provides checks and balances on the Chairman. The Chairman makes departmental ap-

pointments to the local government departments, and he sets budget policy decisions. His office is an elected one, and periodic elections are held in which the members of the Social Sector vote for nominated candidates. He can exert loose or tight control over his departments. (See also W72-10307) (Bell-Cornell)
W72-13930

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 05G.
W72-13931

DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
J. Bargur.
Water Resources Research, Vol 8, No 4, p 801-817, August 1972. 3 fig, 5 tab, 15 ref.

Descriptors: *Water management (Applied), *Planning, *Regional analysis, Water resources, Resource allocation, Optimization, Linear programming, *Calfiornia, Systems analysis, Model studies.
Identifiers: Equilibrium analysis.

In arid and semiarid areas, water is scarce and requires an intersectoral, intertemporal, and sometimes interregional planning approach to insure its efficient use and allocation among the competing factors. In most cases, the water scarcity is an economic phenomenon that is partially determined by the costs of undertaking water development and water transfer projects. Presented is a multisector planning and management approach to water resources that is based on a general equilibrium analysis using input-output models and linear programming techniques. A dynamic multisector programming model that takes into account the sectoral, spatial, and temporal aspects of regional planning and an extension to an activity analysis model are formulated and applied empirically to California and the western United States for a 15-year planning horizon. Results include water requirement forecasts, interregional water transfer requirements, efficient production and cropping patterns, 'shadow prices' for water and labor, and an optimal investment program for water resource projects. Using a general equilibrium programming model makes it possible to investigate problems of regional development that are dependent on the interrelationships between resource availabilities and sectoral planning and illustrates the importance of the complex interdependencies among economic variables. (Bell-Cornell)
W72-13933

RECREATION BENEFIT ESTIMATION AND FORECASTING: IMPLICATIONS OF THE IDENTIFICATION PROBLEM,
Resources for the Future, Inc., Washington, D.C.
C. J. Cicchetti, V. K. Smith, J. L. Knetsch, and R. A. Patton.
Water Resources Research, Vol 8, No 4, p 840-850, August 1972. 2 fig, 1 tab, 29 ref.

Descriptors: *Recreation demand, *Supply, *Benefits, *Estimating, Mathematical models, Systems analysis, Forecasting, Water demand, Water supply.
Identifiers: Equilibrium models, Economic models.

Recreation studies have tended to confuse the terms demand and use. Demand, as used by economists, refers to the schedule of quantities that the community will desire at all possible prices. Use, or participation, is the realization of both demand and supply considerations, i.e., the quantity of recreational services chosen by the community. Accordingly, both demand and supply forces are important to use determination. A priori information in addition to the data must be supplied prior to the estimation of economic models of the recreation market. The type of information and the data themselves impose constraints on the specification, estimation and use of these economic models. Therefore, a taxonomy of each applied study framed around a general equilibrium model of recreation decisions is presented, and the specific applied studies are discussed. Resulting from this taxonomy is a clear outline of the logical structure connecting the theoretical model with its empirical realization. This article is pertinent to the problem of recreational water supply and demand. (Bell-Cornell)
W72-13934

A MULTILEVEL APPROACH TO DETERMINING OPTIMAL TAXATION FOR THE ABATEMENT OF WATER POLLUTION,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
For primary bibliographic entry see Field 05G.
W72-13935

ENGINEERING AND ECONOMIC EVALUATION OF THE RELIABILITY OF WATER SUPPLY,
Mekoroth Water Co., Tel-Aviv (Israel). Research Div.
For primary bibliographic entry see Field 06D.
W72-13936

6B. Evaluation Process

THE ALLOCATION OF REGIONAL WATER SUPPLIES. A CASE STUDY OF THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, N.Y.
W. B. Strandberg.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-678, Microfilm $3.05, Xerox $10.60. Ph. D. Dissertation, 1967, 235 p.

Descriptors: *Water supply, *Regional analysis, *Planning, *Economic prediction, Governments, Economic justification, Costs, Economies of scale, Reservoirs, Water shortage, Water treatment, Northeast U S, Pipelines, Water demand.

A case study analysis is presented of the problem of municipal and industrial water supply in the Northeastern United States. Technical practices and economic theory were combined to define the costs over a range of high-level demands for several basin alternatives in a subregion of the Northeast based on the metropolitan area of New York City and northeastern New Jersey. It was found that costs of the basin systems over the range of yields were reasonable, with appreciable economies of scale at higher outputs. Limited cost savings could be obtained through stage construction, essentially through programming of reservoir construction over the demand buildup period. Data collection of the type necessary to regional water supply studies was being carried on to some extent. However, considerable gaps in availability existed. There appeared to be a need for a subregional organization entity, with representatives from all affected governmental levels, to coordinate the planning and operational efforts properly. (Galwardi-Texas)
W72-13698

THERMAL AQUACULTURE: ENGINEERING AND ECONOMICS,
Oak Ridge National Lab., Tenn.
W. C. Yee.
Environmental Science and Technology, Vol 6, No 3, p 232-237, March 1972. 3 photo, 4 fig, 4 ref.

Descriptors: *Economics, *Fish, *Fish conservation, Aquaculture, Hydroelectric plants, Costs, *Thermal pollution, Legal aspects, Marketing, Resources, Planning.
Identifiers: *Thermal aquaculture, *Waste heat, Regulatory aspects, Demonstration projects, Technical feasibility.

Fish may be raised in warm water discharged from steam electric power plants, but success depends upon costs and profits. Aquaculture is a term that has come to imply a degree of environmental control over the culture medium such that fish yields are enhanced by orders of magnitude. Thermal aquaculture has a potential that remains to be demonstrated. Considerations of technical feasibility, legal and regulatory aspects (on a federal, state, and local level), and marketing aspects reveal hurdles which must be dealt with. Finally, site-oriented demonstration projects will have to show the revenue-producing potential of thermal aquaculture and the extent to which it can assist in helping to pay for the cost of dissipating waste heat from an electric power plant. The resource value of this waste might then be estimated, and a liability of the present might be turned into an asset of the future. Design and cost factors, a cost analysis of a hypothetical integrated aquaculture facility, and aspects of marketing and economics are discussed. (Strachan-Chicago)
W72-13743

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
V. R. Eidman.
Available from the National Technical Information Service as PB-212 003, $3.00 in paper copy, $0.95 in microfiche. Completion Report, August 1972, 293 p, 16 fig, 44 tab, 113 ref. OWRR B-010-OKLA (4).

Descriptors: *Water allocation, *Economic efficiency, *Direct benefits, *Groundwater mining, Groundwater, *Irrigation Water, Economics, Farm management, Water demand, Irrigation practices, Forecasting, Dynamic programming, Linear programming, Computer models, Simulation analysis, Soil-water-plant relationships, Oklahoma, Texas, Kansas, Great Plains, Water policy, Water resource development, Progressive taxes, Water management (Applied), Yield equations.
Identifiers: *Ogallala Formation.

The acreage of irrigated crop production in the region overlying the Central Ogallala Formation has increased from approximately 70,000 in 1950 to 1.5 million in 1965. Annual water withdrawals have exceeded estimated annual recharge since 1954. Resource availability and the demand for the crops produced in the area suggest irrigation will continue to expand. Projections made assuming current institutional restrictions indicate the number of acres irrigated annually will increase to a peak of 3.4 million in 1990 and then decline to 2.8 million by the year 2000. The projected rate of development utilizes 43.5 percent of the stock water supply by the year 2000, making irrigation uneconomic on approximately 44 percent of the area. Estimated primary economic benefits are approximately $50 million per year for the 1970-1990 period and then decline rapidly. Application of a multi-stage sequential decision model indicated the projected rates of withdrawal during the remainder of this century do not exceed the rates required to maximize the present value of net primary benefits for the study area. Analysis of institutional constraints indicates imposing a quantity restriction of 1.5 acre feet annually per acre irrigated would reduce primary economic benefits bothper acre irrigated and per unit of water used. However, imposing a tax of $6.00 per acre foot of

water used above 1.5 acre feet per acre irrigated would increase benefits both per acre irrigated and per unit of water used. Additional analysis of alternative taxing arrangements is needed before a specific plan is recommended for use in the Central Ogallala.
W72-13823

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1970,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06D.
W72-13829

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.
For primary bibliographic entry see Field 06A.
W72-13929

THE RIVER BASIN MODEL: CHAIRMAN AND COUNCIL.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13930

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 05G.
W72-13931

DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 06A.
W72-13933

RECREATION BENEFIT ESTIMATION AND FORECASTING: IMPLICATIONS OF THE IDENTIFICATION PROBLEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13934

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
N. Ely.
Available from the National Technical Information Service as PB-206 096, $3.00 in paper copy. November 1971. 226 p, 525 ref, 1 append.

Descriptors: *Water resources development, *Project planning, *Federal government, *Decision making, Political aspects, Legal aspects, Administrative agencies, Institutional constraints, Cost analysis, Cost-benefit analysis, Water policy, Budgeting, Adoption of practices, Federal budget, Administration, Federal jurisdiction, Comprehensive planning.
Identifiers: *Federal Water Projects Policy.

The major federal agencies involved with water resource development construction projects are identified, such as the Bureau of Reclamation, the Corps of Engineers, the Soil Conservation Service, and the Federal Power Commission. Also identified are reviewing and lending agencies. The process of project development from initial conception, through planning stages, to construction is examined. Also discussed is the process of congressional authorization and control by the Office of Management and Budget. Some of the problems individual agencies encounter in the process of water resource development are examined. Problems which are common to several agencies are discussed as well as conflicts which arise between agencies. The problems caused by Congress are also discussed. Among the author's conclusions are recommendations for consolidating and centralizing water resource development planning and for developing a hearing procedure early in the authorization process for project opponents. (Grant-Florida)
W72-13957

THE RECREATIONAL VALUE OF A SMALL RESERVOIR IN AN ARID ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 06D.
W72-13994

WATER FOR ALABAMA, THE ALABAMA WATER-RESOURCES SPECTRUM--SECOND PROGRESS REPORT,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 05G.
W72-14024

POTENTIALS FOR DESALTING WATER IN THE TULAROSA BASIN, NEW MEXICO - A CASE STUDY,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 03A.
W72-14059

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A MULTILEVEL APPROACH TO DETERMINING OPTIMAL TAXATION FOR THE ABATEMENT OF WATER POLLUTION,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
For primary bibliographic entry see Field 05G.
W72-13935

6D. Water Demand

THE ALLOCATION OF REGIONAL WATER SUPPLIES. A CASE STUDY OF THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 06B.
W72-13698

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.

Florida Bureau of Geology Special Publication No 16, 1972. 61 p, 47 ref.

Descriptors: *Water resources, *Hydrology, *Geology, *Florida, Topography, Mineralogy, Water utilization, Municipal water, Industrial water, Recreation, Groundwater, Water wells, Surface waters, Lakes, Streams, Water yield, Water quality, Water demand, Reviews.
Identifiers: *Tallahassee (Fla).

This pictoral review describes the relationships between environment and hydrology in the Tallahassee, Florida, area. Pictures, maps, illustrations, and literature include descriptions pertinent to topography, geology, water resources, mineral resources, energy resources, and land use. Normal yearly rainfall ranges from 57 inches in southwestern Leon County to about 52 inches in the northeastern part of the county. Leon County's physical features are separated into four major divisions--the high, sandy, clay-hill northern part; the wet, low, sand and limestone southern part, dotted with innumerable small lakes and sinks; the flat, sandy, swampy, and forested western part; and the valleys of the two major rivers. Water for the city of Tallahassee's system is pumped from 13 wells, ranging from 18 to 24 inches in diameter and from 290 to 470 feet deep. Their total rated capacity is 34 mgd. Surface water in Leon County is of good chemical quality, being soft (hardness ranging from 0 to 60 mg/liter) and low in chloride and dissolved solids. Recreation activities constitute its primary use. Most wells in the county yield hard water (121 to 180 mg/liter) and produce water suitable for use without treatment. (Woodard-USGS)
W72-13740

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 06B.
W72-13823

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1970,
Geological Survey, Washington, D.C.
C. R. Murray, and E. B. Reeves.
Geological Survey Circular 676, 1972. 37 p, 12 fig, 18 tab, 76 ref.

Descriptors: *Water utilization, *United States, Surface waters, Groundwater, *Water supply, *Consumptive use, *Water demand, *Water distribution (Applied), Domestic water, Municipal water, Industrial water, Irrigation water, *Estimating.

Estimates of water use in the United States in 1970 indicate that an average of about 370 bgd (billion gallons per day)-about 1,800 gallons per capita per day-was withdrawn for the four principal offchannel uses which are (1) public-supply (for domestic, commercial, and industrial uses), (2) rural (domestic and livestock), (3) irrigation, and (4) self-supplied industrial (including thermoelectric power). In 1970, withdrawals for these uses exceeded by 19% the 310 bgd estimated for 1965. Estimates of water withdrawn from the principal sources included 68 bgd from fresh groundwater, 1 bgd came from saline groundwater, 250 bgd came from fresh surface water, 53 bgd from saline surface water, and 0.5 bgd from reclaimed sewage. The average annual streamflow-simplified measure of the total available water supply-is approximately 1,200 bgd in the conterminous United States. Total water withdrawn in 1970 for offchannel uses (withdrawals other than for hydroelectric power) amounted to about 30% of the average annual streamflow. (Woodard-USGS)
W72-13829

THE RIVER BASIN MODEL: CHAIRMAN AND COUNCIL.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13930

RECREATION BENEFIT ESTIMATION AND FORECASTING: IMPLICATIONS OF THE IDENTIFICATION PROBLEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13934

ENGINEERING AND ECONOMIC EVALUATION OF THE RELIABILITY OF WATER SUPPLY,
Mekoroth Water Co., Tel-Aviv (Israel). Research Div.
E. Damelin, U. Shamir, and N. Arad.

Water Resources Research, Vol 8, No 4, p 861-877, August 1972. 10 fig, 5 tab, 4 ref.

Descriptors: *Water demand, *Water supply, *Reliability, Pumping, Equipment, Failure (Mechanics), Simulation analysis, Computers, Costs, Economics, Evaluation, Mathematical models, Reservoir storage, Operations research.
Identifiers: *Reliability models, Economic models, Sensitivity, Sensitivity analysis, Marginal water costs.

Assuming that a given water supply source is sufficiently large and that the installed equipment and the storage in the system are designed so that all demands can be met, shortfalls will occur only when some of the equipment is not operative due to failure. A simulation model is developed and employed for evaluating the reliability of supplying a known demand pattern in a given water supply system in which shortfalls are caused by random failtures of the pumping equipment. An economic model is presented that enables the reliability model users to compute the cost of the marginal water obtained by improving the reliability of the system and to determine the desirability of the improvement from this cost computation. Results are presented from the initial tests of the reliability model, that examine the sensitivity of the reliability to various variables. The results of applying the reliability and economic models to an existing water supply system are presented and discussed. (Bell-Cornell)
W72-13936

AN INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico State Univ., University Park. Water Resources Research Inst.
M. Gisser, and A. Mercado.
Available from the National Technical Information Service as PB-212 027, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Completion Report 004, June 1972, 33 p, 1 fig, 6 tab, 11 ref. OWRR B-025-NMEX (1).

Descriptors: *Water demand, *Hydrologic Models, *Water pricing, *New Mexico, Irrigation water, Water table, Aquifers, Confined aquifers, Recharge, Model studies.
Identifiers: *Pecos River Basin, *Parametric linear programming, *Water importation, Economic model, Demand function, Semi-confined aquifers, Imported water prices, Pumping costs.

The results of integrating the agricultural sector with the aquifer of the Pecos Basin are presented. In particular it provides steady-state solutions to hydrologic and economic equations in which imported water is artificially recharged to the aquifer and its cost is added to the cost of pumping. A two cell model for the Pecos Basin aquifer is developed. One cell is for the confined aquifer and the other is for the shallow aquifer. The hydrological solution of the model yields two linear steady-state functions which relate the water table in the two cells to other hydrological variables, such as recharge, discharge, and irrigation. The cost of pumping water is also estimated. The agricultural demand function for irrigation water is empirically estimated by applying the technique of parametric linear programming. The demand function for water is then linked to the water table hydrological equations. Solutions are given for a range of expected prices of imported water. (Creel-NMex State)
W72-13993

THE RECREATIONAL VALUE OF A SMALL RESERVOIR IN AN ARID ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
D. A. King.
Available from the National Technical Information Service as PB-212 028, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Aug. 1971, 9 p, 1 tab, 4 ref. OWRR A-026-ARIZ (1).

Descriptors: *Recreation demand, *Water demand, *Reservoirs, Benefit-cost analysis, *Arid land, Deserts, *Arizona.
Identifiers: *Tucson (Ariz).

The purpose of this investigation was to measure the recreational value of a small reservoir and to compare value estimates obtained using four different price proxies. The study area was Pena Blanca Recreation area, a Forest Service area about 70 miles south of Tucson. An on-site survey of visitors to the area was conducted. The equivalent consumers' surplus is the measure of value being used. The price proxies are willingness to pay, to drive additional miles, to drive additional hours, and variable participation costs. The quantity variable is visits per year. Multiple correlation analysis has been used to identify the important control variables for estimation of the consumers' surplus. The control variables identified were age of the family head and recreational equipment investment. Income was not highly correlated with visits or any of the price proxies, indicating that the income effect in the demand for the area is small. No significant differences in socioeconomic characteristics were found between day and overnight visitors. The mean willingness to pay, in terms of a fee per person per visit, was $1.15. The mean willingness to drive, in terms of additional one-way miles, was 30 miles. The mean willingness to drive, in terms of additional time, was 1 hour.
W72-13994

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
H. N. Halberg.
Arkansas Geological Commission Water Resources Summary No 7, 1972. 17 p, 3 fig, 6 tab, 39 ref.

Descriptors: *Water utilization, *Arkansas, *Surface waters, *Groundwater, *Water supply, Water demand, Consumptive use, Water distribution (Applied), Municipal water, Industrial water, Domestic water, Irrigation water.

Arkansas used an average of 3,061 mgd of surface water and groundwater in 1970, 28% more than in 1965. This total does not include the 24,700 mgd used in the production of hydroelectric power. Half the water supplied was groundwater and half was drawn for streams and reservoirs. The principal categories of use are public supply, self-supplied industrial use, rural domestic and livestock use, irrigation, fish and minnow farming, water for wildlife impoundments, and fuel electric-power production. The principal use was irrigation, which used 1,293 mgd, or a little less than half the total, and 82% of which was groundwater. Cooling water for fuel electric-power production required 956 mgd, 31% of the total, and was practically all surface water. Fish and minnow farming used 314 mgd, 10% of the total. Consumption of water was 1,226 mgd, 40% of withdrawals. (Woodard-USGS)
W72-14028

6E. Water Law and Institutions

RESPONSIBILITY FOR PLANT OPERATIONS,
Maryland State Dept. of Health and Mental Hygiene, Baltimore.
For primary bibliographic entry see Field 05F.
W72-13742

OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05G.
W72-13904

POLITICS AND THE COLORADO RIVER,
Arizona Water Commission, Phoenix.
W. E. Steiner.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings, Arizona Section - American Water Resources Association and the Hydrology Section - Arizona Academy of Science, April 22-23, 1971, Tempe, Vol 1, p 405-418, 1971.

Descriptors: *Colorado River Compact, *Colorado River Basin, *Political aspects, *International waters, *Arid lands, Arizona, California, Wyoming, New Mexico, Colorado, Utah, Nevada, Inter-basin transfers, Water law, Pacific Northwest U. S., Mexico, Water allocation (Policy), Legal aspects.
Identifiers: *Central Arizona Project.

The Colorado River is the only major stream in the U.S. whose water supply is fully utilized. This distinction has brought the Colorado more than its share of controversy, within states, between states and between nations. The Colorado River Compact, whose purpose was to equitably apportion the waters between the Upper and Lower Basins and to provide protection for the Upper Basin through water reservation, was ratified by all states except Arizona, in 1923. Arizona finally ratified it in 1944. The history of controversies and negotiation concerning the Compact are outlined through the Supreme Court decision on March 9, 1964, which entitled California to 4.4 maf, Nevada to 0.3 maf and Arizona to 2.8 maf, of the first 7.5 maf available in the Lower Colorado. Unfortunately, the Court did not attempt to establish priorities in the event of shortage. The problem is complicated by an international treaty of 1944, guaranteeing Mexico 1.5 maf annually, except in years of unusual circumstances. Because Senator Connally of Texas was then chairman of the Senate Foreign Relations Committee and because the Treaty allocated twice as much Colorado River water to Mexico as it was then using, it was argued that this treaty represented a tradeoff to Mexico giving it less water from the Rio Grande in exchange for more water from the overburdened Colorado. Problems of inter-basin water transfer studies, uniform Colorado Basin water quality standards and Central Arizona Project planning are discussed. (Casey-Arizona)
W72-13915

PRIVATE REMEDIES TO ABATE WATER POLLUTION IN VIRGINIA AND NEW THEORIES IN ENVIRONMENTAL LAW,
For primary bibliographic entry see Field 05G.
W72-13937

THE LAW AND THE CORPORATE POLLUTER: FLEXIBILITY AND ADAPTION IN THE DEVELOPING LAW OF THE ENVIRONMENT,
For primary bibliographic entry see Field 05G.
W72-13938

WATER LAW--GROUNDWATER RIGHTS IN MISSOURI--A NEED FOR CLARIFICATION (HIGDAY V. NICKOLAUS),
R. C. Thomas.
Missouri Law Review, Vol 37, No 2, p 357-36 (1972). 12 p, 57 ref.

Descriptors: *Missouri, *Judicial decisions *Groundwater resources, *Percolating water Legal aspects, Adoption of practices, Equity Reasonable use, Groundwater, Alluvial aquifers Municipal water, Water management (Applied Water law, Competing uses, Common law, Water allocation (Policy), Riparian rights, Adverse possession, Land tenure, Legal review, Wells, Overlying proprietor.
Identifiers: Correlative rights.

Appellant landowners sought declaratory and injunctive relief against respondent city of Columbia, Missouri, when the respondent attempted to extract groundwater from an alluvial water basin under appellants' lands. On appeal the Kansas City Court of Appeals held that appellants' petition stated a justiciable controversy and outlined a new doctrine to be used in determining rights to percolating groundwater in Missouri. After a general discussion on groundwater the author explains the five basic doctrines that have evolved to determine rights to percolating groundwater: (1) the English absolute ownership rule, (2) the reasonable use doctrine, (3) the correlative rights doctrine, (4) the California correlative rights or common pool doctrine, and (5) the prior appropriation doctrine. The author specifically deals with the evolution of groundwater law in Missouri, noting the confusion in the instant case as to whether the reasonable use or correlative rights doctrine was in fact adopted and the distinctions involved. The author concludes that the latter is preferable because it is a better balancing of interests, uses more factors in determining rights, and is more likely to reach a fair and equitable determination of water rights among competing uses. (Widman-Florida)
W72-13939

POTABLE WATERS.
For primary bibliographic entry see Field 05G.
W72-13940

THE 1973 CONFERENCE ON THE LAW OF THE SEA IN THE LIGHT OF CURRENT TRENDS IN STATE SEABED PRACTICE,
F. M. Auburn.
Canadian Bar Review, Vol 50, No 1, p 87-109 (1972). 23 p, 149 ref.

Descriptors: *Law of the sea, *Exploitation, *Continental shelf, *United Nations, Legal aspects, International law, Land tenure, Jurisdiction, Littoral, Exploration, Mineralogy, Mining, Beds under water, Ownership of beds, Oceans, Continental slope, Slurries, Manganese, Legal review.

Current uses of the seabed are discussed along with some of the controversies which exist among nations in light of the upcoming 1973 Conference on the Law of the Sea. The 1970 Moratorium Resolution of the U.N. General Assembly is discussed along with the disagreement among various international factions as to its legal effect. The extent to which adjacent states may exploit the continental shelf is also discussed. The lines of controversy are drawn between land locked and littoral states, between states with the sharp coastlines and those with gradual coastlines, and over use of the seabed of such semi-enclosed areas as the Red and Baltic Seas. The practice of the United States, Canada, New Zealand, and Australia in granting exploration licenses and controlling seabed activities are examined. The problems of controlling the extraction of Red Sea brines from the waters are discussed. Of concern here is the fact that these brines are a slurry and actually part of the water instead of the seabed. The control of the extraction of manganese nodules and the plans for expansion of the industry are described. Also mentioned is the attempt of some commercial interests to establish sovereignties beyond the jurisdiction of any state by filling in reefs in order to have a tax free base for mineral extraction and processing. It is concluded that few states have a clear concept of their national policy and that time is running out for reaching international agreement. (Grant-Florida)
W72-13941

PROPOSED RECLASSIFICATIONS OF CERTAIN WATERS IN THE BROAD, CATAWBA, FRENCH BROAD, HIWASSEE, LITTLE TENNESSEE, NEW, AND WATAUGA RIVER BASINS TO BE CONSIDERED AT A PUBLIC HEARING TO BE HELD ON JUNE 29, 1972, IN HICKORY, NORTH CAROLINA.
North Carolina Board of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 05G.
W72-13942

REQUIREMENTS FOR APPROVAL OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
For primary bibliographic entry see Field 05G.
W72-13943

ANALYSIS--FLORIDA WATER RESOURCES ACT OF 1972, (CHAPTER 72-299, LAWS OF FLORIDA).

Extract from report by Geraghty and Miller, Inc., Consulting Ground Water Geologists, Jacksonville, Fla. (1972). 12 p.

Descriptors: *Florida, *Water districts, *Water users, *Water utilization, Legislation, Water management (Applied), Water quality control, Water supply development, Planning, Groundwater, Surface waters, Land resources, Water resources, Legal aspects, Permits, Well permits, Water storage, Waste storage.

The analysis is intended as a guide to both users of ground and surface waters and those interested in the planning and management of water supply. The various duties of the five Water Management Districts into which the state is divided are set forth and include the management of water and land related resources, issuance of permits, providing water storage, and to work in conjunction with the Department of Natural Resources in formulating state water use and quality plans. The Florida Water Resources Act is termed 'the toughest water management Act in force in the Nation' since existing users must apply within two years after the implementation date for a permit to continue to divert water. Among other requirements, the applicant must show that his is a 'reasonable-beneficial use'. It is concluded that the Act's definition of 'reasonable-beneficial use' is vague and that its final determination will be decided by the courts. Previous court decisions have set forth a broad priority schedule for users as follows: (1) public and private utilities serving people, (2) agriculture, and (3) industrial. The Act also requires permits for the construction, repair or abandonment of any well and for the alteration of any dam or reservoir designed to impound waters which exceeds ten acres. The Act fails to cover impounding reservoirs or ponds used for storage of industrial wastes. (Ellis-Florida)
W72-13944

NATURAL RESOURCES AND RECREATION AGENCIES, 1971 ANNUAL REPORT.
State of Washington Report, (December 1971). 80 p, 29 fig, 10 tab.

Descriptors: *Administrative agencies, *Natural resources, *Recreation, *Washington, Ecology, Research and development, Political aspects, Agriculture, Water resources, Water pollution control, Water conservation, Water rights, Wells, Waste treatment, Grants, Fish management, Harbors, Aquatic environment, Salmon, Oceanography, Pollution abatement, Powerplants, Thermal powerplants, Water resources development, Institutions.

The Report covers Washington state programs dedicated to the enrichment of the quality of life for the people of the State of Washington. The Department of Ecology's principal activities include water resource management, water pollution control, solid waste management, shoreline management, and the development of a state water plan. The Department of Fisheries manages and preserves the state's fish food resources. Among its policies are the enforcement of provisions applicable to the protection of the aquatic environment and to support efforts to protect the environment. The Department of Natural Resources has among its many divisions that of surveys and marine land management whose programs include the propriety management of all state owned tidelands, shorelands, harbor areas and navigable waters' beds. The mandate of the Oceanographic Commission is to promote, develop, and advise on oceanographic matters. The Commission develops policies and identifies goals, but has no regulatory power. Also discussed is the Pollution Control Hearings Board which acts as a mediator in disputes concerning pollution matters. A Thermal Power Plant Site Evaluation Council exists to attempt to balance ecological considerations with the need for more electric power. (Ellis-Florida)
W72-13945

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT, APRIL 15.
For primary bibliographic entry see Field 05G.
W72-13947

POWERS AND DUTIES OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES, ITS OFFICERS AND DEPARTMENTAL AND ADVISORY BOARDS AND COMMISSIONS.
Pennsylvania Statutes Ann. tit. 71, secs. 510-1 thru 510-108 (Supp 1971).

Descriptors: *Pennsylvania, *Legislation, *Water resources development, *Water utilization, Water law, Legal aspects, Watercourses (Legal aspects), State governments, Administrative agencies, Regulation, Control, Administration, Consumptive use, Water supply, Water demand, Flood control, Water pollution control, Local governments, Water resources, Water management (Applied), Flood control.
Identifiers: Nuisance (Legal aspects).

The Department of Environmental Resources shall exercise the powers and perform the duties of a number of state agencies including the Department of Forests and Waters, the Water and Power Resources Board, the Water Supply Commission and the Flood Control Commission. The Department shall have authority over: conservation, marketing and distribution of the water resources; power to be derived from water resources; transportation by water; all water obstructions such as bridges and wharves; to maintain a complete inventory of all the water resources of the Commonwealth; and flood control. The Department is also given power to order the abatement of any nuisances or to enter upon premises and abate or remove such nuisance if the owner or occupant of the premises fails to comply with the order. An Environmental Quality Board is established to develop a master environmental plan for the Commonwealth. The Environmental Hearing Board is established to hold hearings and issue adjudications on any order, permit, license or decision of the Department. A unit responsible for enforcement of all laws within the jurisdiction of the Department shall be established in the Department. (Brackins-Florida)
W72-13948

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-13957

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 03E.

W72-13969

AIR CODE AND WATER QUALITY CRITERIA FOR INTERSTATE STREAMS FOR STATE OF ARKANSAS.
Arkansas Pollution Control Commission, Little Rock.

August 1969. 19 p, 2 fig.

Descriptors: *Arkansas, *Legislation, *Water law, *Legal aspects, *Water quality control, Water quality standards, Water pollution, Air pollution, Pollution abatement, State governments, Regulation, Control.
Identifiers: *Water quality criteria, Air code.

The 1969 Arkansas air pollution control code and water quality criteria for interstate streams are presneted. Items covered under the section on Water Quality Criteria include: the delegation of authority, the range of application of the laws, the specific standards of water quality, and the legal background of water quality laws in Arkansas. Criteria are set up to protect water quality for present and future use and include such parameters as: temperature, color, turbidity, taste, odor, solids, oils and grease, pH, bacteria, radioactivity, toxic substances, mineral quality, and dissolved oxygen. (Poertner)
W72-14044

THE DISPOSAL WELL ACT.
Texas Water Quality Board, Austin.

Agency Publication Number 72-01, February 1972. 15 p.

Descriptors: *Underground waste disposal, *Waste disposal, *Well regulations, *Texas, *Waste disposal wells, Injection wells, Legal aspects, Water quality control, Oil wastes, Municipal wastes, Water law, Legislation, Industrial wastes, Well permits, Solid wastes, Domestic wastes, State governments, Regulation, Permits, Control.

The Texas Water Quality Board prepared this extract of the 'Disposal Well Act', to present to the public the changes resulting from the recodification of Texas water laws by the Texas Legislature. Five subchapters deal with the following subjects: (1) general provisions, including the act's short title and relevant definitions; (2) regulations covering the issuance of permits for municipal and industrial wastes; (3) regulations covering the issuance of permits for oil and gas wastes; (4) general regulations setting the terms and conditions of the issuance of permits; and (5) civil and criminal remedies for violations. (Poertner)
W72-14050

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, TALKEETNA RIVER-SUSITNA RIVER-CHULITNA RIVER, TALKEETNA, ALASKA.
Corps of Engineers, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-13836

WATER BANK PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.
For primary bibliographic entry see Field 06G.
W72-13959

6G. Ecologic Impact of Water Development

NOTES ON THE AVIFAUNA OF THE MARSHY AREA OF PIERREPONT-SISSONNE (LAONNOIS-AISNE) II,
For primary bibliographic entry see Field 05C.
W72-13678

STUDY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVE LONG ISLAND SOUND BRIDGE SITES,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
E. J. Tuthill, and J. F. Bagg.
Technical Report Series No 12, August 1971. 140 p, 4 fig, 9 tab, 136 ref.

Descriptors: *New York, *Bridge construction, *Environmental effects, *Aquatic organisms, *Birds, *Habitats, *Food habits, *Spawning, *Nesting, *Reproduction, Wetlands, Water pollution, Protection, Legislation.
Identifiers: *Long Island, Bridge sites, Comparison studies.

A study of the environmental impacts of alternative bridge sites was conducted on Long Island Sound. Principal habitats, feeding areas and spawning grounds of all present and future commercial and sport fisheries were identified. The habitats, feeding areas, nesting and reproductive areas of major and rare species of birds and wildlife were also defined. A survey was taken of the existing wetlands within the immediate area of the bridge sites and classified by ownership and biological composition. Specific environmental effects of the alternative bridge sites were compared and approaches to the Rye-Oyster Bay bridge site were assessed. Current pollution levels and potential increases due to bridge construction are documented. An examination was made of existing Federal, State and local environmental protection laws relating to potential bridge sites. (Ensign-PAI)
W72-13907

FISH AND WILDLIFE IN THE MARINE AND COASTAL ZONE, PART A, SUMMARY PLANNING INFORMATION, AND RECOMMENDATIONS,
California State Dept. of Fish and Game, Sacramento.
E. C. Greenhood.
(Comprehensive Ocean Area Plan), Appendix III, November 1971. 166 p, 20 tab, 39 ref.

Descriptors: *California, *Coasts, *Wildlife, *Water quality, *Water utilization, *Land use, *Environmental affects, *Habitat, *Biological communities, Conservation, Resources development, Legislation, Fish, Shellfish, Mammals.
Identifiers: Statewide criteria, Coastal development.

Fish and Wildlife of the marine and coastal zone were studied along with land and water quality uses. Development and inappropriate use of these areas in California could result in population decreases or even extinction of some species. It is anticipated that this information on living organisms and the habitat upon which they depend may aid in setting a general statewide criteria for coastal zone use and development. Various governmental policies on living resources are explained with recommendations and discussions. The fish and wildlife of each county is recorded to aid planners in determining assets of a specific area and to prevent destruction of habitats. Detailed data on certain species of fish, shellfish and marine mammals are presented. (Ensign-PAI)
W72-13908

THE LAW AND THE CORPORATE POLLUTER: FLEXIBILITY AND ADAPTION IN THE DEVELOPING LAW OF THE ENVIRONMENT,
For primary bibliographic entry see Field 05G.
W72-13938

NATURAL RESOURCES AND RECREATION AGENCIES, 1971 ANNUAL REPORT.
For primary bibliographic entry see Field 06E.
W72-13945

AWARD OF P.L. 660 GRANT FOR CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES AND OUTFALL SEWERS--PROJECT NO. WPC-TEX-722 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Air and Water Programs Div.
For primary bibliographic entry see Field 05D.
W72-13949

SANDUSKY HARBOR, ERIE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-13950

WINNEBAGO-BEAN CREEK WATERSHED, RICHARDSON COUNTY, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13951

RED RIVER WATERWAY AND RED RIVER WATERWAY EMERGENCY BANK PROTECTION, MISSISSIPPI RIVER TO VICINITY OF INDEX, ARKANSAS, LOUISIANA, ARKANSAS, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 08A.
W72-13952

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.
For primary bibliographic entry see Field 05G.
W72-13953

DIKED DISPOSAL AREA PROGRAM, DULUTH-SUPERIOR HARBOR, ST. LOUIS COUNTY, MINNESOTA AND DOUGLAS COUNTY, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-13954

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 08D.
W72-13955

LANEPORT, NORTH FORK AND SOUTH FORK LAKES, SAN GABRIEL RIVER, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-13956

PROPOSED HYBRID PROTOTYPE DESALTING PLANT FOR BROWNSVILLE, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W72-13958

WATER BANK PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.

Available from the National Technical Information Service as PB-206 159-D, $3.00 in paper copy. January 31, 1972. 7 p.

Descriptors: *Wetlands, *Federal jurisdiction, *Environmental effects, *Legislation, Administrative agencies, Water law, Land use, Water policy, Wildlife conservation, Federal government, Wildlife habitats, Waterfowl, Aquatic habitats, Water levels, Mosquitos, Institutions, Runoff, Drainage practices, Drainage effects, Surface drainage.
Identifiers: *Environmental impact statement.

Under the Water Bank Program incentive payments will be made to landowners and operators for conserving waters and preserving or improving migratory waterfowl habitat and other wildlife resources. Under the program, long-term agreements are entered into with landowners or operators who agree to take certain actions. The program will help in reducing the loss of wetlands in the Nation. This will result in preserving habitat for migratory waterfowl and other wildlife resources, reduce water runoff, and build water table levels. An adverse environmental effect of the program would be the continuation of mosquito breeding grounds in some areas. An alternative would be to continue under existing arrangements, thus inducing many owners of wetlands to choose to drain their land. This program will help insure a beneficial long-term use of a part of man's environment by helping to keep it in a desirable natural and ecological state. There will be no irreversible or irretrievable commitment of resources under the program. (Waldron-Florida)
W72-13959

KINGSTREE BRANCH FLOOD CONTROL PROJECT, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13960

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13962

AUTHORIZED CHINA MEADOWS DAM AND RESERVOIR LYMAN PROJECT, WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Salt Lake City, Utah. Region 4.
For primary bibliographic entry see Field 08D.
W72-13963

LITTLE RIVER INLET, NORTH CAROLINA AND SOUTH CAROLINA, NAVIGATION IMPROVEMENTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13964

LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-13965

WINNEBAGO-BEAN CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13966

AQUATIC PLANT CONTROL PROGRAM, HUDSON AND MOHAWK RIVERS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-13967

STUART GULCH DAM, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 08D.
W72-13968

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 03E.
W72-13969

WATER FOR ALABAMA, THE ALABAMA WATER-RESOURCES SPECTRUM--SECOND PROGRESS REPORT,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 05G.
W72-14024

DESIGN AND SITING CRITERIA FOR ONCE-THROUGH COOLING SYSTEMS BASED ON A FIRST-ORDER THERMAL PLUME MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05C.
W72-14030

THE CONTROL OF ENVIRONMENT.

112p, North-Holland Publishing Co.: Amsterdam, The Netherlands, and Fleet Academic Editions, Inc., Roslansky, John D. (Edited by), 1971. Pr. $7.50.
Identifiers: Book, *Control, *Environment, Symposium.

The papers presented in this volume were delivered at the 2nd Nobel Conference held at Gustavus Adolphus College on Jan. 12 and 13, 1966. The 5 papers presented are concerned with the effect of the environment on human life and the possibilities of improving life and the conditions in which it develops through the exercise of intelligent control. This book will be of interest to anyone concerned with the relationship between man and his environment.--Copyright 1972, Biological Abstracts, Inc.
W72-14122

MAN AND HIS ENVIRONMENT: CLIMATE,
David M. Gates.
175 P. Harper and Row: New York, N. Y., London, England, 1972. Paper. Pr. $3.25.
Identifiers: Animals, Book, *Climate, *Environment, Plants, *Pollution.

This book is helpful to anyone interested in the effect of weather on himself as well as on other animals and plants. It begins with a basic presentation of fundamental information on weather including temperature and pressure, winds, topographical influences and weather and climate. Among the climatic factors presented are radiation, air temperature, moisture, surface effects and comparison of climates followed by a discussion on various specific climate types and the relationship between climate on various specific climate types and the relationship between climate and man. A presentation is of the interrelationship between plants and animals and their particular climate followed by a discussion on the effects of pollution on climate. The book ends with the author's conclusions and opinions on the future of the environment. Graphs, tables, plates, maps and equations are found throughout.--Copyright 1972, Biological Abstracts, Inc.
W72-14137

07. RESOURCES DATA

7A. Network Design

A REVIEW OF PESTICIDE MONITORING PROGRAMS IN CALIFORNIA.
California State Dept. of Agriculture, Sacramento. Pesticide Advisory Committee.
For primary bibliographic entry see Field 07B.
W72-14043

7B. Data Acquisition

RECENT DEVELOPMENTS OF PHYSICAL INVESTIGATIONS IN BOREHOLES AND WELLS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13727

APPLICATION OF NATURAL ISOTOPES IN GROUND WATER HYDROLOGY,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
For primary bibliographic entry see Field 02F.
W72-13728

AN ELECTRONIC GROUNDWATER-LEVEL DETECTOR WITH AUTOMATIC OUTPUT REGISTRATION,
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands). An Electronic Groundwater-Level Detector with Automatic Output Registration,
W. P. Van Rijn, and K. J. Weber.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 137-142, 1972. 5 fig.

Descriptors: *Water levels, *Gages, *Instrumentation, *Piezometers, *Telemetry, Aquifer testing, Monitoring, Data collections.
Identifiers: *Water level recorders.

A simple, robust, electronic groundwater-level detector measures the water level in piezometers with an accuracy of better than plus or minus 1 mm. A series of these instruments can be connected to an automatic digital recording system. Measurements can be performed according to a selected program of measuring times. The reference level at each level detector location is indicated by gaging glasses attached to a system of interconnected liquid-filled tubes. (Knapp-USGS)
W72-13729

EQUIPPING STRUCTURES OF HYDROELECTRIC POWER STATIONS WITH MEASURING DEVICES FOR MONITORING PERCOLATION,
For primary bibliographic entry see Field 08D.
W72-13758

VARIATION OF PRECISION WITH TIME FOR AUTOANALYZER DATA,
Institute of Rural Science, Aberystwyth (Wales). Analytical Lab.
N. T. Faithfull.
Laboratory Practice, Vol 21, No 4, p 245-247, 268, April 1972. 3 fig, 2 tab, 5 ref.

Descriptors: *Automation, *Nitrogen, *Potassium, *Colorimetry, Flame photometry, Evaluation, Laboratory equipment, Pump testing, Performance, Methodology, Testing procedures, Quality control.
Identifiers: AutoAnalyzers, *Peristaltic pumps, Precision.

The time allowed for the peristaltic pump of an AutoAnalyzer to pump reagents before sampling commences is shown to affect the precision of results. For the colorimetric determination of nitrogen, about 40 minutes warmup is needed, and for flame-photometric determination of potassium, about 23 minutes. The adequacy of assessing the precision of AutoAnalyzer data in terms of standard deviations was examined and its validity shown to depend on a normal distribution of results. It is important that a valid standard deviation figure is used. Histograms from repeatedly analyzed nitrogen and potassium standards are presented. (Mortland-Battelle)
W72-13763

ON CALCULATION OF THE AREAS OF OFF--CHART CHROMATOGRAPHIC PEAKS USING DATA OBTAINED WITH THE AID OF INTEGRATORS,
Akademiya Nauk SSSR, Moscow. Institut Organicheskoi Khimii.
B. Rudenko.
Journal of Chromatographic Science, Vol 10, No 4, p 230-232, April 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Mathematical studies, *Chromatography, Automation, Equations, Approximation method, Pollutant identification.
Identifiers: *Chromatographic peaks, Gaussian curves, Integrators, Errors, Gas liquid chromatography, Chromatograms, Accuracy.

In order to determine the full areas of 'off-chart' chromatographic peaks, a new mathematical method has been introduced based on the Gaussian curve approximation to the peak height. This method uses the area of the resulting curvilinear trapezium and its height and width on top. These parameters can be registered by use of an integrator and verified by computation. The method can be applied for quantitation of chromatograms and gives an accuracy usually obtained in quantitative gas-liquid chromatographic analysis. (Mackan-Battelle)
W72-13769

ON-LINE COMPUTER-CONTROLLED ELECTRICAL DETECTION IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
G. H. Morrison, B. N. Colby, and J. R. Roth.
Analytical Chemistry, Vol 44, No 7, p 1203-1206, June 1972. 3 fig, 10 ref.

Descriptors: *Computers, *Instrumentation, *Methodology, *Automation, *Mass spectrometry, Trace elements, Pollutant identification, Laboratory equipment, Data processing, Data transmission, Data collections.
Identifiers: *Spark source mass spectrometry, Chemical interference, Errors, Precision, Detection, Accuracy.

The design and operation of a versatile on-line computer controlled electrical detection system are described for use in spark source mass spectrometry. The system utilizes a PDP-11/20 dedicated, on-line computer capable of controlling the magnet and electrostatic analyzer of a mass spectrometer in either a scanning or peak switching mode. Since the peak switching mode provides a more precise and accurate method for the determination of trace elements, it has been emphasized in this study. In order to determine how precisely measurements are made with the described system, a sample of 99.9 percent pure iron was analyzed for its mass 58 isotope. For 10 sets of ten measurements, the mean precision (instrumental error) for the Fe-58 isotope was 2.3 percent relative standard deviation. Advantages of the system include: (1) It is convenient to check for possible mass interference with the on-line computer system which might be missed during analysis using a manual switcher; (2) The computer can be programmed to calculate and set a given electrostatic analyzer voltage so that a given mass can be analyzed by the computer even though the peak is not large enough to be observed on the oscilloscope display during the computer scan of the electrostatic analyzer voltage; and (3) The speed of acquisition and reduction of data permits almost immediate evaluation of results. (Long-Battelle)
W72-13770

SEMIINTEGRAL ELECTROANALYSIS: THEORY AND VERIFICATION,
Trent Univ., Peterborough (Ontario).
For primary bibliographic entry see Field 02K.
W72-13791

A NEW LIGHT TRAP FOR PLANKTON,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05A.
W72-13797

VERSATILE COLORIMETRIC COULOMETER,
Honeywell Research Center, Hopkins, Minn.
For primary bibliographic entry see Field 02K.
W72-13802

PRELIMINARY REPORT ON TECHNIQUES FOR MARINE MONITORING SYSTEMS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W72-13850

ESTIMATING THE WETTING OF WALLS BY DRIVING RAIN (OB OTSENKE UVLAZHENIYA STEN PRI KOSYKH DOZHYDAKH),
Main Geophysical Observatory, Leningrad (USSR).
Ts. A. Shver.
In: Prikladnaya klimatologiya; Glavnaya Geofizicheskaya Observatoriya, Trudy No 246, p 122-129, Leningrad, 1969. 2 fig, 3 tab, 7 ref.

Descriptors: *Precipitation (Atmospheric), *Rainfall, *Impact (Rainfall), *Wetting, *Walls, Surfaces, Structures, Buildings, Winds, Wind velocity, Annual, Evaluation.
Identifiers: *European USSR, *Barents Sea, *Baltic Sea, *Gulf of Finland, *Driving rain, Wind-driven precipitation, Wind direction, Wind rose.

The Lacy-Shellard index of driving rain is found too inaccurate becasue it ignores wind direction and relies only on mean annual precipitation and mean annual wind speed. A relative measure of the wetting of walls is provided by a more refined driving-rain index, which is the product of total precipitation and frequency of wind speeds of more than 5 m/sec. A study of maps of the driving-rain index for 158 stations in the European USSR reveals that 30% to 40% of total precipitation strikes walls and other vertical surfaces north of latitude 55 deg N, but that the percentage rises to about 70% along the coasts of the Barents Sea, the Baltic Sea, and the Gulf of Finland. The frequency of wind directions on rainy days can be used to determine the amount of precipitation striking walls of varying exposure. (Josefson-USGS)
W72-13855

PROBLEMS IN HYDROLOGIC INSTRUMENTATION (VOPROSY GIDROLOGICHESKOGO PRIBOROSTROYENIYA).

Gosudarstvennyy Gidrologicheskiy Institut, Trudy No 189, Leningrad, 1971. 144 p.

Descriptors: *Hydrology, *Hydrometry, *Instrumentation, *Measurement, *Analytical techniques, Automation, Control, Regulation, Telemetry, Computers, Gages, Soil moisture meters, Water level recorders, Equipment, Hydrographs, Discharge (Water), Runoff, Physical properties, Conferences, Foreign research.
Identifiers: *USSR, Hydrometric stations.

This collection of 15 papers provides information on Soviet hydrologic instruments and on technical procedures used in water-resources investigations. Methods are given for determining optimal frequency of discharge measurements in gaging streams and moisture content of soils through analysis of terrestrial gamma radiation. Instruments described include the SNM-11 neutron soil-moisture meter, the 'Valday-1' and 'Valday-2' automatic digital temperature gages, the 'Valday' automatic water-level recorder, the GR-97 telemetering water-level gage, and the M-100 radioisotope snow gage. A brief review is given of selected reports presented at the International Symposium on Hydrometry held in Koblenz, Germany between September 19 and 24 1970, and devoted to new techniques and instruments for hydrologic investigations. Intended primarily to serve practicing scientists, methodologists, and engineers interested in various aspects of instrumentation, the text will also prove valuable to hydrometeorologists, and to teachers, undergraduates, and graduates at higher academic institutes. (Jesefson-USGS)
W72-13859

A RADIATION MOLE FLOW-MOISTURE METER,
A. S. Kareev, B. Ya., Minkov, and P. S. Bespalyi.
Available from NTIS, Springfield, Va 22151 as PB-209 058-T, for $3.00 paper copy; 95 cents microfiche. National Tillage Machinery Laboratory Translation, April 1972. 7 p, 5 fig, 2 tab, 4 ref. Translated from Mekhan. i Elektrif. Sots. Sel. Khoz., No 1, 1972.

Descriptors: *Soil moisture, *Moisture meters, *Forestry, *Testing procedures, *Soil tests, Forest soils, Density, Energy, Instrumentation, Measurement, Equations, Data collections.

A mole plow radiation moisture meter was developed for use in measurement of soil conditions in areas where gross sampling of the soil is required, as in tree plantings. An equation was developed to describe the draft force on the mole knife. The radiation mole plow moisture meter was mounted on tractors up to 3 tons, in a cylindrical or narrow slit-shaped mole. Radiation studies of the moisture and density meters were conducted both in the field and laboratory conditions. Energy studies were conducted at different depths to determine the required roughness of working surfaces, speed of movement of the equipment, and to study the physical-mechanical properties of the soil. The resistance of the soil to cutting increased with increases of speed, depth of cutting, and width of cut. (Woodard-USGS)
W72-13862

USE OF ZAYTSEV METHOD FOR DETERMINING THE WATER CONTENT OF FOGS IN CHAMBERS,
A. F. Mumanenko.
Available from NTIS, Springfield, Va 22151 as AD-741-521, for $3.00 paper copy; 95 cents microfiche. U.S. Army Foreign Science and Technology Center Technical Translation, FSTC-HT-23-108-71, October 27, 1971. 8 p, 4 fig, 1 tab, 9 ref.

Descriptors: *Cloud physics, *Fog, *Atmospheric physics, *Meteorology, Meteoric water, Measurement, Condensation, Water vapor, Analytical techniques, Water equivalent, Precipitation (Atmospheric).

The structure of clouds and fogs were studied including the drop size and water content (i.e., the mass of water in the liquid or solid phase, occurring per unit of colume of air). Of all the currently existing methods of measuring water content, the simplest and most widely used is the method of V.A. Zaytsev. In this method, the air to be examined, together with the particles of cloud or fog is directed in a narrow stream at rather high speed into a strip of filter paper covered with dye and placed in a special holder. The air flows freely through the holder, but the drops are deposited by inertia on the paper and saturate it. A spot appears on the paper whose average diameter characterizes the magnitude of the water content. (Woodard-USGS)
W72-13863

APPARATUS FOR MEASURING PROPERTIES OF A FLUID BODY FROM AN AIRBORNE VEHICLE,
Buzzards Bay Corp., Marion, Mass. (Assignee).
S. A. Francis.
U.S. Patent No 3,552,205, 4 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 83, January 5, 1971.

Descriptors: *Patents, Water properties, *Instrumentation, *Measurement, *Bathythermographs, Depth, *Water temperature, *Sea water.
Identifiers: *Airborne instrumentation, *Thermistors.

An airborne vehicle (helicopter) launches or deploys a probe which contains a property sensing element such as a thermistor and sea electrodes for closing a circuit by means of conductive sea water. The sensing element and sea electrodes are connected by means of a three-wire conductor to a measuring bridge circuit located aboard the aircraft. The resistance in the sensing element varies as a function of the water property. The bridge measuring circuit is associated with a servosystem operating a recording system to produce a record of the measurement as a function of the depth of the water. (Sinha-OEIS)
W72-13876

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 03F.
W72-14009

A REVIEW OF PESTICIDE MONITORING PROGRAMS IN CALIFORNIA.
California State Dept. of Agriculture, Sacramento. Pesticide Advisory Committee.

California State Water Resources Control Board, Sacramento, February 1971. 80 p, 6 tab, 61 ref.

Descriptors: *Pesticides, *Monitoring, *California, *Data collections, Water quality, Water pollution, Municipal wastes, Industrial wastes, Water quality control, Heavy metals, Water pollution control.
Identifiers: *Pesticide monitoring.

Recognizing that pesticides are a significant form of water pollution, California formed a Pesticide Advisory Committee to serve the State Department of Agriculture. The Pesticide Advisory Committee early in its existence recognized that a comprehensive study of the current problem of pesticides must be made if a sensible program of control is to be set up. This has led to the statewide review of pesticide monitoring programs. A significant amount of pesticides were found in municipal and industrial wastes, and the present monitoring system was fragmented and uncoordinated. Agricultural runoff was also a significant contributor to the state's pesticides problems and the use of highly toxic organo-phosphate pesticides would contribute greatly to the problem. Refuse dumps were inadequately monitored for pesticide pollution, and heavy metals monitoring was inadequate. It is recommended that the State set up a comprehensive, coordinated system to monitor pesticides and trends in pesticide concentrations. Municipal wastes are especially seen as an area which had previously escaped monitoring and it is felt that this should be remedied. (Poertner)
W72-14043

INDIANA WATER QUALITY, 1969, MONITOR STATION RECORDS--RIVERS AND STREAMS.
Indiana State Board of Health, Indianapolis; and Indiana Stream Pollution Control Board, Indianapolis.

1970. 139 P, 3 FIG, 108 TAB.

Descriptors: *On-site data collections, *Basic data collections, *Indiana, *Water quality, *Water sampling, Water pollution, Rivers, Streams, Alkylbenzene sulfonates, Alkalinity, Biochemical oxygen demand, Chlorides, Coliforms, Color, Dissolved oxygen, Hardness (Water), Nitrates, Odor, pH, Phosphates, Suspended solids, Turbidity.

This is the 11th annual compilation on water quality data for the State of Indiana. Using 82 data collecting stations on Indiana streams, the Ohio River and Lake Michigan, the following water quality parameters are tabulated: (1) ABS, (2) alkalinity (tital), (3) BOD, (4) chlorides, (5) coliform, (6) color, (7) dissolved oxygen, (8) hardness, (9) nitrates, (10) odor, (11) pH, (12) phosphates, (13) specific conductance, (14) suspended matter, and volatile suspended matter, (15) total residues, and (16) turbidity. The objective of the program is six-fold, including (1) the determination of characteristics of pollutants in Indiana waters, (2) the indication of pollution sources in Indiana, and (3) to compile background data on wastes for use in abatement programs. Criteria for locating the sampling stations used in the study are given. Stations were located on waters used for municipal, industrial, agricultural and recreational purposes. Their proximity to sources of pollution and state boundaries also influenced the selection of locations for these stations. (Poertner)
W72-14045

WEST VIRGINIA WATER QUALITY NETWORK.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.

1971. 149 P, 1 FIG, 64 TAB.

Descriptors: *West Virginia, *Water quality, *Water sampling, *Data collections, Water pollution, Rivers, Coliforms, Bio-chemical oxygen demand, Alkalinity, Heavy metals, pH, Odor, Color, Chlorides, Sulfates, Turbidity, Analytical techniques, Networks.

West Virginia set up a Water Quality Network to obtain data on water quality throughout the state. Specific objectives of their program are: (1) establish water quality trends; (2) warn of detrimental changes in water quality, (3) obtain data useful to municipal, industrial, agricultural, recreational and civic interests; and (4) bracket waste discharges and determine their types and effects upon the stream under various conditions. Over 30 parameters were included in this study. Sampling stations were selected so that data could be obtained on all major streams entering and leaving the state. The individual stations were set up near existing U. S. Geological streamflow gaging stations. Included is a copy of the West Virginia water quality regulations, amended to 1969. (Poertner)
W72-14048

IMPROVED THERMOCOUPLE PSYCHROMETER FOR THE MEASUREMENT OF PLANT AND SOIL WATER POTENTIAL: II. OPERATION AND CALIBRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
B. D. Millar.
J Exp Bot. 22 (73): 891-905. Illus. 1971.
Identifiers: Calibration, *Measurement, Operation, *Psychrometer measurement, Soils, Temperature, *Water potential.

The operation characteristics (the Peltier cooling current i and the cooling period tc), the range of measurement of water potential, the calibration sensitivity, and the accuracy are evaluated for an improved psychrometer and compared with data in the literature, and with a recent theory. It has been found to agree fairly well with the predictions of theory. A maximum range of 0 to about -13,000 J/kg is obtainable with the improved psychrometer. This is nearly twice that previously reported for a Spanner-type psychrometer. The experimental calibration sensitivities C's increase with increasing water potential, cooling period, and temperature and, with tc = 60 s, are in general larger than the theoretical values at high water potentials but less than the theoretical values at low water potentials. They are mostly larger than those reported by Monteith and Owen but about the same as those of Lang and Trickett. The accuracy of the improved psychrometer is significantly greater than that previously reported for a Spanner-type psychrometer. While the theory predicts a linear relationship between water potential and peak output, the observed calibration curves are non-linear and vary between psychrometers. Because of these discrepancies between observation and theory, calibration of each psychrometer is necessary.--Copyright 1972, Biological Abstracts, Inc.
W72-14120

THE USE OF AERIAL PHOTOS IN PEDOLOGICAL CARTOGRAPHY OF THE AREA OF TRANSITION BETWEEN THE TROPICAL FOREST AND SAVANNA IN THE CENTRAL IVORY COAST,
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Fysiologische Scheikunde.
W. Verheye.
Natuurwetensch Tijdschr. 52 (4-8): p 137-152. Illus. 1970 (1971). (French summary).
Identifiers: *Aerial photography, Cartography, Forest, *Ivory Coast, *Pedological cartography, Savanna, *Soils, Transition, Tropical, Vegetation.

A close relationship between the natural vegetation and soils exists in the granitic landscape covering large areas in the zone of transition between the dense tropical forest and the savanna in the central Ivory Coast. The key factor at the base of this relationship is the water-retaining capacity. The available moisture in the profile has a direct influence on the natural vegetation of the surface, especially in determining the rapidity with which forest regeneration occurs following clearing. The modal or hardened modified ferrallitic soils located on the plateaus retain enough

moisture, even during the dry season, to allow rapid establishment of a secondary forest. However, the colluvial modified ferrallitic soils with a sandy texture, which are located along the slopes, have a marked water deficiency during certain periods of the year causing the presence of a grassy savanna on these soils. As for the hydromorphous colluvial modified ferrallitic soils located in the humid bottom lands, they are always covered with a littoral forest; the extension of this specific type of vegetation strongly coincides with the hydromorphous soil zones.--Copyright 1972, Biological Abstracts, Inc.
W72-14129

AN INSTRUMENT FOR CONTINUOUS RECORDING OF NATURAL EVAPORATION,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
I. C. McIlroy.
Agric Meteorol. 9 (1/2): 93-100. Illus. 1971.
Identifiers: Crops, *Evaporation, *Instrumentation, Recording, Sensing.

Direct recording of evaporation from crops or other natural surfaces, continuously over long periods, has till now been practicable only by means of elaborate weighed lysimeters or possibly, for large enough uniform sites, by sophisticated eddy correlation techniques. The present instrument adapts the well-known Bowen-ratio method so as to combine the sensing and computing functions into 1 relatively simple package. It utilizes a servo-balanced bridge technique to give a continuous output proportional to the evaporation rate at a low height above the surface, and suitable for conventional recorders or integrators. Trials with an early pilot-model have shown a very satisfactory daytime performance at night.--Copyright 1972, Biological Abstracts, Inc.
W72-14136

WATER PROFILE FLUCTUATIONS RECORDED BENEATH SOME FORAGE PLANTS DURING THE DRY SEASON USING THE NEUTRON METHOD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre d-Adiopodoume.
J. C. Talineau, and P. A. Lespinat.
Cah O. R. S. T. O. M. (Off Rech Sci Tech Outre-Mer) Ser Biol. 15. 3-19. Illus. 1971. English summary.
Identifiers: *Neutron moisture gage, Centrosema-Pubescens-D, Cynodon-Plectostachyon-M, Dry season, *Forage plants, *Ivory Coast, Panicum-Maximum-M, Pennisetum-Purpureum-M, Plants, Recorded, Stylosanthes-Gracilis-D, Tripsacum-Laxum-M, *Water profiles.

A neutron moisture gauge has been used at Adiopodoume (southern Ivory Coast) to find the profile of the field at capacity and the study of the behavior of the following forage plants during the dry season: Panicum maximum, Pennisetum purpureum, Tripsacum laxum, Cynodon plectostachyon; Stylosanthes gracilis, Centrosema pubescens. The experimental field (tertiary sand) was homogeneous, making possible a single calibration curve for the moisture gauge. Regular recording of the neutron profiles provided a means of comparing the water consumption of the different plants in the layer 0-100 cm. The influence of the available water capacity of the soil and also indicated the root system of plants separate treatments of grasses and leguminous plants.--Copyright 1972, Biological Abstracts, Inc.
W72-14138

PSYCHROMETRIC APPARATUS FOR BOWEN--RATIO DETERMINATION OVER FORESTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
T. A. Black, and K. G. McNaughton.
Boundary-Layer Meterorol. 2 (2): 246-254. Illus. 1971.
Identifiers: *Bowen-ratio determination, *Douglas fir, Fir-G, Forests, *Psychrometric apparatus.

The psychrometric apparatus design for Bowen ratio determination reported previously by Sargeant and Tanner was modified and a new apparatus built. Modification of the intake design improved the symmetry and rigidity of the sensor mounting. Wet- and dry-bulb differences were measured with an error less than 0.01 degrees C over a vertical distance of 1 m. Continuous measurements of the Bowen ratio over a 7.8-m Douglas fir forest were made for 6 wk. An example of the energy balance for the forest for 1 day using this equipment is reported.--Copyright 1972, Biological Abstracts, Inc.
W72-14184

MECHANICAL BALANCE: ELECTRICAL READOUT WEIGHING LYSIMETER,
Atmospheric Environment Service, Toronto (Ontario).
E. I. Mukammal, G. A. McKay, and V. R. Turner.
Boundary-Layer Meterorol. 2 (2): 207-217. Illus. Map. 1971.
Identifiers: Electrical readout, *Lysimeters, *Mechanical balance, Percolation, *Runoff measurement.

As part of the research program of the Atmospheric Environment Service, a large, sensitive weighing lysimeter was constructed on the Atmospheric Environment Service research site north of Toronto. Features of the instrument include: measurement of runoff, percolation, drainage of water held in tension, addition of water from below during dry conditions, equalization of soil temperature profile inside with that outside the lysimeter, humidity control to eliminate condensation, low area of discontinuity at the rim to reduce edge effects, and quasimonolith filling. This paper describes the construction and installation of the lysimeter, the problems encountered and some infrequently considered sources of error.--Copyright 1972, Biological Abstracts, Inc.
W72-14185

AN IMPROVED SOIL WATER FLUX SENSOR,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
G. F. Byrne.
Agric Meteorol. 9 (1/2): 101-104. Illus. 1971.
Identifiers: Flow, *Measurement, Rate, *Sensor, *Soil-water flux.

The design, construction, and calibration of a sensor which can be used to measure water flow rates through soil of 10-3 cm/sec is described.--Copyright 1972, Biological Abstracts, Inc.
W72-14192

A HAND-AUGERING METHOD OF INSTALLING ACCESS TUBING FOR NEUTRON MOISTURE METERS,
Forestry Office, Atherton (Australia).
D. A. Gilmour.
Aust For Res. 5 (3): 33-38. Illus. 1971.
Identifiers: Auger, Boring, Equipment, *Meters. *Neutron moisture meters, Sampling, *Soils, Tubing.

Equipment is described for preparing holes for the installation of neutron moisture meter access tubing. It can be man-handled into areas inaccessible to vehicles and provides a versatility not found in conventional techniques. The main feature is the provision of easily exchangeable auger heads. Boring is carried out in 10 cm sections and the soil is retained for subsequent laboratory analyses so that field calibration of the neutron probe can be accomplished.--Copyright 1972, Biological Abstracts, Inc.
W72-14194

7C. Evaluation, Processing and Publication

DIGITAL SIMULATION OF THUNDERSTORM RAINFALL,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 02B.
W72-13634

FLOODING ALONG THE RIO PIEDRAS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
W. J. Haire.
Geological Survey Hydrologic Investigations Map Series No 1, 1972. 2 sheets, 2 fig, 1 map, 1 tab, 1 ref.

Descriptors: *Floods, *Flood damage, *Flood plains, *Flood profiles, *Puerto Rico, Regional flood, Flood forecasting, Flood control, Historic floods, Peak discharge, Flood frequency.
Identifiers: *Rio Piedras (P.R.), San Juan (P.R.).

This 2-sheet hydrologic atlas describes flooding along the Rio Piedras in the San Juan area, Puerto Rico, to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, tables, and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, run off, historical flood heights and other technical data. The only floods for which elevation data are available occurred on June 17, 1970 and October 6, 1970. The larger of the two was the June flood. Storm runoff from the upper basin caused flooding in the University Gardens urbanization with a peak water level of 21 meters. The average frequency of occurrence for the peak discharge (10,000 cubic feet per second) of the flood of June 17 is 8 years. (Woodard-USGS)
W72-13714

GROUND WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
E. D. Gutentag, D. H. Lobmeyer, and H. E. McGovern.
Geological Survey Hydrologic Investigations Atlas HA-416, 1972. 2 sheets, 14 fig, 5 tab, 13 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Water wells, *Water quality, *Kansas, Water yield, Aquifer characteristics, Pumping, Drawdown, Water utilization, Irrigation, Groundwater recharge, Specific capacity, Maps, Curves, Hydrologic data.
Identifiers: *Kearny County (Kans).

This 2-sheet hydrologic atlas uses a text and 19 illustrations (maps, tables, and curves) to describe groundwater hydrology in Kearny County, Kansas. Tertiary and Quaternary deposits underlie most of Kearny County and range in thickness from a few feet to about 500 feet. The increasing use of groundwater for irrigation has resulted in a decline in water levels and a gradual loss of water in storage. Water-level declines from 1940 to 1968 ranged from zero to more than 30 feet. The decline is compared to the decline in thickness of saturated material. In the north-central part of the county, a 30% decline in the saturated thickness has resulted in a significant reduction in well yields. In the area east of the fault, saturated thickness is great and declines are generally less than 10%. Yields from individual wells may be as much as 2,400 gpm; some battery-well systems have produced more than 4,000 gpm. Water in the alluvial aquifer may be a calcium bicarbonate or a calcium sodium sulfate type and is very hard. Water in the sandstone aquifer is a sodium bicarbonate type and is hard. (Woodard-USGS)
W72-13715

GROUND-WATER RESOURCES OF MCLEAN COUNTY, WEST-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
R. L. Klausing.
Available from USGS, Washington, DC 20242-Price $0.75. Geological Survey Hydrologic Investigations Atlas HA-475, 1972. 1 sheet, 1 fig, 1 map, 1 tab, 6 ref.

Descriptors: *Groundwater resources, *Water supply, *Water yield, *Water quality, *North Dakota, Aquifer characteristics, Water wells, Withdrawal, Water utilization, Maps, Curves, Hydrologic data, Water analysis, Chemical analysis, Water resources development.
Identifiers: *McLean County (N. Dak).

This one-sheet hydrologic atlas describes the occurrence and movement of groundwater in McLean County, N. Dak., including the sources and areas of recharge and discharge, the potential yields of wells tapping the major aquifers, and the chemical quality of the groundwater. Important aquifers occur both in the glacial drift and in the underlying bedrock formations. The major glacial-drift aquifers generally will yield more than 50 gpm to individual wells and in places will yield more than 1,000 gpm. Three bedrock units--the Fort Union Formation, Hell Creek Formation, and Fox Hills Sandstone--supply water to wells in McLean County. The most productive bedrock aquifers consist of sandstone and lignite beds. Wells tapping these aquifers can be expected to yield from 2 to 100 gpm. Water from the bedrock aquifers is predominantly soft and is a sodium bicarbonate type. Water from the glacial-drift aquifers generally is harder but less saline and of better quality than water from the bedrock aquifers. (Woodard-USGS)
W72-13716

A COMPUTERIZED SYSTEM FOR STORING, RETRIEVING, AND CORRELATING NMR DATA,
Hercules Research Center, Wilmington, Del.
H. Skolnik.
Applied Spectroscopy, Vol 26, No 2, p 173-182, March/April 1972. 13 tab, 6 ref.

Descriptors: *Indexing, *Nuclear magnetic resonance, *Molecular structure, Spectroscopy, Computers, Computer programs, Organic compounds, Data processing, Automation, Data storage and retrieval, Documentation, Information retrieval.
Identifiers: *Chemical shifts, Protons.

The importance and value of nuclear magnetic resonance arise from the unique and characteristic chemical shifts of protons in organic compounds. Although the resultant shift spectrum is primarily due to the protons in each proton group, it is also modified by other nuclei in the molecule. Because a meaningful correlative index of chemical shift values is essential for effective use of NMR data, a new method based on a linear notation system has been developed. This method uses symbols to express various C-H combinations and other H-R combinations. The notation of each compound and the shifts of each proton group constitute input for a computer which processes the data by a permutation or wrap around program yielding as many index entries as there are proton groups (with shift data) in each molecule. An additional program yields an output, by increasing value, of the chemical shifts of any proton group relative to its neighboring groups. This method not only provides for more effective data handling but eliminates manual indexing and includes more than just a few of the atoms of the full structure, both of which are cited as disadvantages of the Sadtler Chemical Index and Varian Functional Group Index. (Mackan-Battelle)
W72-13808

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
For primary bibliographic entry see Field 10B.
W72-13820

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
For primary bibliographic entry see Field 02A.
W72-13824

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65, PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 2. BASINS FROM NEW YORK TO DELAWARE.
Geological Survey, Washington, D.C.

Geological Survey Water-Supply Paper 1902, 1970. 924 p, 1 fig, 1 plate.

Descriptors: *Surface waters, *Hydrologic data, *Basic data collections, *New York, *Delaware, Streamflow, Flow measurements, Stream gages, Gaging stations, Flow rates, Crest-stage gages, Discharge measurement, Low flow, Peak discharge, Average flow, Lakes, Reservoirs, Water levels, Reservoir operation.
Identifiers: *North Atlantic Slope Basins (NY to Del).

This volume of surface water data for the North Atlantic Slope Basins from New York to Delaware is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1961-65 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W72-13827

ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES-PETROLOGY OF THE SAND FRACTION OF SEDIMENTS, NORTHERN NEW JERSEY TO SOUTHERN FLORIDA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-13830

PERMAFROST IN CANADA.
Geological Survey of Canada, Ottawa (Ontario).

Available from Geol. Survey of Canada and Div. of Building Research, Ottawa-$0.50. Canada Geological Survey Map 1246A-Division of Building Research Publication NRC 9769, 1969 (revised). 1 sheet, 1 map, 1 tab, 65 ref.

Descriptors: *Permafrost, *Canada, *Maps, *Data collections, Frozen ground, Cold regions, Climatology, Temperature, Soil properties, Soil moisture.

This one-sheet atlas describes the distribution and occurrence of permafrost in Canada. The permafrost region is divided into two zones-continuous and discontinuous. The division between these zones is the 23 degree F isotherm of mean annual ground temperature measured just below the zone of seasonal variation (level of zero annual amplitude). In the discontinuous zone, there are areas and layers of unfrozen ground. In the continuous zone, permafrost occurs everywhere beneath the ground surface except possibly in newly deposited unconsolidated sediments where the climate has just begun to impose its influence on the ground thermal regime. The thickness of permafrost varies from about 200 feet at the southern limit of the continuous zone to more than 1000 feet in the northern part of the zone. The active layer, which freezes in winter and thaws in summer, generally varies in thickness from about 1 1/2 to 3 feet and usually extends to the permafrost table. The temperature of the permafrost at the level of zero annual amplitude ranges from 23 F in the south to about 5 F in the extreme north. (Woodard-USGS)
W72-13831

FOUR-DIMENSIONAL WORLD-WIDE ATMOSPHERIC MODELS (SURFACE TO 25 KM ALTITUDE),
Allied Research Associates, Inc., Baltimore, Md. Baltimore Div.
For primary bibliographic entry see Field 02B.
W72-13843

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.
For primary bibliographic entry see Field 06A.
W72-13929

DIGITAL COMPUTER MODELING OF LIMESTONE GROUNDWATER SYSTEMS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02F.
W72-14001

STREAMFLOW SYNTHESIS -- A CASE STUDY,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14005

THEORY OF STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14007

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1972,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14023

RECORDS OF WELLS IN HARRIS COUNTY, TEXAS, 1892-1972,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W72-14027

DEVELOPMENT OF GROUND WATER IN THE EL PASO DISTRICT, TEXAS, 1963-70,
Geological Survey, El Paso, Tex.
For primary bibliographic entry see Field 02F.
W72-14029

08. ENGINEERING WORKS

8A. Structures

TECHNIQUES FOR PREVENTING DIFFERENTIAL-PRESSURE STICKING OF DRILL PIPE,
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 08C.
W72-13618

PLAN THE MUD PROGRAM TO REDUCE EXPLORATION COST,
National Lead Co., Houston, Tex. Baroid Div.
G. R. Gray.
Western Miner, Vol 44, No 4, April 1971, p 36-44. 8 ref.

Descriptors: *Drilling fluids, Rotary drilling, *Exploration, Drilling, Mud, Control, Subsurface investigations.
Identifiers: *Exploratory drilling, Mud control, Diamond drilling.

A well-planned exploratory-drilling program must consider such factors as: the primary objective, water supply, lithology, drill site, drilling equipment, climate, and manpower. The desired end-product is maximum information at minimum cost. Examples are cited of the close relationship between the drilling fluid and other factors affecting the success of exploratory drilling programs. (Campbell-NWWA)
W72-13620

WHICH LOST-CIRCULATION MATERIALS TO USE ... AND HOW TO USE THEM,
Magnet Cove Barium Corp., Houston, Tex.
For primary bibliographic entry see Field 08G.
W72-13621

SQUEEZE SLURRIES FOR LOST CIRCULATION CONTROL,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-13622

A NEW LOOK AT LOST CIRCULATION,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-13623

CHEMICAL REMOVAL OF DRILLED SOLIDS,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-13624

DESIGN AND OPERATION OF JET-BIT PROGRAMS FOR MAXIMUM HYDRAULIC HORSEPOWER, IMPACT FORCE OR JET VELOCITY,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 08C.
W72-13626

WHY ROCK-BIT BEARINGS FAIL,
For primary bibliographic entry see Field 08G.
W72-13632

NEW PIPE CONFIGURATION REDUCES WALL STICKING,
Engineering Enterprises, Inc., Houston, Tex.
F. K. Fox.
World Oil, p 83-87, Dec. 1960. 6 fig.

Descriptors: *Rotary drilling, Drilling fluids, Hydraulics, Drilling equipment, Bore holes, Drilling, Pipes, Wells.
Identifiers: *Differential pressure sticking, Drill collars, Washover operations.

If mud pressure is not uniformly distributed around drill pipe in a borehole, an unbalanced hydrostatic condition exists. This results in the pipe being held against the wall of the hole by the unequalized hydraulic pressure. It is very common for this force to be in the range of 5,000 to 15,000 pounds per foot of pipe stuck. A design which greatly reduces the occurrence of stuck pipe by equalizing hydraulic pressure around the pipe is studied; this design employs several spiral grooves down the length of the collar. The theory is that if the contact surface of the collars is broken repeatedly and at short intervals down the body of the drill collar, then the hydrostatic pressure of the mud column will be equalized around a large percentage of the drill collar's length. (Campbell-NWWA)
W72-13633

RIPRAPPED BASINS FOR CULVERT OUTFALLS,
Colorado State Univ., Fort Collins; and Idaho Univ., Moscow.
M. A. Stevens, D. B. Simons, and F. J. Watts.
Highway Research Record, No 373, p 24-38, 1971. 11 fig, 9 ref.

Descriptors: *Basins, *Scour, *Culverts, *Hydraulic design, *Erosion, *Erosion control, Riprap, Hydraulic structures, Model tests, Rocks, Discharge (Water), Tailwater, Flow rates, Aprons, Hydraulic models. Slopes, Closed conduits.
Identifiers: *Outfalls, Holes, Erosion strength, Rectangular conduits.

A method for designing rock-lined basins for culvert outfalls was developed from model test data. The recommended rock-lined basins are suitable for single-barrel or multibarrel installations for both circular and rectangular outlets. The culvert flows considered are for mildly sloping or horizontal culverts with drawdown at the outlet. Alternative rock basin designs, based on the size of available rock, are provided. If the characteristics of the available rock will not prevent scour at the outlet, then a scoured basin design may become feasible. Cost comparisons between the most economical rock basin design and concrete and fabricated metal outlet structures should be made before selecting the outlet basin design. Design aids for riprapped culvert outlet basins were developed from model tests because the 3-dimensional flow at the outfall varies rapidly. Required stable riprap sizes for such flow fields are different from those for uniform 2-dimensional flow. Models used for the 288 tests performed ranged in size from a 6- by 12-in. rectangular culvert with 1/4-in. riprap to a 36-in.-dia pipe with 7-in.-dia rock. (USBR)
W72-13751

STUDY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVE LONG ISLAND SOUND BRIDGE SITES,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 06G.
W72-13907

WINNEBAGO-BEAN CREEK WATERSHED, RICHARDSON COUNTY, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13951

RED RIVER WATERWAY AND RED RIVER WATERWAY EMERGENCY BANK PROTECTION, MISSISSIPPI RIVER TO VICINITY OF INDEX, ARKANSAS, LOUISIANA, ARKANSAS, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.

Available from the National Technical Information Service as PB-200 799-D, $3.00 in paper copy. May 1971. 41 p, 1 map.

Descriptors: *Bank protection, *Channel improvement, *Dam construction, *Gulf Coastal Plain, Administrative agencies, Louisiana, Texas, Oklahoma, Bank erosion, Multiple-purpose projects, Irrigation practices, Recreation, Water quality control, Erosion control, Area redevelopment, Economic feasibility, Land management, Arkansas, Mississippi River, Navigable waters.
Identifiers: *Environmental impact statement, *Red River.

The plan of improvement consists of a 9 by 200 foot navigation channel with related bank stabilization and nine locks and dams from the Mississippi River via the Old and Red Rivers to Shreveport, Louisiana, and through Twelve Mile and Cypress Bayous to the vicinity of Daingerfield, Texas. The project will provide a transportation system which at present is not available to the area. Environmental impacts include: flood control benefits, irrigation benefits, improved water quality and availability, additional recreational opportunity, enhanced land utilization, and reduced losses from erosion. Adverse impacts include: moderate losses of wildlife along the entire river reach and the adjacent environs, adverse effects to fishery resources, loss of 65,654 acres of land, loss of forestry resources, and loss of some natural scenic values. Alternatives considered include various navigation routes, alternate channel depths, alternate types of protective works, alternate methods of construction, and variations in the degree of channel alignment. (Waldron-Florida)
W72-13952

LANEPORT, NORTH FORK AND SOUTH FORK LAKES, SAN GABRIEL RIVER, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.

Available from the National Technical Information Service as PB-202 321-D, $3.00 in paper copy. October 2, 1970. 9 p.

Descriptors: *Texas, *Dam construction, *Flood control, *Environmental effects, Project benefits, Floods, Dams, Wildlife habitats, Water supply, Water supply development, Hunting, Fishing, Recreation, Economic impact, Streams, Agriculture, Archaeology, Flood protection, Flood damage, Floodwater, Public health, Social aspects, Water quality, Project purposes, Wildlife.
Identifiers: *Environmental impact statement, *Laneport, North Fork, and South Fork Lakes, San Gabriel River (Tex).

The project involves construction of three dams and lakes to meet the needs of flood control, water conservation, fish and wildlife, and recreation. The area is characterized by rugged topography and contains steeply eroded hills, rocky bluffs, spurs, knobs and escarpments. The lakes will inundate about 8,700 acres of land. The projects will provide opportunities for fishing, hunting and other recreation. There will be increased water supply and decreased destruction of crops, loss of livestock, and unpleasant odors and health problems associated with floods. Adversely, the projects will inundate attractive natural streams and wildlife habitat as well as rich agricultural land presently used for field crops. Approximately 100 archaeological sites will be obliterated. However, provisions for salvage will be made for these sites. The only alternative discussed, that of no action,

would result in constraints on economic development as well as loss of project benefits. The region will receive long-term benefits from dependable water supplies and long-term enhancement of the social and physical environment. A list of agencies consulted is included. (Ilkson-Florida)
W72-13956

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-13957

KINGSTREE BRANCH FLOOD CONTROL PROJECT, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13960

8B. Hydraulics

AN ANALYSIS AND THE CONTROL OF LOST CIRCULATION,
Stanolind Oil and Gas Co., Tulsa, Okla.
G. C. Howard, and P. P. Scott, Jr.
Transactions, Society of Petroleum Engineers of AIME, Vol 192, p 171-182, 1951. 18 fig, 2 tab, 41 ref.

Descriptors: *Drilling fluids, Fracture permeability, Rotary drilling, Permeability, Sealants.
Identifiers: *Lost circulation, Formation damage, Mud losses.

During the drilling of wells, fractures which are created or widened by drilling fluid pressure are suspected of being a frequent cause of lost circulation. A study of the variables related to fracturing led to the premise that the presence of an effective lost circulation material in a drilling mud stream would serve to plug small fractures at the moment they are encountered or created and, thereby, eliminate a possible cause of lost circulation by preventing fluid pressure from widening and extending the fractures. A large number of lost circulation materials were classified and tested in simulated fractures. Granular type materials with a gradation of particle sizes were found to be the most effective for plugging. Within the limits of pumpability, the concentration in mud of each lost circulation material tested was found to be a controlling factor in determining the maximum size fracture which could be sealed. A new type centrifugal sorter was given preliminary tests and found to be capable of concentrating cuttings for rejection and reclaiming lost circulation materials. (Campbell-NWWA)
W72-13627

ABILITY OF DRILLING MUD TO LIFT BIT CUTTINGS,
Standard Oil and Gas Co., Tulsa, Okla.
H. N. Hall, H. Thompson, and F. Nuss.
Transactions, Society of Petroleum Engineers of AIME, Vol 189, p 35-46, 1950. 10 ref.

Descriptors: *Drilling fluids, *Rotary drilling, Laminar flow, Viscosity, Mud.
Identifiers: *Bit scavenging, Slip velocity.

Removal of bit cuttings is an important function of drilling muds. In an effort to obtain better understanding of the factors influencing the removal of cuttings, an extensive series of laboratory tests were made in which slip velocities of various sizes and shapes of particles were measured in muds of different physical properties. Empirical equations were then derived from these experimental data. These equations show that slip velocity is dependent on cutting size and shape, mud flow constants, and flow state of the mud. Applicability of these equations for field use is demonstrated by comparing computed slip velocities with slip velocities obtained from field tests. (Campbell-NWWA)
W72-13629

PREHISTORIC NEAR-SURFACE SUBSIDENCE CRACKS IN WESTERN FRESHNO COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-13717

AN EXPERIMENTAL STUDY OF THE GROWTH OF MECHANICALLY GENERATED SURFACE WATER WAVES WHEN SUBJECTED TO A FULLY DEVELOPED TURBULENT CHANNEL AIRFLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02E.
W72-13734

SELECTED STREAMFLOW CHARACTERISTICS AS RELATED TO CHANNEL GEOMETRY OF PERENNIAL STREAMS IN COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02E.
W72-13736

ROUGHNESS ELEMENTS AS ENERGY DISSIPATORS OF FREE-SURFACE FLOW IN CIRCULAR PIPES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.; and Christian Heritage Coll., San Diego, Calif.
J. M. Wiggert, P. D. Erfle, and H. M. Morris.
Highway Research Record, No 373, p 64-73, 1971. 8 fig, 1 tab, 3 ref.

Descriptors: *Energy dissipation, *Prototype tests, *Model studies, Supercritical flow, Hydraulic jump, Open channel flow, Pipe flow, Pipe design, Velocity, Erosion control, Reynolds number, Froude number, Turbulent flow, Slopes, Hydraulic design, Equations, Scour.
Identifiers: Empirical methods, *Energy dissipators, Friction coefficient.

In laboratory and prototype tests, peripheral rings were used in smooth circular pipes to reduce flow velocities as a means of reducing scour at the outlets. The model was a 6-in.-dia pipe, 28 ft long, in which 3 sizes of rings (roughness elements) were tested in different numbers, spacing, and location, and at several discharges and pipe slopes. An 18-in. concrete pipe, 32 ft long, was also tested to verify model-prototype scaling ratios and compare effects of pipe materials. Empirical relationships were developed for element height, spacing, and pipe diameter. An equation developed enables designers to select the pipe diameter for a given discharge when roughness elements are used. Tests and related computations failed to relate a friction factor to either the Reynolds or Froude numbers. Use of 15 roughness elements improved velocity reduction by only 5% over use of 4 elements. Properly designed roughness elements can reduce the exit Froude number to nearly unity. (USBR)
W72-13747

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
For primary bibliographic entry see Field 10B.
W72-13820

CHANNEL NETWORK OF A BASIN AND FORMATION OF RUNOFF (RUSLOVAYA SET' BASSEYNA I PROTSESS FORMIROVANIYA STOKA VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W72-13853

TECHNIQUES AND HYDRULIC VERIFICATION OF HYDROMETRIC STUDIES (METODIKA I GIDRAVLICHESKOYE OBOSNOVANIYE GIDROMETRICHESKIKH RABOT).

Descriptors: *Hydraulics, *Hydrometry, *Analytical techniques, *Streamflow, Channel flow, Runoff, Discharge (Water), Water level fluctuations, Stage-discharge relations, Hydrographs, Water balance, Hydraulic structures, Irrigation canals, Irrigation systems, Reservoirs, Hydroelectric plants, Turbines, Routing, Measurement Calibrations.
Identifiers: *USSR, Ukraine, Karelia, Amu-Dar-'ya River, Hydrometric stations.

This collection contains 7 papers devoted to an analysis of the accuracy of hydrometric data for improving the efficiency of streamflow computations under effects of a changing channel. Specific topics discussed include: (1) accuracy of hydrometric data and improved methods of streamflow measurement in unstable channels of the Amu-Dar'ya River; (2) accuracy of measurement of principal water-balance components at the Kiev and Kremenchug Reservoirs in the Ukraine; (3) improved methods of streamflow measurement on mountain streams with erodible and meandering channels; (4) evaluation of water-balance components in middle reaches of the Amu-Dar'ya River; (5) effects of irrigation diversions in middle reaches of the Amu-Dar'ya River; (6) calibration of turbines at the Segozerskiy hydroelectric station in Karelia; and (7) calibration of turbines at large hydroelectric stations during periods of peak power demand. Designed primarily for hydrologists will also prove valuable to scientific workers at research institutes and establishments of the USSR Hydrometeorological Service. (Josefson-USGS)
W72-13861

ALLUVIAL CUTOFF DATING FROM SUBSEQUENT GROWTH OF A MEANDER,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 02J.
W72-14025

HYDRODYNAMICS OF FREE-BOUNDARY FLOWS,
G. V. Logvinovich.
Available from the National Technical Information Service as TT-70-50187, $3.00 in paper copy, $0.95 in microfiche. National Aeronautics and Space Admin, by Israel Program for Scientific Translations, Jerusalem, 1972. 194 p. (NASA TT F-658. *Translation of Gidrodinamika technii so svobodnymi granitsami, Izdatel'stvo 'Naukova Dumka', Kiev, 1969.).

Descriptors: *Fluid mechanics, *Hydrodynamics, *Boundaries (Surfaces), *Boundary processes, *Flow, Flow characteristics, Properties, Physical properties, Hydrologic aspects, Hydraulics, Drag, Cavitation, Hydrofoils, Profiles, Jets, Gases, Velocity, Submergence, Methodology, Equations.
Identifiers: *USSR.

This monograph on fluid mechanics examines the physical properties of fluids, fluid statics, and problems encountered in fluid motion. The subject matter includes equations and methods for solution of fluid-flow problems by application of the

principles of momentum and energy. Individual topics include: (1) elementary cases of free-boundary flows; (2) symmetric immersion of a body in a fluid; (3) investigations of fundamentals involved in the phenomena of cavitation; (4) application of plane sections to calculation of hydrodynamic forces; and (5) hydrodynamic features of hydrofoils. (Josefson-USGS)
W72-14040

8C. Hydraulic Machinery

TECHNIQUES FOR PREVENTING DIFFERENTIAL-PRESSURE STICKING OF DRILL PIPE,
Continental Oil Co., Ponca City, Okla.
E. L. Haden, and G. R. Welch.
American Petroleum Institute Drilling and Production Practice, March 1961, p 36-41. 3 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Drilling equipment, Pipes, Drilling, Mud.
Identifiers: *Differential pressure sticking, Stuck pipe.

Differential-pressure sticking is a very common occurrence in drilling oil or water wells. Failure to recognize the problem and lack of a preventive technique have made this type sticking costly. A laboratory investigation revealed that in addition to the factors suggested by earlier investigators, mud type and composition influenced the severity of sticking. Tests with surface-active agents and modified collar designs demonstrate these methods to be useful in reducing sticking, but a combination of techniques is necessary for maximum protection. (Campbell-NWWA)
W72-13618

ANALYTICAL DETERMINATION OF OPTIMUM BIT WEIGHT AND ROTARY SPEED COMBINATIONS,
Humble Oil and Refining Co., Houston, Tex.
J. W. Graham, and N. L. Muench.
Preprint 1349-G, October 1959. Society of Petroleum Engineers of AIME. 13 p, 7 fig.

Descriptors: *Rotary drilling, Mathematical studies, Costs, *Drilling.
Identifiers: *Rig cost, Bit weight, Rotary speed.

An analytical method is presented for the selection of optimum combinations of rotary speed and bit weight to minimize total drilling cost. A mathematical analysis of the cost to drill any depth interval is the basis of the method. The results of field experience are used to derive empirical expressions for bit life expectancy and for drilling rate as a function of depth, rotary speed, and bit weight. After the mathematical expressions are adapted to a particular area, the optimum combinations of bit weight and rotary speed can be established. Calculation of combinations of bit weight and rotary speed which are optimum for the conditons of the illustrative field example shows that at depth intervals from 1,000 to 6,000 ft. high bit weights, i.e., in excess of 50,000 lb. at 75 rpm, are necessary to approach minimum total drilling cost. (Campbell-NWWA)
W72-13619

TWO-DIMENSIONAL STUDY OF ROCK BREAKAGE IN DRAG-BIT DRILLING AT ATMOSPHERIC PRESSURE,
Texas Univ., Austin.
K. E. Gray, F. Armstrong, and C. Galtin.
Journal of Petroleum Technology, Vol 225, p 93-98, 1962. 10 fig, 22 ref.

Descriptors: *Drilling, Drilling equipment, *Photography, Films, Failure (Mechanics), Tensile strength, Rock mechanics.
Identifiers: *Tool forces, Rake angles, Photographic studies.

Some preliminary results are presented of two-dimensional cutting tests of dry limestone samples at atmospheric pressure. Cutting tips having rake angles of +30, +15, 0, -15, and -30 deg were used to make cuts on Leuders limestone samples at six depths of cut ranging from .005 to .060 in. at cutting speeds of 15, 109, and 150 ft./min. Motion pictures of the cutting process at camera speeds of 5,000 to 8,000 frames/sec. were taken at strategic points. The movies provide considerable insight into the brittle failure mechanism in rocks. It appears that chip-generating cracks usually have an initial orientation which is related to the resultant of the externally applied forces. Analyses of the forces on the cutting tips indicate that: (1) relatively small increases in vertical loading result in large cut-depth increases for sharp tips (rake angles > 0 deg); (2) tool forces increase at an increasing rate as the rake angle decreases, particularly for rake angles < 0 deg; and (3) for the range of this study, rate of loading had little effect on the maximum forces. Cutting size increases with increased cut depth and rake angles, and decreases slightly at high cutting speeds, the depth of cut having by far the most influence. The amount of contact between the rock and the cutting tip was always less than the depth of cut and rarely exceeded 0.010 in. even for cuts of 0.060 in. (Campbell-NWWA)
W72-13625

DESIGN AND OPERATION OF JET-BIT PROGRAMS FOR MAXIMUM HYDRAULIC HORSEPOWER, IMPACT FORCE OR JET VELOCITY,
Gulf Research and Development Co., Pittsburgh, Pa.
H. A. Kendall, and W. C. Goins, Jr.
Transactions, Society of Petroleum Engineers of AIME, Vol 219, p 238-250, 1960. 9 fig, 17 ref.

Descriptors: *Rotary drilling, Drilling equipment, Hydraulic equipment, Nozzles.
Identifiers: *Jet-bits, Hydraulic horsepower, Compounding pumps.

Several investigations in recent years have shown that drilling rates are increased significantly with increased hydraulic horsepower. But, there has been no over-all method of designing jet-bit programs that efficiently use the surface power. The maximum obtainable bit horsepower, impact force and jet velocity at all depths are described, taking into account the limitations of the pump, piping, hole and minimum circulating rate for adequate cuttings removal. Ranges of operation are developed; and flow rates, surface pressure and bit pressures are specified for each range to provide a maximum of any one of the desired effects. It also is shown that, by proper selection of nozzle sizes and by following the rules presented, the maximum obtainable quantities can be effectively utilized from surface to total depth. Finally, a simple graphical method of selecting nozzle sizes and flow rates is presented which can be used with familiar bit-company hydraulic tables and calculators to design jet-bit programs for maximum bit hydraulic horsepower, impact or jet velocity, as desired. (Campbell-NWWA)
W72-13626

AN ANALYSIS AND THE CONTROL OF LOST CIRCULATION,
Stanolind Oil and Gas Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W72-13627

USE OF CHEMICALS TO MAINTAIN CLEAR WATER FOR DRILLING,
Pan American Petroleum Corp., Tulsa, Okla.
J. P. Gallus, J. L. Lummus, and J. E. Fox, Jr.
Transactions, Society of Petroleum Engineers of AIME, Vol 218, p 70-75, 1958. 5 ref.

Descriptors: *Drilling fluids, Rotary drilling, Flocculation, Polymers, Muds.
Identifiers: Polymer solution, Low-solids muds, *Flocculating agents, Formation permeability.

Fresh water or brine drilling fluids may be kept free of suspended drilled solids by the addition of a water soluble acrylamide-carboxylic acid copolymer at the flowline. Addition of from .01 to 0.2 lb/bbl of the polymer solution to drilling fluids containing less than 5 per cent clay solids by weight causes the solids to flocculate and settle rapidly to the bottom of the pits. Solutions of the polymer injected at the pump suction reduce the loss of water to permeable formations without impairing the permeability to oil. The use of drilling fluids clarified with the polymer has resulted in increased drilling rates, extended bit life, and lower drilling fluid costs. (Campbell-NWWA)
W72-13628

ABILITY OF DRILLING MUD TO LIFT BIT CUTTINGS,
Standard Oil and Gas Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W72-13629

PRESSURE-DIFFERENTIAL STICKING OF DRILL PIPE AND HOW IT CAN BE AVOIDED OR RELIEVED,
Shell Oil Co., Houston Tex. Technical Services Div.
W. E. Helmick, and A. J. Longley.
American Petroleum Institute Drilling and Production Practice, p 55-60, 1957. 2 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Drilling equipment, Pipes, Drilling.
Identifiers: Key-seating, *Pressure-differential sticking.

Investigation of the sticking of drill collars, now called pressure-differential sticking, was initiated after the observation was made that spotting oil would only free pipe that had stuck while remaining motionless opposite a permeable bed. Laboratory investigations established that the force acting to hold the pipe against the side of the hole was proportional to the differential pressure acting across the drill pipe and the area of the pipe isolated from the hydraulic pressure by a thickening mud cake, and that the primary mechanism of release by oil is a wetting action. (Campbell-NWWA)
W72-13630

HOW ROTARY SPEED AND BIT WEIGHT AFFECT ROTARY DRILLING RATE,
Tulsa Univ., Okla.
C. Gatlin.
Oil and Gas Journal, Vol 55, No 20, p 193-198, May 1957. 12 ref.

Descriptors: *Rotary drilling, *Penetration, *Rates, Drilling fluids, Hydrostatic pressure, Drilling.
Identifiers: *Rotary speed, *Bit weight, Drill string failure.

Variables affecting rotary-drilling penetration rate are numerous. Some of the more recognizable are the effects of drilling-fluid properties, hydrostatic pressure, hydraulic factors, rotary speed, and weight on bit. In hard rock areas, penetration rate is limited by the weight on bit or rotary speed which may be applied or both. Normally these limits are imposed by either crooked-hole or equipment considerations. (Campbell-NWWA)
W72-13631

NEW PIPE CONFIGURATION REDUCES WALL STICKING,
Engineering Enterprises, Inc., Houston, Tex.
For primary bibliographic entry see Field 08A.
W72-13633

A STUDY OF ANCHORAGES FOR TRANSMISSION TOWER FOUNDATIONS,
J. I. Adams, and T. W. Klym.
Canadian Geotechniques Journal, Vol 9, No 1, p 89-104, Feb 1972. 12 fig, 3 tab, 8 ref.

Descriptors: *Transmission towers, *Foundations, On-site tests, Glacial soils, Clays, Sands, Gravels, Anchors, Helixes, Grouting, Analysis, Soil mechanics, Loading, Tests, Construction practices, Cyclic loads, Adhesion.
Identifiers: *Uplift footings, *Anchored towers, Guyed towers, Test results, Bonding strength, Pull-out tests, Uplift resistance, Anchored footings, Canada.

Uplift tests were performed at 7 sites on anchors for 4-legged and guyed transmission tower structures. Power installed multihelix anchors and grouted anchors were the main types tested. The multihelix anchors were comprised of 8- to 15-in.-dia helix plates spaced 29 in. apart, drilled to a depth of from 10 to 22 ft. For the grouted anchors, a cased 4- to 8-in.-dia hole from 7 to 75 ft deep was filled with a high-strength grout. A high-strength reinforcing rod was then inserted and the casing withdrawn. To investigate the load distribution, one of the grouted anchors was instrumented with bonded strain gages. Soil conditions included dense glacial till, soft clay, dense sand and gravel, and loose-to-compact silty sand. Uplift loads, consisting of 2 or more load-unload cycles, were applied at a rate of 5,000 to 10,000 lbs/min. The grouted anchor appears best suited for dense glacial tills, dense sand and gravel, and stiff-to-hard clays. The multihelix anchor is suitable for many soils, but may encounter problems in dense till or gravel. In many instances, the choice of anchor would be determined by the cost. (USBR)
W72-13750

SALT RIVER PROJECT 1971 ANNUAL REPORT.
Salt River Project, Phoenix, Ariz. Agricultural Improvement and Power District.
For primary bibliographic entry see Field 04A.
W72-13913

8D. Soil Mechanics

ANALYSIS OF UNCERTAINTY IN SETTLEMENT PREDICTION,
San Diego State Coll., Calif.; and Northwestern Univ., Evanston, Ill.
J. N. Kay, and R. J. Krizek.
Geotechnique, Vol 2, No 2, p 119-129, Dec 1971. 6 fig, 1 tab, 5 ref.

Descriptors: *Settlement (Structural), *Foundations, *Consolidation, Forecasting, Risks, Soil mechanics, Probability, Statistical analysis, Regression analysis, Nomographs, Soil properties, Soil analysis, Void ratio, Stress, Monte Carlo Method, Deformation, Soil consolidation tests.
Identifiers: Empirical equations, Confidence coefficient, Compression index, Deformable soils.

A method is presented for analyzing the uncertainty of predicting settlement by the conventional single answer approach. Instead of individual values, probability distribution functions are used for the compression index, void ratio, and soil stresses found in the formula for computing settlement caused by primary consolidation. The distributions for soil properties are established from a statistical treatment of test results; those for the stress parameters are deduced on a more subjective basis. The study is generalized by repeating the process for a large number of cases. Calculated values are then used in regression analyses to develop empirical equations which provide a measure of the uncertainty associated with a wide range of input parameters. Finally, these equations are represented in the form of nomographs. The solution of an example given indicates a 90% probability that the settlement will lie within the range from 4.2 to 8.4 in. (USBR)
W72-13745

AN EXPERIMENTAL ROCK-SAND DAM,
O. B. Pyshkin.
Hydrotechnical Construction, No 7, p 657-660, July 1971. 4 fig, 8 ref.

Descriptors: *Dam design, *Dam construction, Dams, Rockfill dams, Soil density probes, Construction, Construction methods, Earth dams, Seepage, Rocks, Sands, Slurries, Soil density.
Identifiers: *Rock-sand dams, USSR, Sand fills, Sluicing, Dam facings, Test results, Hydraulic fill dams.

As an alternative to rockfill dams with cutoff walls and central cores, an experimental rock-sand dam constructed shows high imperviousness and seepage stability. The dam dimensions were: height 7.5 m, crest width 2 m, base width 23.6 m, length 4 m, volume 400 cu m, upstream face slope 1:1.25, downstream face slope 1:1.5. In constructing the dam, the first step was to build the dam body, using 8- to 60-cm sorted rocks. As the rockfilling progressed, piezometers were installed. The water level was raised to 2.5 m and 3 conduits were placed at 2.0 m. A sand slurry was sluiced down the 4 conduits and into the body of the dam; slurry was then sluiced into the opposite face of the dam at the same level. The water level was then increased and the procedure repeated at 7 levels until the sand slurry had been sluiced into the entire structure. The sand had an effective diameter of 0.11 mm and an inplace density of 1.65 kg/cc. To stabilize the sand, a layer of crushed rock of 5- to 40-mm grain size was placed on the upstream and downstream slopes. (USBR)
W72-13752

SMALL DIAMETER SAND DRAINS,
Cementation Co. Ltd., Croydon (England).
F. H. Hughes, and A. Chalmers.
Civil Engineering, Vol 67, No 788, p 283-286, Mar 1972. 1 fig, 4 photo, 7 ref.

Descriptors: *Flexibility, *Permeability, Drainage, Groundwater, Pore pressure, Consolidation, Dissipation, Drain spacing, Clogging, Slope stability, Settlement (Structural), Shear strength, Soil mechanics, Piezometers.
Identifiers: *Sand drains, Great Britain, Stress paths, Diameters, Pore water pressure.

A better understanding of the mechanism of soil permeability, drainage, consolidation, and failure has resulted in renewed interest in the use of placed drains to improve the rate of pore pressure dissipation. The aims of using sand drains to permit accelerated dissipation of pore water pressure by lateral drainage in clay soils fall into 3 categories: (1) In embankment or foundation construction on weak clay soils, the sand drain allows a more rapid increase in shear strength. (2) Because maximum settlement during the construction period is desirable to avoid damage to the structure, the time of structural movements can be reduced. (3) Cuttings or natural slopes where high water pressures exist can be stabilized by bored underdrainage. Ideally, a drain should have the following qualities: (1) high permeability to enable rapid dissipation; (2) good flexibility to permit large ground movement and not act as a pile, preventing consolidation; (3) continuous flexibility to maintain a good hydraulic connection over its entire length; (4) ease of placement in the soil; (5) remain useful over the required period; (6) retain all these properties during increased stress; and (7) avoid clogging by the surrounding fine soils. (USBR)
W72-13756

EQUIPPING STRUCTURES OF HYDROELECTRIC POWER STATIONS WITH MEASURING DEVICES FOR MONITORING PERCOLATION,
M. M. Dorokhov.
Hydrotechnical Construction, No 7, p 661-664, July 1971. 2 fig.

Descriptors: *Percolation, *Water measurement, *Electronic equipment, Piezometers, Water levels, Automation, Dam foundations, Remote control, Hydraulic structures, Indicators, Manometers, Transducers, Percolating water, Seepage, Instrumentation, Piezometry, Measuring instruments, Pressure measuring instruments, Monitoring.
Identifiers: *Water-level recorders, USSR, Piezometric head, Piezometric surface.

The use of remote-controlled indicating and recording instruments for monitoring percolation in hydraulic structure foundations is examined. The 2 electrical instruments used for measuring piezometer tube water levels are an electric manometer and an automatic indicator and recorder. The electric manometer acts as a transducer to convert head changes into electric signals, which activate the automatic indicating and recording instrument. Similar equipment could be used to monitor free seepage over the entire area of a hydrodevelopment, the levels of the pools and heads of a hydroelectric powerplant, and discharges of the powerplant units, and allow complete or partial centralization of all the powerplant measurements. Diagrams are given of the systems used at several Soviet hydroelectric powerplants. (USBR)
W72-13758

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.

Available from the National Technical Information Service as PB-205 236-D, $3.00 in paper copy. November 4, 1971. 42 p, 1 map, 7 tab.

Descriptors: *Illinois, *Flood protection, *Levees, *Environmental effects, Wildlife habitats, Aesthetics, Borrow pits, Riprap, Flood control, Flood frequency, Impoundments, Rivers, Flood damage.
Identifiers: *Environmental impact statement, *Fayette County (Ill).

The project is designed to improve flood protection and interior drainage in the Dively Drainage and Levee District, Fayette County, Illinois on the Kaskaskia River. The plan of improvement involves construction of approximately 3.53 linear miles of earth levee thereby providing protection against a flood frequency of one every 30 years. Additionally three gravity drains and three collector ditches will be installed. The left bank of the river will be riprapped in selective reaches. Environmental impacts of the project include: reduced annual flooding, conversion of 170 acres of woodland to cropland, loss of wildlife habitats in the converted area, loss of 102 acres for borrow pits, and aesthetic impairment of the river bank from riprapping. Adverse impacts include: loss of 130 acres of wildlife habitat; aesthetic loss from bank riprapping for 3,800 feet; and borrowing from 102 acres, however, natural vegetation will return to the area. Alternative structural plans such as different levee alignments, impoundments, river cutoffs, pumping stations, and various combinations were considered. (Grant-Florida)
W72-13955

AUTHORIZED CHINA MEADOWS DAM AND RESERVOIR LYMAN PROJECT, WYOMING

(DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Salt Lake City, Utah. Region 4.

Available from the National Technical Information Service as PB-205 581-D, $3.00 in paper copy. January 6, 1972. 76 p, 2 map, 1 photo, 6 tab, 7 append.

Descriptors: *Utah, *Flood control, *Environmental effects, *Dam construction, Irrigation water, *Wyoming, Soil mechanics, Dikes, Earthworks, Land use, Fish conservation, Wildlife conservation, Water management (Applied), Recreation, Storage reservoirs, Reservoir sites, Wildlife habitats, Fisheries, Forages.
Identifiers: *Environmental impact statement, *China Meadows Dam and Reservoir (Wyo).

The proposed project calls for construction of a 2,350 foot long, 109 foot high earthfill dam and dike. The damsite is located in Utah about 25 miles south of Mountain View, Wyoming. The completed project will reduce floods from high spring runoff, provide higher summer flows for an extended irrigation season and minimum flows to preserve stream fishery during nonirrigation season. Inundation of 372 acres of meadow and forest will result in the loss of: 2 miles of quality trout stream; 205 acres of timber; grazing lands; spring and fall forage for an undetermined number of elk, moose, and deer; and 13 family campground units. The major impacts of the project are of a long-term nature. The most significant will be the influx of people and increase in recreational activity. Construction of the project will permanently alter the esthetic value of the site as the recreational attraction offered by the reservoir would encourage further use of the present wilderness area. Alternatives to the proposed project are the inclusion of China Lake in the reservoir, the enlargement of Marsh Lake, the use of other storage sites, and no development. (Waldron-Florida)
W72-13963

LITTLE RIVER INLET, NORTH CAROLINA AND SOUTH CAROLINA, NAVIGATION IMPROVEMENTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13964

LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-206 619-D, $3.00 in paper copy. January 1972. 40 p, 2 map, 5 photo, 4 tab.

Descriptors: *Multiple-purpose projects, *Dam construction, *Oregon, *Environmental effects, Dams, Flood control, Project planning, Water management (Applied), Levees, Water quality control, Damsites, Embankments, Wildlife habitats, Industrial water, Municipal water, Fisheries, Electric powerplants, Hydroelectric plants, Recreation, Irrigation, Adoption of practices, Non-structural alternatives, Highway relocation, Water conservation.
Identifiers: *Environmental impact statement, *Rogue River, *Lost Creek Dam Project (Ore), *Embankment dams.

The project involves construction of an embankment dam and related structures on the Rogue River, Jackson County, Oregon, to provide 315,000 acre feet of usable water storage for flood control, water conservation, water supply, water quality control, recreation, and 49,000 kw of electric power generation. The environmental impact will include: flooding of the river valley behind the dam now used for timber production, farming, pasture, and wildlife habitat; loss of an 11-mile stretch of natural stream to be covered by the lake; reduction of flood damage downstream along the Rogue River; provision of water for irrigation, municipal and industrial water supply, recreation, fish and wildlife, power, and water quality improvement; and hatchery production to mitigate fisheries losses. Adverse environmental effects include: the loss of wildlife habitat and timber production on land needed for the lake, road relocation, and project construction; loss of natural stream with anadromous fish spawning; loss of rearing areas within the proposed lake area; and adverse aesthetic conditions during periods of pool drawdown. Alternatives include: levee protection, flood plain zoning, and/or flood plain evacuation; a similar dam at another site; a dry reservoir alternative; and a concrete dam. (Widman-Florida)
W72-13965

STUART GULCH DAM, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.

Available from the National Technical Information Service as PB-198 722-F, $3.00 in paper copy. August 6, 1971. 30 p, 1 map, 4 tab.

Descriptors: *Dam construction, *Idaho, *Flood protection, *Stream stabilization, Area redevelopment, Tributaries, Intermittent streams, Earth dams, Dam design, Silting, Channel improvement, Land use, Non-structural alternatives, Water resources development, Flood control, Vegetation effects, Wildlife habitats, Air pollution, Storm runoff.
Identifiers: *Environmental impact statement, *Stuart Gulch Dam (Idaho).

The project involves construction of a local flood detention dam on the intermittent stream in Stuart Gulch, a minor tributary of the Boise River. The dam will be an earthfill structure with an ungated spillway and a concrete conduit outlet and will be 54 feet high and 1054 feet long. Stuart Gulch is a small intermittent flowing stream located in a canyon. The major environmental impact of the project will be to prevent flooding of the northwestern section of Boise, and would encourage redevelopment of the area. Adverse impacts include: periodic short-term flooding, silt deposition on the canyon floor, and loss of some nesting habitat. Alternatives to the project include: (1) no action, (2) enlarge the channel, (3) utilize watershed treatment and positive land management to attempt to reduce runoff, and (4) flood plain zoning and floodproofing. With the advent of the proposed project, flood protection would be provided for the existing development and lands of the flood plain, but the potential for future high density development in the project area will be eliminated. (Waldron-Florida)
W72-13968

8E. Rock Mechanics and Geology

TWO-DIMENSIONAL STUDY OF ROCK BREAKAGE IN DRAG-BIT DRILLING AT ATMOSPHERIC PRESSURE,
Texas Univ., Austin.
For primary bibliographic entry see Field 08C.
W72-13625

8F. Concrete

MICROCRACKING EFFECT ON FLEXURAL STRENGTH OF CONCRETE AFTER REPEATED LOADING,
Ritsumeikan Univ., Kyoto (Japan); and Osaka City Univ. (Japan).
A. Yoshimoto, S. Ogino, and M. Kawakami.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 4, p 233-240, Apr 1972. 8 fig, 8 ref.

Descriptors: *Concrete technology, *Fatigue (Materials), Beams (Structural), Concretes, Strain measurement, Test procedures, Tensile stress, Microscopy.
Identifiers: *Flexural strength, *Cyclic loads, Bonding strength, Microstructure, Test results, Stress concentration, Bond, Crack propagation, *Microcracks, Japan, Cement, Paste.

Because little is known of the strength of concrete beams after repeated loading, a study was made of the flexural strength of beams under these conditions. Data are presented on the flexural strength of concrete beam specimens after repeated loading at low cycles and on the effects of microcracking on beam strength. Conclusions are: (1) Repeated loading had little effect on the flexural strength of most specimens, but strength increased in some specimens. (2) Microcracks, which develop in the cement paste, relieved the stress concentrations at the tip of the bond cracks, resulting in increased flexural strength of the concrete. (3) Presence of microcracks does not necessarily lead to fracture of the concrete. (USBR)
W72-13744

COLUMN LOAD INFLUENCE ON REINFORCED CONCRETE-BEAM COLUMN CONNECTION,
Waterloo Univ. (Ontario); and Construction for the Government of the Northwest Territories, Yellowknife.
E. F. P. Burnett, and R. J. Trenberth.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 2, p 101-109, Feb 1972. 8 fig, 3 tab, 7 ref, append.

Descriptors: *Reinforced concrete, *Columns, *Beams (Structural), Reinforcing steel, Structural behavior, Structural design, Structural concrete, Loads (Forces), Structural models, Model tests, Spans, Movement, Moments, Ductility, Failure.
Identifiers: *Continuous beams, *Stirrups, Strain hardening, Inelastic action, Flexural strength, Yield strength, Canada, Beam columns, Yielding.

Nine reinforced concrete systems having 2-span continuous beams and a centrally located stub column were tested. The stub column stress remained constant during the test, but varied from 0 to 2,000 psi during the test series. The 6- by 10-in. cross-section beams were approximately 10 ft long and were point-loaded about 4 ft from the stub column. Apart from the preyield cyclic loads applied in some tests, all beam loading used deflection controlled methods. Test results indicate: (1) Increased column loads significantly decrease the inelastic ductility of yielded beams; (2) equivalent simply supported models indicate overly optimistic estimates of the inelastic ductility of yielded beams; and (3) to obtain valid information from beam-column models, both the column and its load must be simulated. (USBR)
W72-13748

SHORT-TIME DEFLECTIONS OF BEAMS UNDER SINGLE AND REPEATED LOAD CYCLES,
Portland Cement Association, Skokie, Ill.; and Iowa Univ., Iowa City.
K. M. Kripanarayanan, and D. E. Branson.

Journal of the American Concrete Institute, Proceedings, Vol 92, No 2, Part I, p 110-117, Feb 1972. Part II Suppl (unpubl), p 1-14. 9 fig, 7 tab, 14 ref, append.

Descriptors: *Beams (Structural), *Cracks, *Cyclic loads, *Deflection, *Prestressed concrete, *Reinforced concrete, Test procedures, Lightweight concretes, Modulus of elasticity, Yield strength, Structural design, Prestressing, Forecasting, Movement.
Identifiers: Deflection measurement, Composite beams, Moments of inertia, Test results.

A simple and efficient design procedure is presented for predicting the entire short-time load-deflection curve of a beam (or a single point, such as at maximum load) under repeated load cycles into the cracking range. The study includes loading, recovery, and reloading parts of the load-deflection curve. The effective moment of inertia concept adopted by ACI 318-71 for predicting deflections of reinforced beams is extended to both prestressed and reinforced beams under repeated load cycles, including varying load levels, into the cracking range. The reliability of the procedure is indicated by comparisons between computed results and experimental data for 15 prestressed concrete beams, and with data in the literature for reinforced concrete beams. (USBR)
W72-13749

THE INFLUENCE OF REINFORCEMENT DETAILING ON THE STRENGTH OF CONCRETE STRUCTURES,
Cement and Concrete Association, London (England).
G. Somerville, and H. P. J. Taylor.
Structural Engineering, Vol 50, No 1, p 7-19, Jan 1972. 25 fig, 2 tab, 19 ref.

Descriptors: *Reinforcement, *Reinforced concrete, *Joints (Connections), *Structural design, Reinforcing steel, Concrete structures, Test procedures, Structural engineering, Bibliographies.
Identifiers: Great Britain, Beam columns, Test results, Flexural strength.

Experimental data are presented showing the influence of reinforcement detailing on the structural efficiency of half-joints, joggled splices in columns, flexural corners, and in situ concrete beam-column joints. Test data confirmed that the most efficient reinforcement arrangement in design generally can be determined by considering the forces involved. The influence of tolerances and workmanship on strength was particularly important for half-joints. No serious detailing problems arise for joggled splices or for flexural corners being closed. The strength of opening flexural corners greatly depends upon the reinforcement details used, particularly for a high percentage of steel. Design considerations applicable to reinforcement detailing are: (1) a statically determinate set of forces inside an element; (2) capability of the system to carry the collapse load; and (3) controlling cracking under service load, or proportioning members to prevent cracking. (USBR)
W72-13753

FACTORS AFFECTING THE FLEXURAL STRENGTH OF STEEL FIBROUS CONCRETE,
Batelle Memorial Inst., Columbus, Ohio. Columbus Labs.
M. J. Snyder, and D. R. Lankard.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 2, p 96-100, Feb 1972. 3 fig, 1 tab, 9 ref.

Descriptors: *Concrete mixes, *Concrete testing, *Fibers, Aggregates, Coarse aggregates, Beams (Structural), Concretes, Mortar, Steel, Strength, Deflection, Consolidation, Spacing, Volume, Test specimens, Laboratory tests, Reinforced concrete.
Identifiers: *Flexural strength, Steel fibers, Water-cement ratio, Test results, Reinforcing materials.

Investigations were made of the effects of steel fibers on flexural strength of concretes and mortar. Using beam-shaped specimens 2.5 by 3.0 by 16.0 in., high carbon steel fibers in 7 diameters were tested in lengths of 0.25 to 2.5 in. Other variables included aggregate size, water-cement ratio, percentage volume of steel fibers, and amount of water-reducing admixtures. Specimens were cured under low pressure steam at 140 deg F for 7 days. Deflection, first-crack strength, and ultimate flexural strength were measured. Tests showed that first crack and ultimate flexural strengths were influenced by length, diameter, and quantity of steel fibers. Also influencing strength was the degree of consolidation, fiber distribution, and surface condition of the fiber. Significant increases in strengths (up to 4 times) can be achieved through use of short, small diameter steel fibers. Strength increases with decreased fiber spacing, but adding coarse aggregate reduces strength. (USBR)
W72-13754

8G. Materials

WHICH LOST-CIRCULATION MATERIALS TO USE ... AND HOW TO USE THEM,
Magnet Cove Barium Corp., Houston, Tex.
B. Q. Green.
Oil and Gas Journal, Vol 57, No 11, p 110-115, 170-173, March 1959. 9 fig, 5 ref.

Descriptors: *Drilling fluids, Rotary drilling, Cavitation, Sealants, Mud.
Identifiers: *Lost circulation, Formation damage, Mud losses.

Results are described of lab tests made on materials used to prevent and cure loss of circulation of drilling mud. Conclusions are that: (1) size of particles necessary to seal is proportional to the size of the openings to be sealed; (2) the seal must take place inside the opening; (3) fifteen pounds of lost-circulation material per barrel is about optimum; (4) if 15 lb/bbl doesn't seal, use a larger particle size or different distribution of sizes; (5) a waiting period is vital because it permits solids to accumulate in the bridge through filtration. (Campbell-NWWA)
W72-13621

SQUEEZE SLURRIES FOR LOST CIRCULATION CONTROL,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummus.
Petroleum Engineer, p 59-64, September 1968.

Descriptors: *Rotary drilling, *Drilling fluids, Bentonite, *Louisiana, *Sealants, Wells.
Identifiers: *Lost circulation, Induced fractures, *Squeeze slurries, Vugs, Loss zones, Cementing procedures.

Mechanisms are described by which squeeze slurries work to fill cracks and voids where lost circulation occurs. Methods and techniques for emplacement of slurries, and test results from wells drilled in Louisiana are discussed. Different slurry types and techniques of emplacement are described for vugs or caverns and induced fractures, with formulation procedures for both. (Campbell-NWWA)
W72-13622

A NEW LOOK AT LOST CIRCULATION,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummus.
Petroleum Engineer, p 69-73, November 1967. 9 ref.

Descriptors: Rotary drilling, *Drilling fluids, Fracture permeability, *Sealants, Wells.
Identifiers: *Lost circulation, Vugs, *Mud losses, Jet bits.

Lost circulation is one of the greatest expenses faced by the industry in drilling a well. There is a general understanding of the types of lost circulation and the conditions under which these occur, but there is a lack of confidence in materials commercially available for sealing off loss zones. Pertinent points concerning a lost circulation material are: (1) it should contain high strength particles with a definite size distribution; (2) it should form an effective seal under both low and high differential pressure conditions; and (3) it should be equally effective in sealing unconsolidated formations and fractures or vugs in hard formations. (Campbell-NWWA)
W72-13623

CHEMICAL REMOVAL OF DRILLED SOLIDS,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummus.
Drilling Contractor, p 50-67, March-April, 1965. 6 ref.

Descriptors: Rotary drilling, *Drilling fluids, *Flocculation, Flotation, Hydration, Bentonite, Surfactants, Drilling.
Identifiers: Methylene blue, *Scavenging, Selective flocculation.

Chemical methods are required for economical removal of solids smaller than 10 microns. Of the various chemical methods investigated flocculation was found to be the most effective and, as a result, flocculants are now widely used for complete removal of all solids or for maintaining the solids content at a low level. Two new terms are introduced. Complete flocculation is used to describe a flocculation technique which removes all solids. The term selective flocculation describes use of a flocculant which flocculates and removes drilled solids yet at the same time increases the yield of Wyoming bentonite. Examples of how these two flocculation methods are employed in treating field drilling muds to reduce drilling costs are given. A more accurate method of determining the high yield clay content of drilling muds has been developed which has proved useful for treating low solids muds. A graph is included which shows the relationship between density, clay solids, and oil content. The graph is used as a check on mud solids content values obtained using the standard retort method. (Campbell-NWWA)
W72-13624

WHY ROCK-BIT BEARINGS FAIL,
G. R. King.
Oil and Gas Journal, Vol 57, No 47, p 166-182, November, 1959.

Descriptors: *Rotary drilling, Drilling equipment, *Bearings, Wells, Drilling, Abrasion.
Identifiers: *Drill bits, Spalling, Roller bearings, Quebracho, Hydrogen sulfide.

Testing work done on rock-bit bearings is summarized. Many of the most common materials in drilling mud drastically shorten bearing life; and, as a result, increase the cost of wells. These findings led many to believe that sealing bit bearings to keep drilling fluid out is the next important step in making drilling cheaper. Materials and methods tested included water, hydrogen sulfide, mud solids, caustic quebracho, tannins, bit weight, and rotary speed. The wear processes of abrasion, spalling, and scaling are discussed. (Campbell-NWWA)
W72-13632

8H. Rapid Excavation

COMPETITION AND ISOLATION MECHANISMS IN THE GAMBUSIA AFFINIS X G. HETEROCHIR HYBRID SWARM,
Texas Univ., Austin. Dept. of Zoology.
C. Hubbs.
Bull Tex Mem Mus. 19. p 1-46. 1971. Illus.
Identifiers: *Livebearers, *Life history studies, Competition, Gambusia affinis, Gambusia heterochir, Genes, Hybrids, Interactions, Interspecies, Isolation, Mechanisms, Pools.

An analysis of more than 95,323 preserved and 1028 live Gambusia obtained data on several aspects of life history in addition to those on hybridization and interspecies interactions. The tests with living fish were in agreement with the data obtained from preserved samples. The most dense populations of Gambusia were in shallow water with thick aquatic vegetation. These areas also contained the largest fish. Gambusia trap captures were distinctly greater during some clock hours than during others. Traps set during darkness had few fish as did those set during early afternoon hours. Morning and late evening traps contained the most fish. Gambusia females grow rapidly until sexual maturity, after which growth slows. Populations of G. affinis are most abundant in fluctuating temperature environments in summer and in constant temperature environments in winter. All analyses of male morphology produce a trimodal distribution indicating a higher frequency of F1 hybrids than backcrosses, yet putative hybrid females have a fecundity equivalent to the parental types. The low survival of backcross hybrids and of potential introgressive genetic material may result from inability to compete for a niche in the presence of a co-adapted species gene pool.--Copyright 1972, Biological Abstracts, Inc.
W72-13718

EFFICIENT EXCAVATION,
F. Gaye.
Tunnels and Tunnelling, Vol 4, No 1, Part I, p 39-41, 43, 45-48, Jan-Feb 1972; Vol 4, No 2, Part 2, p 135-143, Mar-Apr 1972. 16 fig, 13 plate, 4 tab, 15 ref, 2 append.

Descriptors: *Tunneling machines, *Rock excavation, *Efficiencies, *Rock properties, *Performance, Bibliographies, Tunnels, Energy, Thrust, Hardness, Test procedures, Laboratory tests, Durability, Rotation, Boring machines.
Identifiers: *Cutters, Great Britain, Wear, Rock breakage, Underground openings, Test results.

Cutting head design for hard rock tunneling machines, with particular emphasis on excavation efficiency, is reviewed. Cutting tools may be efficient in producing maximum rock breakage for low energy absorption, but inefficient boring operations may result. Results obtained during laboratory tests of cutting tools may be wholly misleading because the requirements of machines working underground are very different. Some tools found highly efficient in single-tool experiments fail to compete with less efficient tools showing less wear over long periods of underground operation. The basic mechanism of rock-cutting is applied to full-face tunneling machines of circular cross section. The basic fundamentals essential to understanding the boring process, rather than design details, are emphasized. The number and types of cutters, rock hardness and cuttability, and tests on different types of rock are discussed. (USBR)
W72-13746

8I. Fisheries Engineering

LIFE HISTORY AND ECOLOGY OF THE GIZZARD SHAD, DOROSOMA CEPEDIANUM (LE SUEUR) WITH REFERENCE TO ELEPHANT BUTTE LAKE,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 02H.
W72-13927

REPRODUCTION OF TILAPIA NILOTICA L,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. El-Zarka, A. H. Shaheen, and A. A. El-Aleem.
Bull Inst Oceanogr Fish. 1: 193-204. Illus. 1970.
Identifiers: Dimorphism, *Reproduction, Sexual, *Spawning, *Tilapia-Nilotica.

T. nilotica is a mouth breeder and both sexes perform the function of carrying the eggs and young in their mouths. The spawning extends from April to Aug. with its maximum activity in May and June. Sexual dimorphism is quite distinct where reddish coloration is shown on the bellies and the ventral sides of both sexes during the spawning season. Breeding takes place at temperature ranging from 19.2 degrees to 26.8 degrees C. This fish begins to spawn at its 2nd yr of life (scale having an annulus). The minimum length recorded for the mature males and females was 8 cm and 10 cm, respectively. Males are represented by a low percentage (38.6%) during the spawning season. From Jan. to March and from Sept. to Dec., the percentage of males in the catches increased to 59.8% and to 44.3%, respectively.--Copyright 1972, Biological Abstracts, Inc.
W72-14042

RESPONSES OF A BROOK TROUT (SALVELINUS FONTINALIS) POPULATION TO HABITAT DEVELOPMENT IN LAWRENCE CREEK,
Wisconsin Dept. of Natural Resources, Madison.
R. L. Hunt.
Tech Bull, 48. 1-35, Illus, 1971.
Identifiers: *Brook trout, Habitat, *Lawrence Creek, Salvelinus-Fontinalis, Trout, *Wisconsin.

Man-made modifications of trout habitat in the upper mile of Lawrence Creek were followed by significant increases in standing crops of wild brook trout, angler use and yield. An obvious stock piling effect was evident, a result primarily of improved overwinter survival after development. Trout production (total growth) also increased after development. Multiple and partial correlation analyses involving 6 environmental variables and 4 trout population variables indicates that trout carrying capacity of an undeveloped section of stream was limited by the physical quality of the habitat, especially the amount of pool area and permanent bank cover. Both of these environmental components were greatly increased by the development and the trout population increased in response.--Copyright 1972, Biological Abstracts, Inc.
W72-14108

PRELIMINARY OBSERVATIONS OF SUPERINTENSIVE FISH CULTURE IN THE BEITH-SHEAN VALLEY IN 1969-1970,
Laboratory for Research Fish. Dis., Nir Dawid (Israel).
M. Marek, and S. Sarig.
Bamidgeh. 23 (3): 93-99. 1971.
Identifiers: *Air compressors, *Beith-Shean Valley (Israel), Fish culture, Israel, Ponds.

Preliminary experiments in ponds are described, using high densities of fish in mixed culture, and using air compressors to aerate the water. The yields were higher than usual for the area.--Copyright 1972, Biological Abstracts, Inc.
W72-14111

INTERACTION BETWEEN THE COMMON CARP (CYPRINUS CARPIO) AND THE SILVER CARP (HYPOTHALAMICHTHYS MOLITRIX) IN FISH PONDS,
Fish Culture Research Station, Dor (Israel).
A. Yashouv.
Bamidgeh. 23 (3): 85-92. 1971.
Identifiers: Biomass, *Silver carp, *Cyprinus-Carpio, Fish, Hypophthalmichthys-Molitrix, *Phytoplankters, Plankton, Ponds.

Carp and silver carp were grown together in fertilized ponds without the provision of additional feed. The carps attained a biomass of 723 kg/ha in contrast to only 391 kg/ha when grown in monoculture. The biomass of the silver carp also was higher in mixed culture. It is believed that this was due to an increase in available food for both species of fish. The silver carp produce feces rich in undigested phytoplankters, which fall to the bottom and are consumed by the carp, while the carp dig around in the bottom mud and stir up organic detritus, which then is consumed by the silver carp as though it were plankton.--Copyright 1972, Biological Abstracts, Inc.
W72-14112

FISHERIES AND FISH CULTURE IN ISRAEL IN 1970,
Laboratory for Research Fish. Dis., Nir Dawid (Israel).
S. Sarig.
Bamidgeh. 23 (3): 63-84. 1971.
Identifiers: Fish cultures, Fisheries, *Israel.

The statistics of the fish catch for Israel are given for 1970. There was a 9% increase of the total catch as compared to 1969. This was primarily due to a great increase in the catch of pond fish (17.3%). The catch of the deep-sea fishery declined by 8.4%. Various other aspects of the fishery are summarized, such as the catch by species, stocking of fry, the canning industry, fish culture and marketing.--Copyright 1972, Biological Abstracts, Inc.
W72-14113

HARVEST AND FEEDING HABITATS OF LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN MURPHY FLOWAGE, WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
H. E. Snow.
Tech Bull. 50. 1-24. Illus. 1971.
Identifiers: *Bass, Bluegills, Bullheads, Crayfish, *Feeding habits, Harvest, *Largemouth bass, Micropterus-Salmoides, Vegetation, Wisconsin.

From 1955 through 1969 the harvest and feeding habitats of largemouth bass were studied under liberalized fishing regulations and a compulsory creel census. The annual harvest of bass by anglers averaged 2.7 fish or 2.9 lb/acre. Bass fishing was most productive during May and June, and about 75% of all bass were taken on artificial lures. Of the total weight of all items consumed by bass, crayfish comprised 54.6%, fish (mainly bluegills and bullheads) 38.3%. As bass increased in size, the size of bluegills and crayfish consumed increased. Prior to an overwinter drawdown, crayfish were the most important item consumed, bullheads were positively selected and bluegills were neither selected or avoided. After the drawdown which was accompanied by a known decline in aquatic vegetation abundance and an apparent decline in crayfish abundance, consumption of bluegills increased.--Copyright 1972, Biological Abstracts, Inc.
W72-14114

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH CATALOG, VOLUME SEVEN.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 09C.
W72-13617

ANNUAL REPORT, FISCAL YEAR 1970-1971.
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 09D.
W72-13821

9C. Research Facilities

WATER RESOURCES RESEARCH CATALOG, VOLUME SEVEN.
Office of Water Resources Research, Washington, D.C.

Available from Supt. of Doc, Washington, DC 20402, for $16.25 a set. Vol 7, Pts. 1 and 2, 1972. 2660 p, 4 index.

Descriptors: *Research and development, *Projects, *Water resources development, *Contracts, Programs, Project planning, Project purposes, Federal government, Federal project policy.
Identifiers: *Water resources research catalog.

The Water Resources Research Catalog, vol 7 is a tabulation of descriptions of 6,371 research projects, most of which are funded by the U. S. Government. Some of the projects are independently funded and voluntarily reported. Each project description includes the name of the investigator, title of the project, object of study, plan of work, and source of support. The catalog lists 7,161 investigators, 1,087 performing organizations, and 548 supporting organizations.
W72-13617

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT, FISCAL YEAR 1970-1971.
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.

Available from the National Technical Information Service as PB-211 861, $3.00 in paper copy, $0.95 in microfiche. August, 1971. 90 p, 102 ref. OWRR A-999-N.J. (6).

Descriptors: *New Jersey, *Research and development, *Water Resources Institute, Hydrology, Hydraulics, Water management (Applied), Planning, Aeration, Biochemical oxygen demand, Water pollution.

Research progress and prospects are summarized under the headings: hydrology and hydraulics; water supply management and planning; instream aeration and biochemical oxygen demand; other pollution problems; and institutional and political studies. Details are given in 35 project reports by principal investigators.
W72-13821

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition AND Processing

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES-VOL. I.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.
For primary bibliographic entry see Field 05D.
W72-13638

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES - VOL II.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.
For primary bibliographic entry see Field 05.
W72-13639

10B. Reference and Retrieval

WATER RESOURCES RESEARCH CATALOG, VOLUME SEVEN.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 09C.
W72-13617

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
H. Wellisch.
Available from the National Technical Information Service as PB-211 913, $4.85 in paper copy, $0.95 in microfiche. Maryland Water Resources Research Center Technical Report No 11, 1972. 95 p, 6 fig, 9 tab, append. OWRR A-999-MD (6).

Descriptors: *Bibliographies, *Abstracts, *Indexing, *Hydraulic engineering, *Information retrieval, Data storage and retrieval, Hydrology, Methodology, Data processing, Data transmission, Computer programs, Documentation, Editing, Libraries, Technical writing, Reviews.
Identifiers: *Abstract services.

This report provides a complete and up-to-date review of the abstracting and indexing services available in water resources engineering. Between 1955 and 1970 the number of services in this field increased from about 20 to 40. This exponential growth or doubling every 15 years suggests that by 1985 there will be 80 abstracting services inexistence. Abstracting and indexing services were evaluated from all over the world to find out whether the existing services are adequate in number, quality and coverage. In view of the increasing tendency to retrieve information from secondary literature tools with the help of machines, the criteria of standardization of data elements and of compatibility of products were investigated also. Some conclusions and recommendations are given with the aim to assist editors of abstracting services to enhance the value of their publications through the introduction of useful features which are found in some but not all services, and the elimination of certain shortcomings. (Woodard-USGS)
W72-13820

10C. Secondary Publication AND Distribution

APPLICATION OF MODELS IN GEOHYDROLOGICAL INVESTIGATIONS,
Koninklijke Nederlandsche Heidemaatschappij, Arnhem (Netherlands).
For primary bibliographic entry see Field 02A.
W72-13731

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W72-13800

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DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 24
DECEMBER 15, 1972

W72-14201 -- W72-15000

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 24
DECEMBER 15, 1972

W72-14201 -- W72-15000

e of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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SUBJECT FIELDS AND GROUPS

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS AND FACILITIES
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ABSTRACT SOURCES

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

ANOMALOUS WATER AND OTHER POLYMERIC MATERIALS,
Maryland Univ., College Park. Center of Materials Research.
E. R. Lippincott, J. M. Casper, and P. Schuhmann.
Available from NTIS, Springfield, Va. 22151, as AD-739 673, Price $3.00 paper copy; 95 cents microfiche. Final Technical Report, March 1972. 42 p, 11 fig, 3 tab, 15 ref. DAAH 01-71-C-0639.

Descriptors: *Water chemistry, *Water types, *Polymers, *Synthesis, *Chemical reactions, Laboratory tests, Analytical techniques, Condensation, Gels, Silica, Water structure, Laboratory equipment.
Identifiers: *Polywater, *Anomalous water, Glass wool, Pyrex tubing, Glass tubing.

The preparation of anomalous materials by condensation in five capillaries was investigated under varied conditions of temperature, pressure and atmospheric composition. These experiments indicated that a saturated atmosphere of water vapor and a relatively high area of glass surface are primary requisites. Attempts were made to form anomalous materials by condensation on glass wool. Sodium methylcarbonate was isolated with methanol. The interaction of the room air (particularly the carbon dioxide) with the liquid and glass is important in the formation of anomalous substances. Anomalous materials were condensed directly from the air onto cold glass surfaces but not with cold plastic surfaces. This emphasized the role of glass. A possible explanation for the formation of anomalous materials on glass surfaces is that the first drops of liquid on the surface form basic sites which then condenses acidic substances from the air (primarily CO2) to form salts. Small amounts of silicon compounds may be involved to help produce the anomalous properties. (Woodard-USGS)
W72-14365

WATER PHENOMENA PHASE II: THEORETICAL STUDY OF WATER CLUSTERS AND A SEARCH FOR A NEW ALLOTROPE OF LIQUID WATER,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
P. L. M. Plummer.
Available from NTIS, Springfield, Va. 22151, as AD-735 152; Price $3.00 paper copy; 95 cents microfiche. Final Report, December 1971. 16 p, 8 ref. ONR Contract N00014-69A-0141-0002.

Descriptors: *Water chemistry, *Water types, *Water properties, *Silica, *Gels, Reviews, Chemical properties, Water structure, Pollutants, Laboratory tests, Evaluation.
Identifiers: *Anomalous water, *Polywater, Capillaries.

Studies performed in the attempt to produce and characterize anomalous water are summarized. It was concluded that the properties attributed to anomalous water were due to impurities, primarily silicates. Abstracts of seven papers concerning anomalous water are included. (Woodard-USGS)
W72-14366

THE VELOCITY DEPENDENCE OF THE TOTAL CROSS SECTION FOR ALKALI--WATER SCATTERING,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05A.
W72-14838

SOLUBILIZING EFFECTS OF AMIDE-WATER MIXTURES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05A.
W72-14843

02. WATER CYCLE

2A. General

SUBSURFACE HYDROGRAPH ANALYSIS BY CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 02F.
W72-14219

DEADLY SURGES IN THE BAY OF BENGAL: DYNAMICS AND STORM-TIDE TABLES,
Harvard Univ., Cambridge, Mass, Earth and Planetary Physics Center.
G. R. Flierl, and A. R. Robinson.
Nature, Vol 239, p 213-215, Sept. 22, 1972. 2 fig, 1 tab, 5 ref.

Descriptors: *Typhoons, *Surges, *Wind tides, *Flood forecasting, *Mathematical models, Waves (Water), Floods, Tropical cyclones, Weather patterns, Winds.
Identifiers: *Bay of Bengal, *India, *Bangladesh.

During the 1960's alone about 400,000 people died in the exceptionally high tides which swept in along the low lying northern coast of the Bay of Bengal under the force of tropical cyclones. Over half of these lives were lost in the single surge caused by the storm of November 1970. Such loss of life can be prevented only by depopulation of the area, construction of permanent defences, or by prediction of and protection against individual storms. The problem of sea level dynamics and prediction, was studied using simple mathematical models. Several factors amplify surge heights in the Bay of Bengal; the large (10-18 feet) astronomical tidal range, the large expanse of shallow water overlying the broad continental shelf, and the curvature of the coastline which focuses incoming storm-induced long waves. The maximum surge height occurs in response to a standard storm (W=100 knots, V=30 knots) run on straight line track as a function of track parameters, angle and landfall point. The maximum surge occurs shortly after landfall of the storm (within two hours but usually within one hour) and very near the landfall point (within 50 miles but usually closer than 20 miles). (Knapp-USGS)
W72-14367

SOME PROBLEMS WITH LOG-NORMAL MARKOV RUNOFF MODELS,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges.
Proceedings, American Society of Civil Engineers, Journal of the Hydraulics Division, Vol 98, No HY9, Paper 9169, p 1487-1496, September 1972. 3 fig, 2 tab, 8 ref, append. OWRR C-1635 (No 3150) (5).

*Markov processes, *Water yield, *Mathematical models, *Probability, *Runoff forecasting, *California, Reservoir design, Stochastic processes, Statistical models, Simulation analysis, Synthetic hydrology, Model studies.
Identifiers: *Arroyo Seco (Calif).

Two methods for estimating the parameters of log-normally distributed runoff volumes employed in a lag one Markov model were investigated. In the first method the parameters were determined from the logarithms of the observed record. In the second method parameters were determined directly, by a method of moments, from the untransformed record. Both annual and monthly generation models were studied. Parameters for the flow record of Arroyo Seco, Calif. were estimated by both methods. Sequences were generated for both sets of parameters and used in a typical application, a storage reservoir capacity study. Storage requirements determined from these sequences differed significantly. (Knapp-USGS)
W72-14520

DETERMINATION OF THE RELATION BETWEEN SPRING DISCHARGE AND PRECIPITATION--AN APPLICATION TO SARIKIZ SPRINGS IN TURKEY,
Aegean Univ., Bornova (Turkey).
U. Ozis, and E. Benzeden.
In: International Association of Hydrogeologists Memoires, Vol 8, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 181-184, 1972. 2 fig, 4 ref.

Descriptors: *Springs, *Water yield, *Discharge (Water), *Stochastic processes, *Correlation analysis, Water balance, Precipitation (Atmospheric), Infiltration, Groundwater movement, Regression analysis.
Identifiers: *Sarikiz Springs (Turkey).

The recharge system and the discharge of springs are usually investigated through the use of hydrogeological elements, qualitatively, and through methods of deterministic hydrology, quantitatively. Methods of stochastic hydrology yield satisfactory results in cases where the fluctuations in the discharge are significant. The principal geologic formation of the recharge area of Sarikiz Springs of Turkey is karstic limestone. A linear relationship was determined through correlation between monthly average discharge of Sarikiz Springs and cumulative precipitation during the antecedent 12-month period over the probable recharge basin. This relationship is highly significant, even though the available data are very limited and the serial correlation effect was considerable. (Knapp-USGS)
W72-14602

A REVIEW OF THE STOCHASTIC APPROACH TO FLOW THROUGH POROUS MEDIA,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 02F.
W72-14610

VARIABILITY OF THE UNIT HYDROGRAPH,
For primary bibliographic entry see Field 02E.
W72-14614

THE CONTRIBUTION OF GLACIER ICE TO THE WORLD WATER BALANCE (A STATUS REPORT ON THE WORLD GLACIER INVENTORY),
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 02C.
W72-14715

THE INFLUENCE OF MAN ON THE HYDROLOGICAL CYCLE,
H. C. Pereira.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 553-569, 1 fig, 1 tab, 13 ref.

Descriptors: *Hydrologic cycle, *Land use, *Urbanization, Water conservation, Land development, Soil conservation, Land management, Water resources development, Watershed management, International Hydrological Decade.

'The Influence of Man on the Hydrological Cycle' is the title chosen by the Co-ordinating Committee of the International Hydrological Decade for a water resources study by a Working Group of the IHD. The most important influence of man is exerted through his use of land. The results of the study are given under the headings of Forest Lands, Grasslands, Arable Lands, Irrigation and Urbanization. Modern technology provides fully effective methods of developing land for all of the above uses, while incorporating protection of water resources. Desalination of seawater or of brackish ground water does not offer a viable alternative to watershed development. In the most developed countries methods for watershed protection and soil conservation are successfully adopted, but severe problems remain in urban and industrial areas of water pollution and disposal of waste products. In the developing countries watershed protection is failing at an alarming rate as natural vegetation cover is destroyed by unskilled subsistence agriculture. Both problems arise from the rapidly accelerating growth of human population. Implementation of the Group's recommendations must depend on political acceptance of public restrictions for the common good. In developing countries it is proposed that social, medical, economic and technical aid should be linked to land use improvement on a watershed basis and to the acceptance of essential restrictions of natural resources. (Knapp-USGS)
W72-14716

WATER AND ENERGY BALANCES OF DIFFERENT VEGETATION COVERS,
Munich Univ. (West Germany). Meteorologisches Institut.
For primary bibliographic entry see Field 02D.
W72-14717

PRELIMINARY RESULTS OF NEW INVESTIGATIONS OF WORLD'S WATER BALANCE,
Munich Univ. (West Germany). Meteorologisches Institut.
For primary bibliographic entry see Field 02D.
W72-14718

A SYNOPTIC STUDY FOR EVALUATING THE ROLE OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 02H.
W72-14719

WATER BALANCE AND FLOW STUDY IN THE BRAHMAPUTRA-GANGES BASIN OF EAST PAKISTAN,
East Pakistan Water and Power Development Authority, Dacca.
For primary bibliographic entry see Field 02E.
W72-14720

DISTINGUISHING SEASONAL RECHARGE TO GROUNDWATER BY DEUTERIUM ANALYSIS IN SOUTHERN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 02F.
W72-14721

SEPARATION OF HYDROGRAPH COMPONENTS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
For primary bibliographic entry see Field 02E.
W72-14722

USE OF NEW TECHNIQUES FOR DETERMINING REGIONAL WATER BALANCES AND THEIR REPRESENTATION BY MATHEMATICAL MODELS (REFLEXIONS SUR L'UTILISATION DE TECHNIQUES NOUVELLES DANS L'ELABORATION DE BILANS HYDRIQUES REGIONAUX ET LEU R REPRESENTATION PAR MODELES MATHEMATIQUES),
International Association of Scientific Hydrology, Gentbrugge (Belgium). Surface Water Commission.
J. Jacquet.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 640-651. 5 ref.

Descriptors: *Water balance, *Reviews, *International Hydrological Decade, Forecasting, Water yield, Water demand, Water utilization, Climatology, Hydrologic cycle.

The methodology of working out water balances on a regional scale is discussed, taking into account the possibilities offered by modern methods of data collecting and processing, and also the limitations imposed by the practical aims of such operations. In any continental zone, determination of water balances is the necessary preliminary to preparation of prediction models based on the (present or future) level of consumption of the water resources of the region in question. For the prediction to take all factors into account, this obviously means that the regional water balance must be related to a global model depicting circulation of the atmospheric water on which replenishment of the resources depends. After problems are listed and the progress made in solving them is reviewed, a few lines of research are stressed because they look particularly promising for bringing out improvements in the efficiency of techniques for analyzing and representing hydrological phenomena. (Knapp-USGS)
W72-14723

ADAIR IHD EXPERIMENTAL BASIN NO 14, 1970.
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 04A.
W72-14729

WATER RESOURCES OF THE CROW WING RIVER WATERSHED, CENTRAL MINNESOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14743

INVESTIGATION OF TIME PARAMETER OF WATERSHEDS,
South Dakota State Univ., Brookings. Water Resources Inst.
S. T. Chu, and W. F. Lytle.
Available from the National Technical Information Service as PB-212 384, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Sept 1, 1971. 26 p, 10 fig, 1 tab, 8 ref, append. OWRR A-023-SDAK (1).

Descriptors: *Surface runoff, *Unit hydrographs, *Time of concentration, *Small watersheds, Peak discharge, *South Dakota, Storm runoff, Rainfall-runoff relationships, *Flood discharge.
Identifiers: Ungaged watersheds.

The base width of instantaneous unit hydrograph -- the time of base for thirty-five watersheds in South Dakota is investigated. This time parameter is correlated with the measurable physical properties of watersheds. A formula equation was derived which correlates the peak runoff and the duration of rainfall excess for a variable rainfall excess pattern. This formula augments theoretical developments in applying the ideas of unit hydrography theory and time of base to analyze runoff data. Based upon this correlation, a new method is developed to determine the flood discharge for ungaged watersheds with area less than 500 sq. miles in South Dakota.
W72-14918

STOCHASTIC SPACE-TIME MODELS OF THE RAINFALL-RUNOFF PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel, L. Duckstein, and J. L. Sanders.
Available from the National Technical Information Service as PB-212 387, $3.00 in paper copy, $0.95 in microfiche. Technical Completion Report, September 1972. 5 p. OWRR A-032-ARIZ (1).

Descriptors: *Flood forecasting, *Model studies, *Streamflow, Statistics, *Urban runoff, Watersheds (Basins), *Rainfall-runoff relationships, Water resources development, Arizona.
Identifiers: Tucson (Ariz).

The problem of forecasting the flow (floods and flow volumes) is approached from two vantage points: (a) use of basic stochastic hypotheses about thunderstorm patterns in space and time coupled to a simple rainfall-runoff model for a small basin so as to obtain a theoretical probability distribution of flow volumes, (b) use of a simple linear regression model relating flood peak to concurrent rainfall in the Tucson area as a basis for a Bayesian decision theoretic study of the worth of secondary data sources (rainfall) to augment information in the primary data (flood peak). The strength of the first approach rests on the goodness of the hypotheses and has the promise of generating classes of theoretical probability distributions of streamflow descriptors for the same descriptors. The approach gets away from use of multivariate hydrologic models for preserving second-order moment properties of rainfall and streamflow. The second but complementary vantage point looks at the hydrologic situation with small sample sizes as the decision maker might view it. Improvement in bridge pier design is obtained as a result of using the secondary data source. The focus is on the decision to be made with the aid of the data and not on model building for its own sake. However, both vantage points should gradually converge as stochastic models become more representative of flow on different parts of the drainage net.
W72-14922

STABLE ISOTOPE SURVEY OF THE FRESH WATER OCCURRENCES IN ISRAEL AND THE NORTHERN JORDAN RIFT VALLEY,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
For primary bibliographic entry see Field 02K.
W72-14945

EFFECT OF CATCHMENT AREA ON FLOOD MAGNITUDE,
Australian Rivers and Water Supply Commission Victoria, New South Wales.
G. N. Alexander.
Journal of Hydrology, Vol 16, No 3, p 225-240 July 1972. 8 fig, 1 tab, 49 ref.

Descriptors: *Rainfall-runoff relationships *Regression analysis, *Rational formula Precipitation intensity, Runoff coefficient Watersheds (Basins), Peak discharge, Desig flow, Duration curves, Stochastic processes.

The estimation of the exponent in the commo power-type formula relating flood flow t catchment area yields values ranging from 1/ (Meyer-Jarvis) to 1 (Rational formula), all in com mon use. To reduce this range it is essential t distinguish between values obtained by regressio analysis from those obtained using an envelop From examination of values based on regressio estimates depend on the range of area sizes, rai fall frequency, and climate. The average of e ponents in the three power-type formulae relatin rainfall intensity with duration; duration or l with area A; or flood intensity with rainfall intens ty, is 0.7. (Knapp-USGS)

W72-14946

ROLE OF BASEFLOW IN RAINFALL-RUNOFF RELATIONS,
Illinois State Water Survey, Urbana.
K. P. Singh.
Water Resources Bulletin, Vol 8, No 4, p 813-824, August 1972. 4 fig, 3 tab, 3 ref.

Descriptors: *Base flow, *Rainfall-runoff relationships, *Water yield, *Flood forecasting, Runoff forecasting, Storm runoff, Peak discharge, Hydrogeology, Hyetographs, Hydrographs, Hydrograph analysis, Recession curves, Regression analysis, Correlation analysis, Data collections, Soil moisture, Evapotranspiration, *Illinois.
Identifiers: *Base flow (Initial).

The role of initial baseflow, or the baseflow at the beginning of storm precipitation, in modifying mathematical rainfall-runoff relations was analyzed by using data from 95 storms over a drainage basin in Illinois. A regression model used total runoff, surface runoff, baseflow runoff, and peak flow as dependent variables, and storm precipitation, initial baseflow, effective and total storm durations, and temperatures as independent variables. Storm precipitation and initial baseflow are the most important variables for making dependent variable estimates. The standard error estimates using only storm precipitation and initial baseflow as predictors show a seasonal trend with a peak in July, August, or September. An understanding of the role of baseflow as an indicator of average soil moisture condition over the basin can be of great help in short-term reservoir regulation and flood warning. (Knapp-USGS)
W72-14955

WATER RESOURCES APPLICATIONS OF STREAM CHANNEL CHARACTERISTICS ON SMALL FORESTED BASINS,
Pennsylvania State Univ., University Park. School of Forest Resources.
D. R. DeWalle, and A. Rango.
Water Resources Bulletin, Vol 8, No 4, p 697-703, August 1972. 3 tab, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Variability, *Alluvial channels, *Channel morphology, Geomorphology, Discharge (Water), Water yield, Runoff forecasting, Runoff, Hydrogeology, Streamflow forecasting.

Stream channel characteristics are useful indices to the hydrology of 27 small forested basins in the Northeast United States. Channel width alone explains 37 percent of the variation in mean annual runoff, and channel width combined with basin area explains 78 percent of the variation. Mean annual precipitation explains 83 percent. A simulated 15% increase in precipitation, such as might occur in a weather modification project, produced increases in channel width, depth, and channel area of 3, 4, and 8 percent, respectively. (Knapp-USGS)
W72-14966

2B. Precipitation

ATMOSPHERIC WATER RESOURCES RESEARCH,
Fresno State Coll., Calif.
For primary bibliographic entry see Field 03B.
W72-14232

RESEARCH IN NUMERICAL ANALYSIS TECHNIQUES FOR MODEL SIMULATION,
Digital Programming Services, Inc., Waltham, Mass.
R. C. Serbagi.
Available from NTIS, Springfield, Va., 22151, as AD-740 967. Price $3.00 paper copy; $0.95 microfiche. Air Force Cambridge Research Laboratories Final Research Report AFCRL-71-0581, November 15, 1971. 37 p, 4 ref. Contract No F19628-69-C-0178.

Descriptors: *Computer models, *Cloud physics, *Meteorological data, *Fog, *Numerical analysis, Condensation, Computer programs, Methodology, Drops (Fluids), Evaporation.

A computer model is given for the numerical solution of the partial differential equations governing the transport and condensation processes of clouds. The models include two-dimensional warm fog seeding, one-dimensional cumulus cloud formation, and three-dimensional warm fog modification by external heat sources. The finite difference techniques used and the stability criteria are discussed. The method of calculating, the condensation/evaporation rates, and the diffusion parameters are also given. In addition, a series of computer programs, data reduction techniques, and data analysis procedures were developed to recover pertinent data from various recording media generated on C-130 aircraft. The meteorological data collected were reduced into a usable form such that computer studies can be made relative to the growth, structure, and modification techniques of convective clouds. (Woodard-USGS)
W72-14358

DEADLY SURGES IN THE BAY OF BENGAL: DYNAMICS AND STORM-TIDE TABLES,
Harvard Univ., Cambridge, Mass. Earth and Planetary Physics Center.
For primary bibliographic entry see Field 02A.
W72-14367

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION,
Transportation Systems Center, Cambridge, Mass.
For primary bibliographic entry see Field 07B.
W72-14372

LARGE SCALE EFFECTS OF CLOUD SEEDING--1970-1971 SEASON AND FOUR YEAR SUMMARY,
Aerometric Research, Inc., Geoleta, Calif.
For primary bibliographic entry see Field 03B.
W72-14538

WATER RESOURCES OF NORTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14540

FLOODS OF AUGUST 1967 IN EAST-CENTRAL ALASKA, WITH A SECTION ON WEATHER FEATURES CONTRIBUTING TO THE FLOODS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-14725

EVALUATION OF THE STREAMFLOW-DATA PROGRAM IN HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W72-14737

FORECASTING PRECIPITATION TYPE AT GREER, SOUTH CAROLINA,
National Weather Service, Columbia, S.C.
J. C. Purvis.
Available from NTIS, Springfield, Va. 22151 as COM-72-10332, Price $3.00 paper copy; $0.95 cents microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NWS-ER-44, 1971. 8 p, 2 fig, 3 tab, 4 ref.

Descriptors: *Weather forecasting, *Precipitation (Atmospheric), *Meteorology, *Synoptic analysis, *South Carolina, Analytical techniques, Weather data, Meteorological data, Rainfall, Snowfall, Sleet.
Identifiers: *Precipitation types, *Greer (SC).

Using the predictors recommended by Younkin, an objective technique in the form of a nomograph has been developed for forecasting precipitation type at Greer, S.C. A test on independent data showed that this technique produces results at least as good as the forecasts released to the public. The objective technique can help overcome an apparent reluctance of forecasters to forecast frozen or freezing precipitation at Greer until it is observed. The Younkin method relates both the 1000 - 850 mb. and the 850 - 700 mb. thickness to type of precipitation. The technique as applied for Greer relates the 0000Z observed thickness data to the type of precipitation that occurs the following calendar day, which begins at 0500Z. To make the technique completely objective, an arithmetic mean of the Athens, Georgia, and Greensboro, North Carolina, radiosonde data is used, without any adjustments. (Woodard-USGS)
W72-14741

EVALUATION OF WARM-FOG ABATEMENT CHEMICALS,
Naval Weapons Center, China Lake, Calif.
E. E. Hindman, II, and R. S. Clark.
Available from NTIS, Springfield, Va. 22151, as AD-740 640 - Price $3.00 paper copy; $0.95 cents microfiche. Department of Transportation, Federal Aviation Administration Report FAA-RD-72-21, 1972. 31 p, 4 fig, 2 tab, 22 ref. DOT FAA72WA1.

Descriptors: *Fog, *Abatement, *Chemicals, *Methodology, *California, On-site tests, Drops (Fluids), Heating, Meteorology, Precipitation (Atmospheric), Evaporation, Humidity.
Identifiers: *Fog-abatement chemicals, *Glycerine, Warm fog, Fog dissipation.

Dow Chemical Company demonstrated that glycerine, diethylene- and tetraethylene-glycol were promising warm-fog abatement chemicals. The FAA requested that the fog-abatement properties of these chemicals be evaluated during the NWC Project Foggy Cloud IV, Humboldt County, California. Nineteen micron glycerine droplets were sprayed at 21 gal/acre into a 250 ft deep stratus deck from a tethered hot-air balloon. The heat from the balloon cleared the first 50 ft of the deck and the glycerine droplets cleared a 178 ft diameter hole through the remaining 200 ft. The droplets cleared the hole by reducing the relative humidity in the stratus deck which caused the stratus droplets to evaporate. (Woodard-USGS)
W72-14747

CLIMATOLOGIC TRAITS OF EASTERN PARAGUAY,
Asuncion Univ. (Paraguay). Faculty of Agronomy.
Teofilo Farina Sanchez.
Bol Soc Argent Bot. 11 (Suppl.): p 111-119. 1970.
Identifiers: *Climatology, *Paraguay, *Humidity.

The factors of sunshine, temperature, evaporation, dew, rain, wind, storms, frost, fog and dust storms are analyzed. A breakdown of different climates within the area distinguishes between tropical subhumid climate with deficient humidity in winter; mesothermal humid with deficient humidity in winter; mesothermal subhumid with adequate year-round humidity.--Copyright 1972, Biological Abstracts, Inc.
W72-14906

THE ROLE OF ELECTRICAL FORCES IN THE DEVELOPMENT AND DISSIPATION OF CLOUDS AND FOGS,
University of Manchester Inst. of Science and Technology (England).
J. Latham, and M. H. Smith.
Available from NTIS, Springfield, Va. 22151 as AD-737 728 - Price $3.00 paper copy; $0.95 cents microfiche. Final Technical Report, November 1971. 37 p, 22 fig, 61 ref. DAJA37-71-C-1117.

Descriptors: *Cloud physics, *Electrical properties, *Dropwise condensation, *Weather modification, *Rainfall, Fog, Meteorology, Model studies, Meteorological data, Atmospheric physics, Clouds, Mathematical studies, Analytical techniques.
Identifiers: *Cloud dissipation, *Fog dissipation.

Cloud physics studies provide data concerning the coalescence efficiencies of water drops; the production of satellite droplets by colliding water drops and the resulting effect upon rainfall rate; the influence of electric forces upon the interaction of cloud droplets; and calculation of the effectiveness of various hygroscopic materials as fog modification agents. The studies of the interactions of colliding water drops comprise the main body of the report. The results of computations utilizing a model of the movement of charged droplets under the influence of their charges are presented graphically. The main features of the graphs are the reversal positions of the electric field and the droplet velocities. The electric force and gravitational force on the particles nearly cancel out leaving a very low remaining force. The electric fields produced are quite large even in the case of the spraying of relatively small amounts of material. (Woodard-USGS)
W72-14963

2C. Snow, Ice, and Frost

COARSE SEDIMENT TRANSPORT BY FLOOD FLOWS ON KNIK RIVER, ALASKA,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W72-14207

DEEP EROSION BY CONTINENTAL ICE SHEETS,
North Carolina Univ., Chapel Hill. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14208

TURBIDITE MUDS WITHIN DIATOM OOZE OFF ANTARCTICA: PLEISTOCENE SEDIMENT VARIATION DEFINED BY CLOSELY SPACED PISTON CORES,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14209

VERTICAL MIXING OF ICE-RAFTED VOLCANIC ASH IN NORTH ATLANTIC SEDIMENTS,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 02J.
W72-14210

ALPINE SUBNIVAL BOULDER PAVEMENTS IN COLORADO FRONT RANGE,
Ohio State Univ., Columbus. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14229

MEANDERING HABIT OF SUPRAGLACIAL STREAMS,
Sheffield Univ. (England). Dept. of Geography.
A. D. Knighton.
Geological Society of America Bulletin, Vol 83, No 1, p 201-204, January 1972. 2 fig, 1 tab, 7 ref.

Descriptors: *Meanders, *Melt water, *Glaciers, *Channel morphology, *Glaciohydrology, Ice, Melting, Geomorphology, Hydraulics, Streamflow, Discharge (Water).
Identifiers: *Supraglacial streams.

There is a general similarity in the form of meanders developed in alluvial valleys and on glacier ice, despite large differences in environmental conditions. As measurements were made only two months after the beginning of the snow-melt, time does not appear to be an important element in the attainment of a mean meander geometry where the stream is free to develop its planimetric form in the abence of severe physical constraints. Nor do differences in scale seem to affect the relations; meanders are shaped to maintain a proportionality between the form parameters themselves and between those parameters and the size of the channel. These considerations indicate the importance of flow dynamics in meander formation and lend support to the contention that meanders develop in response to the action of a general physical principle. The value of studying supraglacial streams lies in the fact that the adjustment of form to process takes place relatively rapidly in conditions which are free from some of the constraints imposed on alluvial rivers. (Knapp-USGS)
W72-14231

MEASUREMENTS OF ULTRASONIC WAVE VELOCITIES IN ICE CORES FROM GREENLAND AND ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
H. F. Bennett.
Research Report 237, June 1972. 58 p, 53 fig, 61 ref. Contract DA-49-092-ARO-40.

Descriptors: *Ice cover, *Sound waves, *Ultrasonics, *Arctic, *Antarctic, Anisotropy cores, Isotropy velocity, Measurement, Instrumentation, Methodology, Analytical techniques, Model studies, Profiles, Crystals, Correlation analysis.
Identifiers: *Greenland, *Antarctica, *Ice cores, Acoustic birefringence.

Detailed ultrasonic velocity measurements were made on snow and ice cores from Greenland Antarctica to study velocity anisotropy and its relationship to the petrofabric analysis of these cores. In addition, ultrasonic velocities were measured in the near-surface snow layers at Byrd Station and South Pole Station, Antarctica, to provide detailed velocity profile in the region of the ice sheet where velocity is greatly influenced by the snow structure. The design of equipment, measurement errors, techniques, and problems encountered in the study are discussed. The theory of wave propagation in a general anisotropic medium is reviewed and a detailed presentation of this theory, concerning transversely isotropic media, is given. A method is developed for calculating a theoretical velocity model from the petrofabric analysis of the ice cores, thus providing a means of testing the theory with field and laboratory observations. There is good agreement between the theoretical velocity models based on the petrofabric ice core analysis and the observed seismic and ultrasonic shear-wave velocity observations, but poorer agreement with the compressional wave velocities. (Woodard-USGS)
W72-14521

THE CONTRIBUTION OF GLACIER ICE TO THE WORLD WATER BALANCE (A STATUS REPORT ON THE WORLD GLACIER INVENTORY),
McGill Univ., Montreal (Quebec).
F. Mueller, and C. S. L. Ommanney.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 539-553, 2 fig, 4 tab, 38 ref.

Descriptors: *Water balance, *Glaciers, *Data collections, *Canada, *International Hydrological Decade, Hydrology, Surveys, Networks, Hydrologic data, Data processing.

This paper reviews the UNESCO/IASH guide for a world glacier inventory and the three pilot studies carried out on the basis of the guide's recommendations, and reports, using Canada as an example, on the problems and progress of one of the countries most advanced in its IHD glacier inventory work. After a brief mention of some of the efforts being made to implement this guide in many other countries, some of the limitations, difficulties and potentials are discussed. Plans for an International Technical Secretariat for global data compilation and analysis are mentioned. (Knapp-USGS)
W72-14715

AN EARTH FILL DAM ON PERMAFROST: HESS CREEK DAM, LIVENGOOD, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08D.
W72-14939

GLACIOLOGICAL INVESTIGATIONS IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. J. Gow.
Antarctic Journal of the United States, Vol 7, No 4, p 100-101, July-August 1972. 2 fig.

Descriptors: *Glaciers, *Antarctic, *Sediment transport, Sedimentation, Provenance, Glaciation, Regimen, Dusts, Sands, Gravels.
Identifiers: Royal Society Range (Antarctica).

Glaciers along the southern foothills of the Royal Society Range, Antarctica were studied to observe the debris patterns in the glaciers and to learn the mechanisms of their emplacement. Sites visited included eight alpine glaciers-Walcott, Adams, Miers, Joyce, Garwood, Hobbs, Blue, and Commonwealth-and a single outlet glacier, Taylor. All the glaciers contained laminations made up of fine sand and dust. Such debris tended to be concentrated into zones up to 3 meters thick and as many as four laterally extensive zones were identified in several of the glaciers. Deposition of dust and sand occurred on a periodic basis. Most of the debris was probably derived by wind from sources of exposed rock in the Royal Society Range. Some of the debris may be volcanic ash. Additionally, the Garwood, Blue, and Taylor Glaciers all contain thick sequences of sand and gravel intercalated with bubbly glacial ice. Though obviously distorted by englacial deformation, these deposits still possess characteristic features of water-laid deposits. This debris was originally deposited on top of the glaciers (in their accumulation areas) by melt streams or by avalanching during some period of ablation much more intensive than the present. This period of ablation could be correlated with the climatic optimum of several thousand years ago. (Knapp-USGS)
W72-14940

OGIVE SYSTEMS ON POLAR ALPINE GLACIERS,
Ohio State Univ., Columbus. Inst. of Polar Studies.
M. J. McSaveney.
Antarctic Journal of the United States, Vol 7, No 4, p 101-102, July-August 1972. 4 ref. NSF Grant GV-28804.

Descriptors: *Glaciers, *Antarctic, *Movement, *Rheology, Ablation, Regimen, Glaciation, Surveys.

To test various models of glacial ogive formation and to find out how wave ogives are formed and

modified under polar alpine conditions, closely spaced surface strain networks were erected on the ogive train of Meserve Glacier, Antartica, deep and shallow bore holes were placed within these networks, ice samples were taken for fabric studies, and areal variation in ablation was studied. In addition, other ogive systems in the McMurdo Sound region were observed. The Meserve Glacier ogive train is not a single train of waves but a system of two interdigitating trains symmetrically disposed about the center-line. Well developed ogive trains were located on polar-facing alpine glaciers in the valley of the Ferrar Glacier and in Pearse Valley. Poorly developed ogives of polar orientation were observed in Taylor and Wright Valleys. Strain variation over ogive systems is large and consistent with the ogive pattern. The largest wave form on Meserve Glacier is now a recumbent fold, flattening under gravity. (Knapp-USGS)
W72-14941

DEEP LAKE, CAPE BARNE, ANTARCTICA,
Institute of Nuclear Sciences, Lower Hutt (New Zealand).
C. H. Hendy, M. J. Selby, and A. T. Wison.
Limnology and Oceanography, Vol 17, No 3, p 356-362, May 1972. 7 fig, 5 ref.

Descriptors: *Lakes, *Antarctic, *Lake ice, *Paleoclimatology, *Paleohydrology, Geomorphology, Water temperature, Water chemistry, Limnology, Glaciation, Freezing, Melting.
Identifiers: *Deep Lake (Antarctica).

Microrelief on the ice of Deep Lake, Ross Island, Antarctica, is caused by differential ablation. A 3.3 m high ice cone was formed by tilting of ice blocks beneath a gravel cover of varying thickness. The temperature of the lake water beneath the ice is a result of solar heating. Chemical stratification is an indication that there was an arid period in the recent past. (Knapp-USGS)
W72-14958

2D. Evaporation and Transpiration

PLANT POPULATION EFFECTS ON THE EFFICIENT USE OF WATER: WATER UPTAKE CHARACTERISTICS,
Agricultural Experiment Station, Stillwater. Okla.
For primary bibliographic entry see Field 03F.
W72-14433

STOMATAL RESISTANCE AND TRANSPIRATION POTENTIAL OF BOG PLANTS,
New Hampshire Univ., Durham. Dept. of Soil and Water Science.
P. J. Marchand.
M.S. Thesis, May 1972. 57 p, 3 tab, 7 fig, 32 ref. OWRR A-015-NH (2).

Descriptors: *Transpiration control, *Evapotranspiration, *Water yield improvement, Soil-water-plant relationships, Bogs, Stoma.
Identifiers: *Stomatal resistance, *Bog plants, Transpiration potential.

Control of vegetative ground cover offers one means of regulating evapotranspiration losses and increasing watershed yield. In order to identify species differences in water use, key resistances in the transpiration pathway were studied, under common field conditions. Stomatal diffusion resistance was compared among ten wetland species with three-fold differences noted. Xylem tensions were measured with a pressure bomb as a means of inferring species differences in internal resistance to water movement. Diurnal trends showing progressive stomatal closure throughout the day in some species but not in others, indicates important differences in water-use patterns, possibly related to liquid-phase resistances. It is concluded that the magnitude of species differences in 'effective' stomatal resistance under field conditions is significant in terms of resulting soil-water depletion. Furthermore, making such comparisons with the diffusion porometer remains a practical means of surveying watershed vegetation.
W72-14543

HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,
R. Kaneko.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 140-144, 1972. 5 fig.

Descriptors: *Evapotranspiration, *Water balance, *Sand dunes, Infiltration, Groundwater movement, Saline water intrusion, Urbanization, Industrial water, Water table, Hydrogeology.
Identifiers: Hiratsuka (Japan).

The groundwater level was recorded from 1953 through 1965 at the observation field in Hiratsuka, Japan, and a water balance calculation around the field was performed to estimate groundwater flow and evapotranspiration. No surface flow takes place near the field. Soil moisture, groundwater level, and evapotranspiration from lysimeters were measured at the investigation site in addition to meteorological observation. During the period, the increase of population and the development of industry in Hiratsuka caused a rapid increase of pumped discharge of groundwater. Accordingly, the groundwater level in deep wells gradually fell, and also the unconfined groundwater table was lowered owing to percolation into deeper strata. Transpiration from sandy land is estimated by providing precipitation, groundwater flow, groundwater stage, and the relationship between groundwater level and its drawdown corresponding to the change of environments. The value of evapotranspiration indirectly obtained by water balance calculation on an area in question better represents the true evapotranspiration of the area than direct measurement in such a limited plot as lysimeters. (Knapp-USGS)
W72-14599

WATER AND ENERGY BALANCES OF DIFFERENT VEGETATION COVERS,
Munich Univ. (West Germany). Meteorologisches Institut.
A. Baumgartner.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 570-580 6 fig, 1 tab, 9 ref.

Descriptors: *Water balance, *Climatology, *Land use, *Evapotranspiration, Water utilization, Consumptive use, Vegetation effects, Evaporation, Snowmelt, Thermodynamics, International Hydrological Decade.

Using the thermodynamics of evaporation, the rate at which evaporation can be influenced by man's activity to change the earth surfaces is calculated. Evaporation increases with growing plant mass of the soil covers. The potentials to change the water balance of continents, oceans, and the globe are evaluated. The possibility of changing the water balance by altering the vegetated part of the earth's surface is extremely small, of the order of only about 001%. (Knapp-USGS)
W72-14717

PRELIMINARY RESULTS OF NEW INVESTIGATIONS OF WORLD'S WATER BALANCE,
Munich Univ. (West Germany). Meteorologisches Institut.
A. Baumgartner, and E. Reichel.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 581-592, 1 fig, 2 tab, 39 ref.

Descriptors: *Water balance, *Climatology, Evaporation, Precipitation (Atmospheric), Reviews, Runoff, Hydrologic cycle, International Hydrological Decade, Evapotranspiration.

Methods and results of recent investigations to improve the certainty of numerical data of global water balance as well the partition of water to continents, oceans and latitudinal zones are reviewed. A new detailed precipitation chart was drawn. A chart of the level of stream discharge was drawn on a similar scale as the map of precipitation, on the basis of the published numerical values. A chart of the evaporation quantities was calculated on a climatological basis from the methods and values given by Thornthwaite. The three maps for precipitation, runoff, and evaporation are used for a mutual control. Evaluation of evaporation from seas is possible at the present state with higher reliability than of the precipitation. The evaluation of evaporation on the seas results from considerations of vapor exchange and from investigations of the heat balance by calculating the latent heat for evaporation. (Knapp-USGS)
W72-14718

RELATIONSHIPS BETWEEN THE AMOUNT OF TRANSPIRATION AND THE STOMATE OPENING OF SOME PHANEROPHYTES FROM THE ZAGREB FOREST (YUGOSLAVIA),
Institut za Botaniku, Zagreb (Yugoslavia).
Mihovil Gracanin, and Ljudevit Ilijanic.
Biol Glas. Vol 21, No 1-4, p 137-149. 1968 (1969). Illus.
Identifiers: *Transpiration, *Stomata, Acer pseudoplatanus D, Carpinus betulus D, Corylus avellana D, Fagus sylvatica D, Forests, Fraxinus excelsior D, Opening, Phanerophytes, Quercus petraea D, Relationships, Sambucus racemosa D, Yugoslavia.

Under natural conditions no definite causal relationship between transpiration values and stomate size was ascertained because these are affected by external physical and internal physiological factors. In some species (Corylus avellana, Quercus petraea, Fraxinus excelsior and especially Acer pseudoplatanus and Sambucus racemosa) the stomata never completely close during the day or during the vegetation season (May 23 to Oct. 2). The stomata of Carpinus betulus and especially of Fagus sylvatica are often closed in the early morning and late afternoon. It appears that the condition of the stomate is highly dependent on light intensity and turgidity of the stomate cells, while transpiration is not only determined by the size of the stomate opening, but more by the water vapor potential between the leaf blade and the atmosphere. From spring to fall the structure of the epidermal cells changes and with it the transpiration capacity.--Copyright 1972, Biological Abstracts, Inc.
W72-14828

PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF PLANTS TO DIFFERENT INTERNAL WATER POTENTIALS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 02I.
W72-14835

COMPARISON OF LYSIMETER AND NEUTRON SCATTER TECHNIQUES FOR MEASURING EVAPOTRANSPIRATION FROM SEMIARID RANGELANDS,
Agricultural Research Service, Sidney, Mont.
J. R. Wight.
J Range Manage. Vol 24, No 5, p 390-393. 1971. Illus.

Identifiers: *Evapotranspiration, *Measurement, Semiarid climates, Flux, Lysimeters, Percolation, Rangelands, Runoff, Soil water.

Evapotranspiration (ET) calculated from changes in soil water content measured by the neutron scatter method was compared to ET measured by lysimetry. During 1968, a near-average precipitation year (33 cm), the neutron method was effective for determining ET over periods of 4 wk or longer. Cumulative ET curves as determined by lysimetry and the neutron method were in excellent agreement. In 1969, a year with high precipitation in June and July, reliability of the neutron method was severely limited by deep percolation and possibly by surface runoff. Failure of the neutron method to measure accurately water content near the soil surface following periods of precipitation was the major source of error when percolation and runoff were not factors. Sensitivity of the neutron method during a 30-day drying cycle was equal to that of a hydraulic lysimeter. Upward soil water fluxes were evident and are potential sources of error.--Copyright 1972, Biological Abstracts, Inc.
W72-14862

A NOTE ON THE MEASUREMENT AND ESTIMATION OF EVAPORATION,
R. W. Gloyne.
Meteorological Magazine, Vol 100, p 322-328. 1 fig, 16 ref. (1971).

Descriptors: *Evaporimeters, *Evaporation, *Evaporation pans, *Water loss, Transpiration, Evapotransportation, Transpiration control, Climatology, Microclimatology, Analytical techniques, Measurement.

In a given macro-meteorological situation, the rate of water-loss per unit area from a device such as a pan, a small pond, or from an isolated small area can, and generally does, differ systematically in varying degrees from the corresponding rate of water loss from an extensive, homogeneous vegetated surface. Causes of the differences between the rate of water loss from an evaporimeter and that from an extended, freely evaporating area are discussed. Theoretical expressions of the evaporation rate from a strip and a circular area are examined to clarify the problem. Attention is directed to the leading edge effect and to the oasis effect. Field results are included to help illustrate these effects. (Black-Arizona)
W72-14879

MEASURED AND PREDICTED EVAPORATION AT PASAJE, ECUADOR,
M. R. Hasan, and P. S. Jones.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR3, p 511-516, September 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Evapotranspiration, *Consumptive use, *Crops, *Tropical regions, South America, Humid areas, Evaporation, Evaporimeters.
Identifiers: *Bananas, *Ecuador.

To determine the water requirements of bananas and certain other crops in the coastal region of the Jubones River basin, southern Ecuador, a study was made of the measured and computed evaporation regimes based on the Class A pan, Piche evaporimeter and climatic data covering 84 months at one station in the project area. Both the Thornthwaite and Blaney-Criddle methods appear to overestimate evaportranspiration. The application of these formulas, without any modification to suit the climatic anomalies of the area, can be justified only if a high degree of approximation is acceptable in calculating water requirements of bananas or any other crop. (Knapp-USGS)
W72-14952

2E. Streamflow and Runoff

ENVIRONMENTAL CONSTRAINTS ON THE SUBSTITUTION OF SPACE FOR TIME IN THE STUDY OF NATURAL CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
A. D. Abrahams.
Geological Society of America Bulletin, Vol 83, No 5, p 1523-1529, May 1972. 4 fig, 2 tab, 20 ref.

Descriptors: *Geomorphology, *Drainage patterns (Geologic), *Drainage density, Terrain analysis, Statistics, Topography, Channel morphology, *Australia.
Identifiers: *Stream channel networks.

Data for stream frequency and drainage density were gathered from five fluvially eroded landscapes in eastern Australia. Growth models may be defined only for basins of a given order in a particular landscape. Laws of change through time (growth laws) involving any drainage basin morhpometric property that is functionally related to the random development of channel networks may be represented by laws of change over space only where the sampled basins are of the same order (or magnitude) and experience similar environments. For real channel networks, variability density originates in systematic variations in the environment and apparently random development of channel networks. (Knapp-USGS)
W72-14203

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 08B.
W72-14205

MEANDERING HABIT OF SUPRAGLACIAL STREAMS,
Sheffield Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W72-14231

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W72-14234

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1971,
Geological Survey Helena, Mont.
For primary bibliographic entry see Field 07C.
W72-14235

FIELD OBSERVATIONS OF WAVE RUNOFF ON A SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 07C.
W72-14362

A SUMMARY OF PEAK STAGES AND DISCHARGE IN MARYLAND, DELAWARE, AND DISTRICT OF COLUMBIA FOR FLOOD OF JUNE 1972,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 07C.
W72-14369

PREDICTION OF COLUMBIA RIVER TEMPERATURES DOWNSTREAM FROM GRAND COULEE DAM FOR WIDE EXTREMES OF FLOW AND WEATHER CONDITIONS,
For primary bibliographic entry see Field 04A.
W72-14402

WIND DRIVEN WATER CURRENTS,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08B.
W72-14412

SOME PROBLEMS WITH LOG-NORMAL MARKOV RUNOFF MODELS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14520

EFFECTS OF THE JANUARY AND FEBRUARY 1969 FLOODS ON GROUND WATER IN CENTRAL AND SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-14525

QUALITY OF SURFACE WATER IN THE BEAR RIVER BASIN, UTAH, WYOMING, AND IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14539

WATER RESOURCES DATA FOR NEW YORK, 1971: PART 1. SURFACE-WATER RECORDS.
Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 07C.
W72-14609

VARIABILITY OF THE UNIT HYDROGRAPH,
P. Light.
Available from NTIS, Springfield, Va 22151 as COM-72-10363 Price $3.00 paper copy; $0.95 microfiche. NOAA, National Weather Service, Final report, December 1971. 42 p, 7 fig, 17 tab, 14 ref. Project No 0211912 NOAA Contract E-191-69 (N).

Descriptors: *Storms, *Precipitation (Atmospheric), *Rainfall-runoff relationships, *Unit hydrographs, *Model studies, Computer programs, Statistical methods, Variability, Hydrologic data, Analytical techniques, River forecasting, Storm runoff, Urbanization.

Statistics were collected on the variability of the unit hydrograph from storm to storm, and the factors responsible for the variations were evaluated. The 12 drainage basins selected for study are located in Missouri, Illinois, and Louisiana. The selections were based on size of drainage area, length and quality of automatic recording rainfall and streamflow records, and absence of significant stream regulation or urbanization. Computer programs are described, and an analysis of different systems of unitgraphs is presented. The functions selected for unitgraph derivation are based on the surface runoff models conceived by Clark, Nash and Dooge. The 2-parameter Nash function provides a satisfactory fit of the unit hydrograph, and is superior to the Clark function (Woodard-USGS)
W72-14614

MODELS FOR THE SYNTHESIS OF MONTHLY STREAMFLOWS FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau.
(1972). 24 p, 13 tab, 14 equa, 4 append.

Descriptors: *North Carolina, *Simulation analysis, *Equations, *Digital computers, *Streamflow, Monthly, Forecasting, Gaging stations, Design, Alternative planning, Water resources development, Regional analysis, Regression analysis, Flow characteristics, Urban hydrology, Mathematical models, Systems analysis.
Identifiers: *Piedmont, *Conservation of mass.

Constructed are sample sequences of monthly streamflow at several locations in a portion of the North Carolina Piedmont Region for the purpose of simulating the behavior of several alternative designs for a regional water resource system to serve the needs of urban areas. The simulation models consist of a system of equations that express the principle of conservation of mass for a particular system design and a set of logical statements that specify how the system is to be operated under all possible circumstances that could arise within the context of the model. By routing sequences of flows through the model on a digital computer and tabulating the response of selected output variables, it is possible to predict, in the form of probability statements, what the future behavior of a particular system will be under a specified operating policy. The approach taken here is to use the historical data to identify and to calibrate a model for streamflows which can then be used to generate an arbitrary number of new sequences of flows each of arbitrary length. Multivariate linear regression models are used to represent flows in the region. The special case of a third-order stationary autoregressive model is adopted as the basic or core model. (See W72-14638) (Bell-Cornell)
W72-14640

HYDRAULIC GEOMETRY AND LOW STREAMFLOW REGIMEN,
Illinois Univ., Urbana. Water Resources Center.
J. B. Stall, and C. T. Yang.
Available from the National Technical Information Service as PB-212 282, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 54, July 1972. 31 p, 18 fig, 8 tab, 27 ref. OWRR B-051-ILL (2).

Descriptors: *Channel flow, Dispersion, *Meanders, *Illinois, Energy, *Streamflow, *Low flow.
Identifiers: *Hydraulic geometry, Pools, Riffles, *Unit stream power, Kaskaskia River basin.

Unit stream power defined as the time rate of potential energy expenditure per unit weight of water of a natural stream has been studied intensively. The distribution and variation of unit stream power have a determinate effect on the behavior of a natural stream. The unit stream power can be regulated by a stream through the combined process of meandering, forming pools and riffles, and carving a concave longitudinal stream bed profile. A study of the Kaskaskia River basin shows that sinuosity increases in the downstream direction by meandering. Field measurements made along the Middle Fork Vermilion River indicate that unit stream power can be minimized by the formation of pools and riffles. The hydraulic geometry--unit stream power equations developed for 9 river basins in the United States show that unit stream power in a river basin decreases with increasing frequency of flow and drainage area. These results are evidence of different levels of self adjustment made by a natural stream to minimize its unit stream power in accordance with the law of least time rate of energy expenditure. The calculated dimensionless dispersion coefficients at 11 gaging stations in the Kaskaskia River Basin show that the coefficients increase with increasing width-depth ratio.
W72-14680

WATER BALANCE AND FLOW STUDY IN THE BRAHMAPUTRA-GANGES BASIN OF EAST PAKISTAN,
East Pakistan Water and Power Development Authority, Dacca.
M. R. Tarafdar.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 613-622, 2 fig, 4 tab, 5 ref.

Descriptors: *Water balance, *Floods, *Rivers, Water storage, Water yield, Runoff, Rainfall-runoff relationships, River basins, Watersheds (Basins), River forecasting.
Identifiers: *Brahmaputra-Ganges Basin (Pakistan).

The flood problem in East Pakistan is caused by the two mighty rivers, the Ganges and the Brahmaputra. To study this flood problem the Hydrology Directorate of EPWAPDA (East Pakistan Water and Power Development Authority) and FAO-UNDP undertook a joint venture into flood measurement and water balance. The pattern of flow of the two rivers, intensity of flooding in the area, overbank spill on both banks of the Brahmaputra, and their effects in this area were determined. The intensity of peak floods in the area is due to change of storage and every year more than 96% of the gain is contributed by streamflow. (Knapp-USGS)
W72-14720

SEPARATION OF HYDROGRAPH COMPONENTS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
M. Ludovit.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 634-639. 5 fig, 7 ref.

Descriptors: *Hydrograph analysis, *Water balance, *Rainfall-runoff relationships, Runoff, Infiltration, Base flow, Recession curves, Evapotranspiration, Percolation, Subsurface runoff, Peak discharge.

The determination of the terms of a balance equation requires a detailed analysis of the basic components of the water regime, one of which is runoff. Separation of runoff components may be on the basis of the runoff genesis or by taking into consideration the actual conditions in the watershed. The two methods are described and compared for single peak hydrography, multipeak hydrographs, and for mountain watersheds. (Knapp-USGS)
W72-14722

FLOODS OF AUGUST 1967 IN EAST-CENTRAL ALASKA, WITH A SECTION ON WEATHER FEATURES CONTRIBUTING TO THE FLOODS,
Geological Survey, Washington, D.C.
J. M. Childers, J. P. Meckel, G. S. Anderson, and S. L. Diemer.
Available from GPO, Washington, DC 20402, Price $1.25 (Paper cover). Geological Survey Water-Supply Paper 1880-A, 1972. 77 p, 36 fig, 2 plate, 7 tab, 11 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *Flood discharge, *Alaska, Flood frequency, Streamflow, Flood recurrence interval, Floodwater, Peak discharge, Precipitation (Atmospheric), Stream gages, Runoff.
Identifiers: *Alaska floods (August 1967), East-Central Alaska.

East-central Alaska had record floods near Fairbanks following extensive rains of August 8-20, 1967. Precipitation during this period totaled as much as 10 inches, which is close to the average annual precipitation for this area. The most extensive flooding occurred in the White Mountains northeast of Fairbanks and along the major streams draining those mountains. Some of the major streams flooded were the Salcha, Chena, Chatanika, Tolovana, and lower Tanana Rivers, and Birch Creek west of Circle. Peak discharges on some streams were from two to four times the probable 50-year flood. The peak discharge of 74,400 cubic feet per second of the Chena River at Fairbanks, from 1,980 square miles of drainage area, was 2.6 times the 50-year flood. The rise of ground-water levels in the Tanana River flood plain to the land surface during the flood caused foundation failures and prevented drainage of subsurface structures. Above-normal ground-water levels existed until the middle of September. Total flood damage was estimated in excess of $85 million. Six lives were reported lost, and about 12,000 persons were evacuated during the flood. (Woodard-USGS)
W72-14725

EVALUATION OF THE STREAMFLOW-DATA PROGRAM IN HAWAII,
Geological Survey, Honolulu, Hawaii.
G. Yamanaga.
Geological Survey Open-file Report, 1972. 28 p, 6 fig, 5 tab, 7 ref.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Hydrologic data, *Hawaii, Data collections, Evaluation, Project planning, Geology, Hydrogeology, Gaging stations, Stream gages, Aquifers, Reviews.
Identifiers: *Streamflow characteristics.

Streamflow data for Hawaii are evaluated and guidelines for planning future data programs are provided. At the end of the 1971 water year, there were 150 gaging stations in operation in Hawaii. The variability of streamflow in Hawaii reflects the extreme variability of rainfall. Mean annual rainfall in the Islands ranges from 6.5 inches in Kawaihae to about 460 inches at Mt. Waialeale. On each of the major islands, average rainfall ranges from less than 18 inches to more than 250 inches per year. Streamflow reflects differences in geology. Perennial streams are found where the terrain has become relatively impervious due to weathering and also below springs which act as drains for groundwater fed by percolation into pervious surfaces and confined by dikes or other geologic features. In areas of relatively fresh lava where there are no confining features, rain disappears into the ground and except during extremely heavy rains, channels are dry throughout their length. (Woodard-USGS)
W72-14737

A MOMENTUM APPROACH TO OPEN CHANNEL TRANSITIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14745

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 08A.
W72-14751

MEASUREMENT AND ANALYSIS OF NATURAL-TYPE SURFACE ROUGHNESSES AFFECTING FLUID FLOW,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 08B.
W72-14837

A RANDOM-WALK SIMULATION MODEL OF ALLUVIAL-FAN DEPOSITION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
E. S. Simpson, and W. E. Price, Jr.
Arizona Water Resources Research Center Partial Technical Completion Report, May 15, 1972. 4 p. OWRR A-020-ARIZ (6).

Descriptors: Alluvial fans, *Markov processes, *Sedimentation, *Model studies, Statistical methods, Forecasting, *Monte Carlo method.
Identifiers: *Digital models, *Random walk, *Stochastic model.

A digital model based on a random walk was used in an experiment to determine how well such a model is able to simulate alluvial-fan deposition. The model is in three dimensions and is dynamic with respect to both time and space. Two principal stochastic events were employed, (1) a relative uplift of the mountain area that is the source of the fan sediments, and (2) a storm event of sufficient magnitude to result in the deposition of material on the fan. These two events are assumed to follow independent Poisson processes with exponentially distributed interoccurrence times. The pattern of deposition is determined by a random walk from the canyon mouth at the mountain front, and each depositional event is assumed to occur instantaneously. The direction that each step in the walk takes is determined probabilistically by the gradient in the direction of flow, the momentum of flow, and the boundary conditions stipulated in the model. The type of flow, whether a depositing debris or water flow, or eroding water flow, depends upon the thickness of erodible material in the source basin. Deposition is assumed to occur over the entire route of flow either as a bed tapered in the direction of flow or as a bed of uniform thickness. The particle-size distribution of the water-flow deposits is governed by the slope in the direction of flow. Erosion is considered negative deposition and results from the exponential decline in elevation of the main stream channel at the fan apex during periods of no uplift, or from water flows containing little basin sediment. Results from the computer runs were printed as geologic maps of the fan surface, and geologic sections through the deposits; these indicate that, at least qualitatively, a random-walk model provides a reasonable basis for simulating alluvial-fan deposition. (See also W72-10270, W71-04269 and W71-11858).
W72-14915

INVESTIGATION OF TIME PARAMETER OF WATERSHEDS,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 02A.
W72-14918

AN IMPROVED TEMPERATURE PREDICTION MODEL FOR SMALL STREAMS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
G. W. Brown.
Available from the National Technical Information Service as PB-212 385, $3.00 in paper copy, $0.95 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report (1972). 20 p, 6 fig, 9 ref. OWRR A-007-ORE (1).

Descriptors: *Model studies, *Water temperature, *Streams, Energy budget, Solar radiation, Streambeds, Bedrock.

A model for predicting the maximum change in temperature for completely exposing a reach of stream to solar radiation was developed during earlier research. This model, which assumes that net solar radiation is the sole source of energy to the stream, worked well on most streams. In a few cases it worked very poorly. These streams contained either a large proportion of pools or bed rock in the stream bottom. Only the flowing portion of the pools should be included in the heat exchange process. The bed rock stream bottoms can conduct about 20% of the incident solar radiation away from the stream. Reducing the estimates of stream surface area and net heat load according to pool configuration and bed condition provided good estimates of temperature change using the original model.
W72-14920

STOCHASTIC SPACE-TIME MODELS OF THE RAINFALL-RUNOFF PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02A.
W72-14922

EFFECT OF CATCHMENT AREA ON FLOOD MAGNITUDE,
Australian Rivers and Water Supply Commission, Victoria, New South Wales.
For primary bibliographic entry see Field 02A.
W72-14946

A SEMI-AUTOMATIC GATE TO IMPROVE THE SENSITIVITY OF THE CRUMP WEIR AT LOW FLOWS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 08C.
W72-14947

FLOOD PEAKS AS MODIFIED BY DAM SIZE AND LOCATION,
State Univ. of New York, Syracuse. Coll. of Forestry.
P. E. Black.
Water Resources Bulletin, Vol 8, No 4, p 780-783, August 1972. 2 fig, 2 tab, 7 ref.

Descriptors: *Flood control, *Hydraulic models, *Simulated rainfall, *Dams, Rainfall-runoff relationships, Reservoirs, Watershed management, Peak discharge, Time lag, Time of concentration, Hydrographs, Recession curves, Reservoir design.

Storms were simulated on a rainfall simulator over a hydraulic model to study the effectiveness of dams of different sizes and locations in reducing flood peaks. When storms uniformly and completely cover the watershed, large dams are nearly twice as effective as a network of small and medium dams in reducing the flood. The lower portion of the watershed is the primary contributor to the peak when the watershed is completely and uniformly covered with rainfall. The dams had no discernible effect on lag time or on time of concentration. The model without dams exhibited a strongly curvilinear recession curve which was in contrast to the straightline recession curves with dams in place. The peak also is considerably flattened, from triangular form to a trapezoidal shape. (Knapp-USGS)
W72-14954

ROLE OF BASEFLOW IN RAINFALL-RUNOFF RELATIONS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02A.
W72-14955

MODIFICATIONS OF SHIELDED NET RADIOMETERS TO MEASURE SOLAR RADIATION PROFILES IN WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 07B.
W72-14962

WATER RESOURCES APPLICATIONS OF STREAM CHANNEL CHARACTERISTICS ON SMALL FORESTED BASINS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 02A.
W72-14966

2F. Groundwater

SALTWATER INTRUSION EXTRACTION BARRIER,
California State Dept. of Water Resources, Los Angeles. Southern District.
J. J. Coe.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 387-403, September 1972. 9 fig, 1 tab, 7 ref.

Descriptors: *Saline water intrusion, *Saline water barriers, *Groundwater barriers, *Withdrawal, *Cone of depression, Water pollution control, Saline water-freshwater interfaces, Groundwater movement, California.
Identifiers: *Oxnard (Calif).

An experimental extraction-type sea water intrusion barrier was tested near Oxnard in Ventura County, California, to develop information on halting intrusion in the area and in other areas with similar hydrologic and geologic conditions. Major facilities of the barrier were 5 extraction wells, 25 piezometers, one anode well for cathodic protection, and a discharge pipeline. During the barrier test, intrusion was halted in the test area and the intruded area decreased in size from 6,200 acres to 4,800 acres. However, because of inadequate extraction capacities at the pumping wells, it was not possible to lower the ground water levels at the extraction well line below the trough in the piezometric surface located inland of the test site. Difficulty was experienced with the cathodic protection system; use of noncorrosive materials is recommended. An extraction-type barrier is technically feasible to halt intrustion in the Oxnard area. (Knapp-USGS)
W72-14204

MOVING WATER TABLES IN TILE-DRAINED SOILS,
West Pakistan Univ. of Engineering and Technology, Lahore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W72-14218

SUBSURFACE HYDROGRAPH ANALYSIS BY CONVOLUTION,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
W. M. Snyder, and L. E. Asmussen.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 405-418, September 1972. 7 fig, 3 tab, 9 ref.

Descriptors: *Hydrograph analysis, *Infiltration, *Subsurface runoff, *Mathematical models, *Rainfall-runoff relationships, Routing, Numerical analysis, Irrigation, Subsurface irrigation, Coastal plains, *Georgia.
Identifiers: Convolution integrals.

Subsurface flow from an 0.8-acre watershed in the Southern Coastal Plain at Tifton, Ga. is intercepted and gaged independently of any surface flows. The hydrographs of seven flow events following significant rainfall were analyzed by the nonlinear technique of two-stage convolution. The convolutional model is based on two conceptual components. A characteristic function represents the three-dimensional storage capability of the soil profile and thus could be visualized as a map of the flow potential of the drainage area. A state function expresses the movement, or routing, of the characteristic function to the outlet. This routing is

the first-stage convolution and produces a unit response function. Second-stage convolution of the response functions with effective rainfall produces the outflow hydrograph. The consistent results should allow identification of the parameters, and thus the two quasiphysical model components, with physical features of the drainage area. (Knapp-USGS)
W72-14219

GROUND-WATER OUTFLOW, SAN TIMOTEO--SMILEY HEIGHTS AREA, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA, 1927 THROUGH 1968,
Geological Survey, Menlo Park, Calif.
L. C. Dutcher, and F. W. Fenzel.
Geological Survey Open-file Report, February 9, 1972. 30 p, 7 fig, 13 ref.

Descriptors: *Groundwater resources, *Groundwater movement, *Aquifer characteristics, *Discharge (Water), *California, Hydrogeology, Hydrologic data, Basic data collections, Test wells, Aquifer testing, Permeability, Pumping, Geology, Faults (Geologic).
Identifiers: *Santa Ana Valley (Calif).

Groundwater outflow in the San Timoteo-Smiley Heights area in the upper Santa Ana Valley, San Bernardino and Riverside Counties, Calif., was estimated by an indirect method not involving balancing of the hydrologic budget. To provide data for the outflow estimates, several miles of reflection and refraction seismic transverses were made along and across the outflow section. Nineteen deep and shallow test holes were drilled; one of the deep test holes and several existing wells were pumped to obtain data on aquifer permeability. The estimated average permeabilities of the aquifer materials range from 5 gpd per square foot for the lower part of the San Timoteo beds to 220 gpd per square foot for the upper part of the San Timoteo beds. The estimated outflow in 1927 was 8,150 acre-feet. By 1967 the estimated total outflow was 5,350 acre-feet, a reduction of approximately 34%. During the 12-year period 1956 through 1967, however, the annual outflow decline has been considerably less than the average for the 41-year period 1927 through 1967, and the decline as of 1968 was about 30-35 acre-feet per year. (Woodard-USGS)
W72-14233

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W72-14234

GROUND-WATER FLOW,
Geological Survey, Harrisburg, Pa.
C. R. Wood.
Photogrammetric Engineer, Vol 38, No 4, p 347-352, Apr 1972. 6 p, 5 fig, 1 illus.

Descriptors: *Base flow, *Springs, *Inflow, Aquifers, Seepage, Infrared detectors, Aerial photography, Discharge (Water), Thermal diffusion, Hydrology, Remote sensing, Water temperature, Seasonal, Soil temperature, Waste water, Color photography, *Pennsylvania.
Identifiers: *Groundwater flow, *Infra red photography, Thermal diffusion, *Lehigh River (Pa).

A cooperative USGS-NASA program conducted on the Lehigh River, Pa, developed remote-sensor technology in the solution of water resources problems. Four sets of infrared imagery were taken from low altitude flights and surface-water temperatures were measured at 25 sites during the flights. An infrared imager sensing in the 8-14 micrometer bandwidth was used. Failures and successes are described and causes given. Results showed: (1) No relation between size of dark areas on imagery and rate of ground-water discharge was discerned; (2) numerous springs and seeps on the riverbanks were detected but most inflow through the riverbed was not detected; (3) size of dark imagery area depends more on the depth and velocity of the river than on quantity of water discharged; (4) predawn winter imagery is probably most favorable; and (5) low river flows must prevail. (USBR)
W72-14248

GEOTHERMAL STEAM IN THE GEYSERS--CLEAR LAKE REGION, CALIFORNIA,
L. E. Garrison.
Geological Society of America Bulletin, Vol 83, No 5, p 1449-1468, May 1972. 15 fig, 3 tab, 30 ref.

Descriptors: *Geothermal studies, *California, *Steam, *Thermal power, Heat flow, Thermal water, *Geysers, Water vapor, Hydrogeology, Aquifer characteristics, Geophysics.

Dry, superheated natural steam from wells in the Mayacmas Mountains, north-central California Coast Ranges is used to generate electrical power. The source of the heat is a shallow intrusive magma body emplaced in Quaternary to Holocene time. Magmatic heat is transmitted through the largely impermeable country rock by conduction. Convectional heating takes place in zones of permeability and porosity caused by faulting and shearing. Most of the thermal fluid is derived from meteoric water, but some is probably derived from the magma. In the exploited part of the system the fluid is in the vapor state. This controls the temperature and pressure regime; reservoir pressures are lower than hydrostatic pressures in a liquid-dominated system. Generation capability was 182,000 kwh in 1971, and a capability of more than 600,000 kwh is projected for 1975. (Knapp-USGS)
W72-14351

RELATIONS OF FRESH AND SALTY GROUND WATER ALONG THE SOUTHEASTERN U.S. ATLANTIC COAST,
Geological Survey, Brunswick, Ga.
For primary bibliographic entry see Field 02L.
W72-14518

COMPOSITION OF FLUID INCLUSIONS,
Geological Survey, Washington, D.C. Geologic Div.
For primary bibliographic entry see Field 02K.
W72-14519

EFFECTS OF THE JANUARY AND FEBRUARY 1969 FLOODS ON GROUND WATER IN CENTRAL AND SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. L. Hughes, and A. O. Waananen.
Geological Survey Open-file Report, 52 p, 1972. 12 fig, 10 tab, 30 ref.

Descriptors: *Floods, *Flood data, *Groundwater recharge, *Hydrologic data, *California, Water levels, Water wells, Aquifers, Groundwater resources, Groundwater availability, Water supply, Water storage, Reservoirs, Water level fluctuations.
Identifiers: *Central California, *Southern California.

Precipitation in 1969 in some areas of central and southern California was as much as 150 percent of average, principally as a result of heavy rains in January and February. The winter storms caused recordbreaking floods in many areas. A 216-foot water-level rise was recorded in a well in the Lytle Creek area in San Bernardino County. Diversion of floodflows from stream channels to prepared spreading grounds contributed greatly to groundwater in storage and reduced the flows discharged directly to the ocean. Reservoir storage aided in groundwater recharge through retention of runoff for release after floodflows subsided. Recharge to groundwater storage from direct precipitation and percolation of storm runoff and floodflows in nine major drainage basins was estimated to be at least 2.4 million acre-feet. Flood damages in southern California in 1969 exceeded $210 million. In contrast, the water added to groundwater in storage is valued at more than $66 million, on the basis of the cost of an equivalent supply from other sources. (Woodard-USGS)
W72-14525

HYDROLOGIC RECONNAISSANCE OF THE PROMONTORY MOUNTAINS AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14526

PROCEDURE AND RESULTS OF GROUNDWATER POLLUTION STUDIES IN TEHERAN AREA, IRAN,
Ministry of Water and Power, Teheran (Iran). Research Div.
For primary bibliographic entry see Field 05B.
W72-14590

ON HYDROGEOLOGY AND GROUNDWATER WELLS OF ETHIOPIA,
Ministry of Public Water Works, Addis Ababa, (Ethiopia). Water Resources Dept.
For primary bibliographic entry see Field 04B.
W72-14591

GROUNDWATER BASIN TYPES IN TURKEY,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
T. Y. Oldac.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 12-15, 1972. 5 fig, 18 ref.

Descriptors: *Groundwater basins, *Hydrogeology, *Aquifer characteristics, Aquifers, Alluvium, Limestones, Groundwater movement, Mapping, Lakes, Water balance.
Identifiers: *Turkey.

Data from more than 500 different basin investigations were used to classify groundwater basins in Turkey. Turkey has two ranges of older rocks, which are parallel to sea shores in the north and in the south. Generally, large faults trend east-west. Groundwater basin types in Turkey may be classified in five different groups depending on geological, morphological and hydrological characteristics. The types include neogene basins with alluvium, closed-semiclosed basins with lake sediments, valley alluvium basins, limestone basins overlain by impervious or semipervious layers, and delta and shoreline plain basins. (Knapp-USGS)
W72-14592

PALEOZOIC SANDSTONE AQUIFERS IN SAUDI ARABIA,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
G. Otkun.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971 Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 16-21, 1972. 4 fig, 5 tab, 7 ref.

Descriptors: *Water resources, *Hydrogeology, *Aquifers, *Water quality, *Water yield, Water resources development, Aquifer characteristics, Stratigraphy.
Identifiers: *Saudi Arabia.

Absence of surface water and scarcity and irregularity of rainfall make Saudi Arabia dependent upon groundwater and give the impression that this country is very poor in water. However, investigations carried out in recent years have proved that two types of formations in particular, sandstone and limestone-dolomite, are capable of producing considerable amounts of water, at least over two-thirds of the Kingdom. One-third of the country is covered by metamorphic and igneous rocks which yield little groundwater, yet the other two-thirds are occupied by sedimentary formations which generally form very good reservoirs. The quantity of water which can be mined from the storage is considerable and can be expressed in hundreds of millions of cubic meters per year. If properly exploited, the Paleozoic Sandstone Aquifer will have a major part in the development of Saudi Arabia. (Knapp-USGS)
W72-14593

THE HYDROGEOLOGY OF THE ANSEONG RIVER BASIN, KOREA,
Geological Survey of Korea, Seoul.
J. U. Lim.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971. Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 41-44, 1972. 2 fig, 1 tab.

Descriptors: *Hydrogeology, *Mapping, Water balance, Aquifer characteristics, Alluvium, Alluvial channels, Water yield, Transmissivity, Water resources development.
Identifiers: *Anseong River basin (Korea).

A hydrogeological map of the Anseong River basin, Korea, was completed in 1969. The main purpose of the study was to find the hydrogeological conditions as a basin unit instead of on a small scale. The geology of the basin consists of impermeable gneiss, schist and granite. The principal aquifer is alluvium, in part lacustrine deposits of silt and silty sand, and valley deposits of sand, gravel, and detrital materials. The direction of groundwater movement is almost parallel to the river channel. The coefficient of transmissibility in the most favorable conditions ranges from 0.8 to 3.0 square meters per minute but rapidly decreases in the outer part of the same area. The annual mean precipitation in this area amounts to 1,130 mm, and possible total yield of water is at least 630,000 cubic meters per day. (Knapp-USGS)
W72-14594

GROUNDWATER RECHARGE BY DAMMED UP RIVERS,
For primary bibliographic entry see Field 04B.
W72-14595

ARTIFICIAL RECHARGE IN JAPAN,
Geological Survey of Japan, Kawasaki.
For primary bibliographic entry see Field 04B.
W72-14596

ESTIMATING THE TRANSMISSIVITY OF AQUIFERS FROM THE FORMATION CONDUCTANCE,
Ministry of Water and Power, Tehran (Iran). Div. of Groundwater.
For primary bibliographic entry see Field 04B.
W72-14597

PRELIMINARY NOTE ON THE FORMULATION OF MATHEMATICAL MODELS FOR THE STUDY OF NON-LINEAR FLOWS IN AQUIFERS,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
M. Benedini, G. Cicioni, and G. Giuliano.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 121-123, 1972. 10 ref.

Descriptors: *Mathematical models, *Groundwater movement, *Aquifer characteristics, *Turbulent flow, Darcys law, Porous media, Dupuit-Forchheimer theory, Permeability, Transmissivity.

Non-Darcy flows are frequently observed in water-bearing materials; their study can be useful in groundwater exploitation. Mathematical models of water flow in aquifers may be generalized in such a way as to allow for consideration of both linear and nonlinear flows. Such a model is presented with applications to some well-known nonlinear laws in steady and unsteady flow conditions. Special attention is given to the formulation of initial conditions, the form of which is affected by the nonlinearity of the flow law. These difficulties along with the boundary conditions substantially affect the nature of approach to the final solution. (Knapp-USGS)
W72-14598

HYDROLOGICAL STUDIES OF EVAPOTRANSPIRATION AND GROUNDWATER FLOW IN SANDY LAND,
For primary bibliographic entry see Field 02D.
W72-14599

PROSPECTING OF UNDERGROUND WATER BY THE MEASUREMENT OF NATURAL RADIOACTIVITY,
National Research Institute of Agricultural Engineering, Hiratsuka (Japan).
T. Ochiai.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 159-163, 1972. 4 fig, 5 ref.

Descriptors: *Exploration, *Groundwater, *Gamma rays, *Spectrometers, *Instrumentation, Hydrogeology, Water chemistry, Radioactivity techniques, Nuclear moisture meters.
Identifiers: *Japan.

Groundwater may be detected by means of natural radioactivity. Seven kinds of measuring instruments have been tested. In 1956, a car-borne continuous-measuring instrument was developed. Three scintillation counters are set outside the car, and the compound value of the measurements of the counters is recorded. The detector consists of a ground surface scintillation counter, a detector of cosmic rays, a 5-channel gamma-ray pulse height analyzer, and a recorder. The gamma-ray energy is separated into five channels through the linear amplifiers and self-recorded by a five-pen recorder. (Knapp-USGS)
W72-14600

DETERMINATION OF THE RELATION BETWEEN GROUNDWATER LEVEL, PRECIPITATION AND OVERDRAFT,
Aegean Univ., Bornova (Turkey).
U. Ozis, E. Karabacak, and E. Benzeden.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 178-180, 1972. 3 fig, 4 ref.

Descriptors: *Water balance, *Safe yield, *Correlation analysis, *Stochastic processes, *Saline water intrusion, Water levels, Withdrawal, Recharge, Water yield, Precipitation (Atmospheric), Statistical methods.
Identifiers: *Bornova Plain (Turkey).

The relation between groundwater level and precipitation over the recharge area may be analysed by methods of stochastic hydrology in order to confirm the existence of an overdraft and to compute the extent of this overdraft. The method was applied to Bornova plain in Turkey. Although the available data were quite limited and the serial correlation in the nature of groundwater level sets as well as cumulative precipitation sets was not good, the regression equations of groundwater level on cumulative precipitation proved to be significant. Through the use of these equations, the overdraft rate was computed as 2.5 m/year, whereas the average safe draft is expected to be 2.0 m/year. This large excess draft may cause the intrusion of saline seawater, unless counteractive measures are taken. (Knapp-USGS)
W72-14601

DETERMINATION OF THE RELATION BETWEEN SPRING DISCHARGE AND PRECIPITATION--AN APPLICATION TO SARIKIZ SPRINGS IN TURKEY,
Aegean Univ., Bornova (Turkey).
For primary bibliographic entry see Field 02A.
W72-14602

GRAPHICAL METHOD FOR ESTIMATING THE TRANSMISSIBILITY AND STORATIVITY OF AQUIFERS FROM SPECIFIC CAPACITY OF WELLS,
Egyptian Desert Inst., Cairo.
S. Rashwan.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 185-188, 1972. 4 fig, 2 tab, 4 ref.

Descriptors: *Aquifer testing, *Storage coefficient, *Drawdown, *Transmissivity, *Specific capacity, Water yield, Water wells, Aquifer characteristics, Artesian aquifers.

The specific capacity of a well can be used as a useful method for estimating the hydrologic parameter of the aquifer. The specific capacity of the well, which is the discharge per unit drawdown, decreases with time. If the discharge during the pumping test is constant, then the specific capacity should vary with time. Transmissibility and storativity of the aquifer are two main factors for shaping the slope of the time-specific capcity curve. Values of specific capacity and corresponding time are plotted on log- log paper with time in minutes as X axis and specific capacity values as Y axis. A straight line will be obtained. This graphical method is rapid and easy for wells of 8 or 9 inches diameter without serious errors. (Knapp-USGS)
W72-14603

APPLICATION OF THE WATER BALANCE SIMULATION FOR PREDICTING LAND SUBSIDENCE--A DIGITAL COMPUTER APPROACH,
T. Shibasaki, A. Kamata, and M. Wada.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 197-202, 1972. 6 fig, 11 ref.

Descriptors: *Water balance, *Artesian aquifers, *Land subsidence, *Simulation analysis, Mathematical models, Numerical analysis, Finite element analysis, Seepage, Groundwater movement, Withdrawal, Recharge.
Identifiers: *Niigata (Japan).

Nonsteady-state ground water flow in leaky aquifer systems can be approximated by difference-differential equations. A digital computer simulation program was written to solve the equation using a finite-difference technique. The simulation technique was used in the study of land subsidence problems in the Niigata lowland area of Japan. The computed squeeze rate from semi-pervious strata into the main aquifer almost agrees with the measured land subsidence rate. The recharge rate to the confined ground water basin varies with the hydraulic head loss caused by pumping discharge from the main aquifer system. The induced supplemental recharge can be divided into the lateral seepage flow through the aquifer and the vertical inflow into the main aquifer from confining strata. The vertical recharge is estimated to be about 60 to 70% of the total recharge to the main aquifer. (Knapp-USGS)
W72-14604

A STUDY ON THE MECHANISM OF CONFINED GROUNDWATER RECHARGE,
Tokyo Univ. (Japan). Faculty of Engineering.
S. Shindo.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 203-207, 1972. 5 fig.

Descriptors: *Artesian aquifers, *Confined water, *Land subsidence, *Hydraulic models, *Recharge, Water yield, Withdrawal, Model studies, Water balance.
Identifiers: *Kanto Basin (Japan).

In most confined aquifers, groundwater recharge varies with the discharge to some extent. The greatest part of recharge is supplied by leakage and by squeezing of aquitards. Experimental studies are described on the recharge mechanism and results are applied to the groundwater conditions of the Kanto basin of Japan. A tank model was used with a stratified columnar section. The permeability of the clay aquitard was 0.00005 cm/sec and that of the gravel aquifer was 0.28 cm/sec. In this region the discharge has exceeded the recharge over a long period of time. Accordingly, most of the discharge nowadays is not circulating groundwater but stored groundwater. (Knapp-USGS)
W72-14605

WATER QUALITY PROBLEM IN EASTERN OSAKA, JAPAN,
Osaka City Univ. (Japan).
M. Tsurumaki.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 208-214, 1972. 4 fig, 2 tab, 8 ref.

Descriptors: *Water quality, *Chlorides, *Connate water, *Water circulation, *Water chemistry, Tracers, Tritium, Land subsidence, Withdrawal, Hydrogeology.
Identifiers: *Osaka (Japan).

In eastern Osaka, Japan, four main types of water based on alkalinity and chloride content are described, with subdivision based on tritium content. The waters characterized by high chloride (100 to 300 ppm) are distributed in the central part of this area. The chloride ion was derived from ancient saline water entrapped in the sediments deposited in a marine or brackish environment. As a result of this study three discontinuous lines of water-quality were found. Although one of them coincides with a geological structure and the others lack geological evidence, the pattern of these discontinuities provides a reasonable interpretation for the groundwater movement as well as for the distribution of the amount of land subsidence in this area. (Knapp-USGS)
W72-14606

A STUDY OF THE RELATIONSHIP BETWEEN THE GEOPHYSICAL P.D.R. (POTENTIAL DROP RATIO) RESISTIVITY MEASUREMENTS AND THE COEFFICIENT OF TRANSMISSIBILITY (T) OF THE AQUIFERS,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
M. Yaralioglu, and M. Boybeyi.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 215-221, 1972. 14 fig, 6 ref.

Descriptors: *Electrical studies, *Geophysics, *Resistivity, Surveys, Exploration, Water resources development, Geohydrologic units, *Transmissivity.
Identifiers: *Turkey, *Potential drop ratio.

Potential drop ratio resistivity surveys are more effective than surface resistivity surveys (vertical electrical sounding) in defining the boundaries of horizontal water bearing layers. It is possible to define by this method the anomalies of zones under investigation as a function of depth, when there is a significant resistivity contrast between the layers. The method was applied in the eastern part of Middle Anatolia and north of Eregli-Bor closed Basin, Turkey. The transmissibility values of aquifers in the area vary between 88 and 9100 cu m/day/m. (Knapp-USGS)
W72-14607

DISPERSION OF GROUNDWATER FLOW,
National Research Center for Disaster Prevention, Tokyo (Japan).
K. Yuhara.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 224-230, 1972. 7 fig, 3 tab, 6 ref.

Descriptors: *Dispersion, *Porous media, *Groundwater movement, Mixing, Flow, Hydraulics, Path of pollutants, Darcys law, Diffusion.

Flow of fluid through porous material is microscopically very complex and each fluid particle moves through small complex channels which have different directions from the mean flow direction and have many joints or branches. Therefore, the microscopic stream lines of the flow may, even if in the laminar flow region, be twined three-dimensionally at the joints or branches. In study of dispersion in flow through porous material, the mean length between two twining points is called the mean twining length, and it is compared to the mean mixing length of the turbulent motion. The dispersion is proportional to the mean filter velocity of the flow, the diameter of the sand particle, and a function of the porosity. Some experiments show such proportionality, and show the mean twining length to be about 0.09 cm for the porous medium used. (Knapp-USGS)
W72-14608

A REVIEW OF THE STOCHASTIC APPROACH TO FLOW THROUGH POROUS MEDIA,
Illinois Univ., Urbana.
L. Torelli, and A. E. Scheidegger.
Paper presented at International Symposium on Stochastic Hydraulics, Pittsburgh, May 31-June 2, 1971. 13 p, 4 fig, 16 ref. OWRR C-1613 (3146) (2).

Descriptors: *Flow characteristics, *Porous media, *Model studies, *Reviews, *Stochastic processes, Groundwater movement, Hydrogeology, Water pollution, Path of pollutants, Analytical techniques, Capillary conductivity, Transmissivity, Hydraulics.
Identifiers: *Random geometry models.

Some random geometry models of flow through porous media are reviewed. Three groups of models are distinguished: In the first group, the randomness is described as inherent in the fluid particle; in the second group, the randomness is ascribed to the medium. In the first case one has random walk models, in the second some kind of modified random maze model. The third group consists of topological models in which statistics is done over ensembles of bifurcating graphs which are considered to represent the path followed by a fluid particle which undergoes successive splittings. In addition, some probabilistic descriptions of the geometry of porous media are reviewed, which do not treat the problem of flow through porous media directly. (Woodard-USGS)
W72-14610

DISTINGUISHING SEASONAL RECHARGE TO GROUNDWATER BY DEUTERIUM ANALYSIS IN SOUTHERN ARIZONA,
Arizona Univ., Tucson.
E. S. Simpson, D. B. Thorud, and I. Friedman.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 623-633. 1 fig, 4 tab, 15 ref.

Descriptors: *Water balance, *Groundwater basins, *Arizona, Deuterium, Stable isotopes, Tracers, Recharge, Water sources, Runoff, Snowmelt, Hydrogeology, Alluvium, Streamflow, Precipitation (Atmospheric).
Identifiers: *Tucson Basin (Ariz).

The Tucson Groundwater Basin in southern Arizona covers an area in excess of 600 square miles and contains sediment more than 1,000 feet thick. The apparent age of groundwater (determined by C-14 analyses) ranges from zero (near recharge areas) to about 6,000 years. Average annual precipitation is about 11 inches; slightly more than half occurs during the summer as convective storms and most of the remainder during the winter as frontal storms. Summer moisture mostly originates in the Gulf of Mexico and winter moisture mostly comes from the Pacific Ocean. All streams in the basin are intermittent. Seventeen summer storms in 1968 show a weighted average deuterium value of -4.2 percent (relative to SMOW) and 14 winter storms in 1968-69 show a weighted average value of -6.1 percent. Two groundwater samples from wells near a recharge area show -6.6 and-6.3 percent values. Two other wells in widely separated parts of the valley, tapping much older water, show values of -5.8 percent each. The deuterium values for most snowfall and snowmelt in the surrounding mountains range from about -6 to -11 percent. The greater isotopic similarity between winter precipitation and groundwater suggests that winter runoff is the dominant factor in producing recharge. (Knapp-USGS)
W72-14721

GROUND-WATER RESOURCES OF ORANGE AND ULSTER COUNTIES, NEW YORK,
Geological Survey, Washington, D.C.
M. H. Frimpter.
Available from GPO, Washington, DC 20402, Price $1.25 (Paper copy). Geological Survey Water-Supply Paper 1985, 1972. 80 p, 34 fig, 4 plate, 4 tab, 42 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Water yield, *New York, Water wells, Water levels, Water level fluctuations, Chemical analysis, Groundwater movement, Water utilization.
Identifiers: *Orange County (NY), *Ulster County (NY).

The ground-water resources of Orange and Ulster Counties, in southeastern New York, occur in Pleistocene sand and gravel deposits of glacial origin and in Precambrian and Paleozoic consolidated rocks. The aquifer in the valleys of the Neversink River and Basher Kill between Port Jervis and Summitville, with an estimated groundwater yield of about 100 mgd (millions gallons per day) could be the most productive aquifer in southeastern New York exclusive of Long Island. An additional 20 mgd might be produced from similar deposits between Phillipsport and Wawarsing. Numerous smaller sand and gravel aquifers are scattered throughout the valleys of the two counties. Major parts of the two larger stream valleys, the Wallkill River and Esopus Creek valleys, are filled with relatively impermeable clay and silt. The consolidated rock has secondary porosity and is a dependable aquifer for small domestic supplies, but not for municipal and industrial supplies. Notable exceptions are the brecciated fault zones in southeastern Orange County and the carbonate rocks deep in the Rondout Creek and Sandburg Creek valleys. Iron, manganese, and hydrogen sulfide are the most common and troublesome chemical pollutants of the groundwater in Orange and Ulster Counties but the water is generally of good chemical quality for public water supplies. (Woodard-USGS)
W72-14726

GROUND WATER IN CENTRAL ST. CROIX, U.S. VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-14731

HYSTERESIS OF FLUX-GRADIENT RELATIONS FOR SATURATED FLOW OF WATER THROUGH CLAY MATERIALS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
For primary bibliographic entry see Field 02G.
W72-14736

GROUND-WATER CONDITIONS IN THE EAST SHORE AREA, BOX ELDER, DAVIS, AND WEBER COUNTIES, UTAH-1960-69,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14742

WATER RESOURCES OF THE CROW WING RIVER WATERSHED, CENTRAL MINNESOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14743

'SLATON CHANNEL' -- A BURIED VALLEY,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.
W72-14877

BIBLIOGRAPHY OF GROUND-WATER STUDIES IN NEW MEXICO.
New Mexico State Engineer, Santa Fe.

New Mexico State Engineer Special Publication, March 1972. 28 p, 1 fig.

Descriptors: *Bibliographies, *Publications, *Groundwater resources, *New Mexico, Reviews, Documentation, Water wells, Aquifers, Water yield, Withdrawal, Water quality, Water utilization, Water demand, Groundwater recharge.

This bibliography includes 274 reports concerning groundwater resources in New Mexico. The bibliographic listing is in alphabetical order by the author's name, or by the publishing agency if no author is given. Each citation has been assigned a designation letter according to the increasing intensity and detailed nature of the study: a, reconnaissance; b, qualitative; and c, quantitative. The letter p has been added to designate in-progress studies. A map of New Mexico is keyed to locations of groundwater publications and studies. (Woodard-USGS)
W72-14938

STABLE ISOTOPE SURVEY OF THE FRESH WATER OCCURRENCES IN ISRAEL AND THE NORTHERN JORDAN RIFT VALLEY,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
For primary bibliographic entry see Field 02K.
W72-14945

RECHARGE, STORAGE AND DISCHARGE OF GROUNDWATER IN SOME SANDSTONE AREAS IN CENTRAL EUROPE,
Kiel Univ. (West Germany). Geological Inst.
G. Einsele.
Journal of Hydrology, Vol 16, No 3, p 247-259, July 1972. 8 fig, 1 tab, 12 ref.

Descriptors: *Water balance, *Groundwater, *Water storage, *Sandstones, Recharge, Discharge (Water), Water levels, Water table, Europe, Hydrogeology, Evapotranspiration, Aquifer characteristics.

Recharge curves in relation to precipitation and altitude (temperature) in central Europe may be derived from evapotranspiration data and compared with the results of other methods to determine groundwater replenishment in areas of strongly and moderately cemented sandstones as well as of loose sands. Infiltration and percolation of groundwater from a sandy cover into jointed sandstones, discharge of groundwater into streams, rapidly fluctuating discharge of contact springs, and constant base flow into effluent watercourses were demonstrated by a simplified model using average permeabilities. Under natural conditions the maximum difference between positive and negative annual storage is the amount of groundwater discharged in 2-2.5 years in moderately cemented sandstone areas. The corresponding change of piezometric surface amounts to about 10 m. (Knapp-USGS)
W72-14948

PERTURBATION ANALYSIS OF THE EQUATION FOR THE TRANSPORT OF DISSOLVED SOLIDS THROUGH POROUS MEDIA, PART III, INFLUENCE OF BOUNDARY CONDITIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. A. Wooding.
Journal of Hydrology, Vol 16, No 3, p 241-245, July 1972. 1 fig, 5 ref.

Descriptors: *Porous media, *Mass transfer, *Diffusion, *Chemical reactions, *Ion transport, Dispersion, Water chemistry, Permeameters, Chromatography, Solutes, Aqueous solutions.

The properties of solute transport involving first-order irreversible reaction in a finite column of porous material with unstirred fluid both upstream and downstream are described in a linearized system. If the effective diffusivity in the column is large compared with that in the unstirred fluid, the Danckwerts boundary conditions are appropriate. This situation is typically found in laboratory columns and chemical reactors. At the upstream boundary a pseudo-discontinuity in concentration exists, and depends upon the reaction rate and the rate of fluctuation of the input concentration. (The influence of downstream boundary conditions is exponentially small, and is neglected). At the downstream boundary, a small 'back-diffusion' zone exists, and serves to adjust the outlet concentration gradient to zero. (Knapp-USGS)
W72-14949

KARST SPRINGS IN THE VALE OF KASHMIR,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
J. M. H. Coward, A. C. Waltham, and R. J. Bowser.
Journal of Hydrology, Vol 16, No 3, p 213-223, July 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Springs, *Karst hydrology, *Hydrogeology, Tracers, Water sources, Water circulation, Dye releases, Aquifer characteristics, Limestones, Water chemistry.
Identifiers: *Vale of Kashmir (India).

The Vale of Kashmir is a basin surrounded by Triassic limestone mountains rising to over 4000 m. At the eastern end of the Vale a group of five large karst springs has a combined mean annual discharge of 9 cu m/sec. Two of the springs are supplied by their immediate limestone hinterlands. Leakage from clastic rocks into the limestone mass partially supplies two other springs. A dye test was carried out to confirm the hydrologic connection between the fifth spring and sinks along the bank of the Bringi River, 14 km from this spring. There was no structural or lithologic control for the spring positions, which were at the lowest hydrologic points of the limestone blocks. (Knapp-USGS)
W72-14950

2G. Water in Soils

MOVING WATER TABLES IN TILE-DRAINED SOILS,
West Pakistan Univ. of Engineering and Technology, Lahore. Dept. of Civil Engineering.
N. M. Awan, and T. O'Donnell.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 459-477, September 1972. 9 fig, 17 ref.

Descriptors: *Water level fluctuations, *Hydraulic models, *Water table, *Tile drainage, Model studies, Drawdown, Steady flow, Subsurface drainage, Tile drains, Groundwater movement.
Identifiers: *Hele-Shaw models.

A Hele-Shaw analogy of the tile drainage problem was used to provide data on moving water table characteristics. The experimental data for water table recession following complete cessation of recharge are presented in comparison with five analytical solutions and two numerical solutions. Experimental data on rising water tables following sudden commencement of recharge are also presented. The drainage variables whose effects on the moving water table are reported are: (1) The initial or final steady-state mid-drain water table height; (2) the depth of the impermeable bed below the drain axis; and (3) the drain size. Drainage characteristics are virtually independent of the depth of the impermeable bed below the drain axis once that depth is one-eighth or more of the spacing between drains, regardless of the initial steady-state water table height. For given values of an appropriate dimensionless time parameter, the proportional amount of rise increases with increasing ym/d, but at a progressively diminishing rate. (Knapp-USGS)
W72-14218

STUDY OF PH AND EH CHANGES OF WATER-LOGGED SOIL AND IN PURE SYSTEMS,
National Commission on Agriculture, New Delhi (India).
S. K. Mukherjee, and S. N. Basu.
Indian Soc Soil Sci. 19 (2): 197-202. Illus. 1971.
Identifiers: Hydroquinone, Potential, Redox, Soils, *Waterlogged soils, *Hydrogen ion concentration, *Eh values.

With the addition of hydroquinone in the pure systems of ferric ammonium sulfate and ferric phosphate, both the pH and Eh values decline. Under waterlogged conditions, soil pH, after slight initial depression, increases gradually to near neutrality while Eh values decrease gradually. Irrespective of days of submergence, Eh and pH values of submerged soil are lower with increasing soil depth. Water extractable P and ferrous Fe increase up to 20 days of submergence but decrease thereafter. Ferric Fe declines sharply at the end of 30 days followed by a gradual decrease.--Copyright 1972, Biological Abstracts, Inc.
W72-14269

LYSIMETER STUDIES ON THE SHORT TERM EFFECT OF COMPOSITION OF IRRIGATION WATER ON THE BORON ACCUMULATION IN SOIL,
Udaipur Univ. (India). Coll. of Agriculture.
For primary bibliographic entry see Field 05B.
W72-14283

MECHANISM OF THE FORMATION OF EXCHANGEABLE AMMONIUM NITROGEN IMMEDIATELY AFTER WATERLOGGING OF RICE SOILS,
Palli Siksha Sadana, Sriniketan (India).
A. K. Bhattacharyya.
Indian Soc Soil Sci. 19 (2): 209-213. Illus. 1971.
Identifiers: *Ammonium nitrogen, Clay, Crystals, Lattice, Minerals, *Rice-M, *Soils, *Waterlogging.

When several rice soils (West Bengal) were waterlogged for 10 days, a marked increase of exchangeable NH4-N in many soils occurred; the fixed NH4-N, however, decreased. This strongly suggests that in waterlogging there was an expansion of crystal lattices of clay minerals (depending on the nature of mineralogical composition) when part of the fixed NH4-N came out and were held as an exchangeable complex outside the crystal lattice. The increase of exchangeable NH4-N was not due to microbial activities.--Copyright 1972, Biological Abstracts, Inc.
W72-14287

TECHNIQUE FOR MEASURING C-1402 UPTAKE BY SOIL MICROORGANISMS IN SITU,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 05A.
W72-14301

STUDY OF THERMOPHILIC AEROBIC SPOREFORMING BACTERIA ISOLATED FROM SOIL AND WATER,
Missouri Univ., Columbia. Dept. of Food Science and Nutrition.
For primary bibliographic entry see Field 05C.
W72-14324

AVAILABILITY OF SOIL MOISTURE (BESCHIKBAARHEID VAN WATER IN DE GROND),
Institute for Land and Water Management Research, Wageningen (Netherlands).
G. M. van der Valk, and W. P. Stakman.
Cultuurbouwmededelingen Vol 32, No 123, p 421-456, October-November 1969. 5 fig, 1 tab, 1 ref.

Descriptors: *Soil-water-plant relationships, *Soil properties, *Moisture tension, Foreign research, Analytical techniques, Water table, Groundwater, Root zone, Soil water, Capillary water, Measurement, Curves, Soil types.
Identifiers: *Wageningen (Holland).

The availability of water and air for plants in a particular soil is described by means of moisture tension. Besides the available water in the root zone, additional water can be supplied from the zone below the roots and from the groundwater. This supply depends on the actual suction gradient, the depth of root zone and the depth of the groundwater table. An example is given of the calculation of the maximum possible capillary rise at certain rooting depths and a known groundwater depth. Clay soil has less favorable characteristics than sand or peat soil. (Woodard-USGS)
W72-14528

SOIL SURVEY OF TUCSON-AVRA VALLEY AREA, ARIZONA,
Soil Conservation Service, Tucson, Ariz.
F. W. Gelderman, B. A. Whitney, and W. P. Tripp.
April 1972. 70 p, 32 maps, 9 fig, 6 tab, 15 ref.

Descriptors: *Soil surveys, *Soil classification, *Arizona, *Arid climates, *Soil management, Mapping, Soil types, Land use, Soil engineering, Clay loam, Loam, Silts, Gravels, Sands.
Identifiers: *Tucson-Avra Valley (Ariz).

This soil survey is designed to be used in the management of farms and ranches in the area; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for agriculture, industry, and recreation. Detailed mapping, much of which was prepared from aerial photographs, is accessed from indexes. The survey includes descriptions of 31 different soils: their use and management both for irrigated and dryland soils; their formation and classification; and a section of general information on the physiography and climate of the area. A table showing engineering interpretations of the soils includes detailed information on all 31 soils covered, such as: (1) suitability as a source of topsoil, sand, gravel, or road fill; (2) soil features affecting highway location and uncompacted dikes, farm ponds, compacted embankments, irrigation, and trafficability; and (3) limitations for sewage disposal fields, and foundations for low buildings. (Paylore-Arizona)
W72-14576

GENERAL SOIL MAP LOWER PANTANO WASH AREA, PIMA COUNTY, ARIZONA - A SPECIAL REPORT WITH SELECTED ENGINEERING INTERPRETATIONS,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 07C.
W72-14578

PRELIMINARY STUDY OF MERCURY RESIDUES IN SOILS WHERE MERCURY SEED TREATMENTS HAVE BEEN USED,
Agricultural Research Service. Hyattsville, Md.
For primary bibliographic entry see Field 05B.
W72-14623

HYSTERESIS OF FLUX-GRADIENT RELATIONS FOR SATURATED FLOW OF WATER THROUGH CLAY MATERIALS,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky.
V. Novak.
Journal of Soil Science, Vol 23, No 2, p 248-253, June 1972. 4 fig, 1 tab, 6 ref.

Descriptors: *Saturated flow, *Clays, *Porous media, *Hysteresis, *Expansion clays, Kaolinite, Bentonite, Hydraulic gradient, Darcys law, Groundwater movement, Soil water movement, Porosity, Pores, Laboratory tests, Permeameters, Permeability, Hydraulic conductivity.

The relation between flow velocity (V) and hydraulic gradient (I) was studied for two porous materials. The volume of the sample was allowed to change during experiment. For the kaolinite, the relation between v and I is non-linear, and the hydraulic conductivity k becomes dependent on time and varies for both increasing and decreasing I. After some time, k tends to some constant value. For bentonite, k remains constant as I increases. However, when I starts to decrease, k decreases accordingly. Hysteresis in the relationship between v and I remains unchanged with time. The observed deviations from Darcy's law may be due to deformation of the voids. (Knapp-USGS)
W72-14736

FIELD INVESTIGATION OF SELECTED FOUNDATION PIEZOMETERS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08G.
W72-14738

DETERMINATION OF SOIL MOISTURE CONTENT WITH AIRBORNE MICROWAVE RADIOMETRY,
Aerojet-General Corp., El Monte, Calif. Microwave Div.
G. A. Poe, and A. T. Edgerton.
Available from NTIS, Springfield, Va. 22151 as COM-72-10430 - Price $3.00 paper copy; $0.95 cents microfiche. Summary Report 4006R-2, September 1971. 43 p, 19 fig, 18 tab, 14 ref. NOAA 1-35378.

Descriptors: *Soil moisture, *Moisture content, *Remote sensing, *Microwaves, Radiation, Analytical techniques, Aircraft, Instrumentation, Measurement, Agriculture, Soils, *Arizona.
Identifiers: Brightness temperatures, *Phoenix Valley (Calif).

Airborne microwave brightness temperature measurements of agricultural soils in the Phoenix Valley, Arizona, on February 25 and March 1, 1971 were compared with extensive soil moisture measurements. Aircraft data were acquired by NASA/Goddard Space Flight Center, Greenbelt, Maryland. A comparison of results from available theory and measured data at 1.42, 4.99, 19.35, 37 and 94 GHz (frequency) is presented. Computation of correlation coefficients for measured brightness temperatures and measured soil moisture contents are also given. These comparisons reveal that the 1.42 and 4.99 GHz measured brightness temperatures consistently responded to measured soil moisture changes along the flight lines. Several reasons were advanced to explain the lack of correlation at the higher frequencies. (Woodard-USGS)
W72-14748

WASTE WATER RENOVATION IN CONNECTICUT SOILS,
Connecticut Agricultural Experimental Station, New Haven.
For primary bibliographic entry see Field 05D.
W72-14863

PLANT INDICATORS IN IRAQ. PART I - NATIVE VEGETATION AS INDICATOR FOR SOIL SALINITY AND WATERLOGGING,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
I. M. Habib, T. A. Al-Ani, M. M. Al-Mufti, B. H. Al-Tawil, and B. A. Takessian.
Iraq Ministry of Higher Education, Council for Scientific Research, Technical Report No 14, 1970. 15 p, 2 tab, 1 fig, 10 ref.

Descriptors: *Arid lands, *Halophytes, *Soil texture, *Salinity, *Soil analysis, *Desert plants, *Soil properties, *Soil-water-plant relationships, *Bioindicators, Land reclamation, Ecology, Habitats, Microenvironment, Saline soils, Salt tolerance, Soil types, Indicators, Saturation.
Identifiers: Iraq.

The main problems confronting cultivation in the Lower Mesopotamian Plain of Iraq are salinity and waterlogging of the soil. Degree of soil salinity can usually be estimated on the basis of plant cover. Combining correlations of native vegetation with soil salinity, waterlogging and soil texture was the purpose of this study which may prove to be a helpful tool in recognizing soil conditions with minimum time, effort and expenses. Each of the common native halophytes was found to grow in soils with a definite range of total soluble salts. A ranking of the various species for soil salinity and groundwater mineralization is given. Non-halophytic communities were mostly found in the northern part of Iraq, as expected. All halophytes were found in soils with groundwater depth ranging from 0.6-2.0 meters, except for Salsola vermiculata which could be used as an indicator for groundwater depth of more than 2 meters. Plant indicators for soil texture and recommendations for the possibility of reclaiming halophyte-inhabited soils are discussed. (See also W72-14869) (Black-Arizona)
W72-14868

PLANT INDICATORS IN IRAQ, PART II - MINERAL COMPOSITION OF NATIVE PLANTS IN RELATION TO SOILS AND SELECTIVE ABSORPTION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
T. A. Al-Ani, I. M. Habib, A. I. Abdulaziz, and N. A. Ouda.
Iraq Ministry of Higher Education, Council for Scientific Research Technical Report No 15, 1970, 12 p, 4 tab, 11 ref.

Descriptors: *Halophytes, *Saline soils, *Salinity, *Bioindicators, *Ecology, *Soil-water-plant relationships, *Salt tolerance, Terrestrial habitats, Absorption, Soil analysis, Desert plants, Resistance, Soil shemical properties, Soil types, Analytical techniques, Indicators.
Identifiers: Iraq.

Physiologically, halophytes may be divided into two categories: (1) those which are able to absorb salts from the saline habitat, and (2) those which do not absorb but are able to withstand high salinity, and are native to saline soils because they are not then in competition with salt-sensitive plants. This investigation was carried out to determine whether it is possible to use some of the native plants of Iraq as indicators for mineral elements composition of the soil in which they were grown, and to present examples of selectivity in the absorption and accumulation of mineral elements by native plants. Native vegetation of Iraq showed considerable variation in their ability to accumulate mineral elements. Some halophytes indicate very high sodium content in their soils such as Seidlitzia rosmarinus and Halocnemum strobilaceum. Selectivity in the uptake and accumulation of mineral elements was exhibited by native plants. This was indicated by high or low concentrations of some elements in a species in comparison with other species collected from the same site and at the same time. Magnesium and sulfur concentrations were as high as 5.80 and 4.06 percent respectively, when the concentrations in other species growing at the same sites were as low as 0.59 and 0.43 respectively. (See also W72-14868) (Black-Arizona)
W72-14869

HYDROLOGICAL AND SOIL PHYSICAL CONDITIONS IN A PILOT AREA IN THE GREATER MUSSAYEB PROJECT,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
A. I. Hawa, A. Ishaq, H. A. Hassan, J. Z. Al-Rawi, and J. S. Dougrameji.
Iraq Ministry of Higher Education, Council for Scientific Research, Technical Report No 17, 1970, 43 p. 1 tab, 14 fig, 5 ref.

Descriptors: *Arid lands, *Saline soils, *Soil texture, *Soil physical properties, *Hydrology, *Hydrogeology, *Subsurface mapping, *Irrigated programs, Mapping, Groundwater, Water table, Salinity, Porosity, Permeability, Hydrography, Subsurface waters, Geomorphology, Irrigated land, Land reclamation, Irrigation canals.
Identifiers: Greater Mussayeb Project (Iraq), *Iraq.

The Greater Mussayeb Project is situated in the lower floodplain of the Mesopotamian Plain between the Euphrates and Tigris rivers, about 65 km south of Baghdad, Iraq. It comprises a total area of some 80,000 ha which is irrigated with Euphrates water. This study was conducted in a sample area of 1500 ha in the northwest part of the Project for the purpose of obtaining detailed information on the hydrological and soil physical conditions in order to develop a reclamation program designed to restore agricultural production potential. Involved were a total of 61 augerings down to groundwater to determine the depth of the water table and the salinity of the groundwater itself. From these measurements, a water table contour map and a groundwater salinity map were constructed. Results indicate that soils in the Greater Mussayeb Project are pedogenetically immature, moisture characteristics are generally related to soil texture, maximum available plant moisture is found in medium to moderately fine textured soils, and occurence of highly saline groundwater at depths from 150-200 cm causes rapid salinization largely from improper drainage conditions. Information on general physiography, soil texture, soil porosity, soil permeability, and drainage patters is included. (Black-Arizona)
W72-14871

COMPARATIVE STUDIES OF PLANT GROWTH AND DISTRIBUTION IN RELATION TO WATERLOGGING, IV THE GROWTH OF DUNE AND DUNE SLACK PLANTS,
University Coll. of South Wales and Monmouthshire, Cardiff.
For primary bibliographic entry see Field 02I.
W72-14874

SOIL AND WATER RESEARCH TO MANAGE THE ENVIRONMENT,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05G.
W72-14891

NITRATE LEACHING UNDER BARE FALLOW AT A SITE IN NORTHERN NIGERIA,
Reading Univ. (England). Dept. of Soil Science.
A. Wild.
Journal of Soil Science, Vol 23, No 3, p 315-324, September 1972. 2 fig, 5 tab, 25 ref.

Descriptors: *Leaching, *Nitrates, *Fertilizers, Adsorption, Porosity, Infiltration, Soil physical properties, Soil chemical properties, Permeability, Nitrification.
Identifiers: *Nigeria.

In northern Nigeria, on a site under bare fallow nitrate formed from soil organic matter persisted in the top 120 cm of the soil profile throughout most of the rainy season. The rainfall in the two years was 1199 and 973 mm. Slow leaching was caused by adsorption on to positive charges in th textural B horizon, high rainfall intensities, an the presence of cracks and channels in the soil down which water will pass quickly withou leaching the newly mineralized nitrate. This nitrat diffuses relatively slowly through the aggregate or is carried downwards by water moving in th small pores. Leaching of nitrate added to the su face as fertilizer would be more rapid than that c nitrate formed from soil organic matter within th aggregates. (Knapp-USGS)
W72-14942

HYSTERESIS IN THE MOISTURE CHARAC TERISTICS OF CLAY SOIL,
Manchester Univ. (England). Simon Engineerin Labs.
G. Pavlakis, and L. Barden.
Journal of Soil Science, Vol 23, No 3, p 350-36 September 1972. 6 fig, 2 tab, 25 ref.

Descriptors: *Hysteresis, *Soil water movemen *Permeameters, *Clays, Saturation, Permeabilit Soil physical properties, Soil moisture, Percol tion, Unsaturated flow.

The relation between soil suction, degree of sat ration, and the air and water permeabilities w experimentally investigated for two clay soil Marked hysteresis can exist between saturati and permeability, but does not follow a uniq trend. Thus permeability can be greater on wetting or drying cycle depending on the structu of the clay soil. This behavior was considered terms of the cluster concept of soil structure, a it is concluded that any general theory of hyste sis must recognize both the macrostructure a microstructure of a soil. (Knapp-USGS)
W72-14943

AN INTERPRETATION OF RESERVOIR SED MENTATION. II. CLAY MINERALOGY,
California Univ., Riverside.
For primary bibliographic entry see Field 02J.
W72-14944

FEASIBILITY STUDY OF CHEMICAL SEA ING OF SOILS,
Diamond Alkali Co., Painesville, Ohio.
For primary bibliographic entry see Field 05B.
W72-15000

2H. Lakes

GEOCHEMISTRY OF FERROMANGANE OXIDE CONCRETIONS AND ASSOCIATI DEPOSITS IN LAKE ONTARIO,
Ottawa Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02K.
W72-14202

AVAILABILITY OF FOOD AND SPAWNI GROUNDS IN LAKE LADOGA FOR THE PIK -PERCH (LUCIOPERCA LUCIOPERCA),
Gosudarstvennyi Nauchno-Issledovatelskii stitut Ozernogo i Rechnogo Rybnogo Khozya va, Leningrad (USSR).
R. A. Rizvanov.
Vopr Ikhtiol. Vol 11, No 4, p 735-739. 1971. Map
Identifiers: Availability, *Lake Ladoga, Lucio ca lucioperca, *Perches, *Pike-perch, Spawni USSR, Fish diets.

Analysis of the food supply and spawning grou in Lake Ladoga for L. lucioperca, showed that yield of this fish can easily be increased. At present time only about 8.4% of the possi spawning grounds are utilized by the pike-per The adults feed on frostfish, whitefish, roa perch and striped perch. The young feed Mysidae, zooplankton, frostfish, pike and L

Ladoga whitefish. The species which serve as food for the young and the adult pike-perch are in good supply.--Copyright 1972, Biological Abstracts, Inc.
W72-14321

OPTIMUM RESERVOIR OPERATION USING STOCHASTIC DYNAMIC PROGRAMMING,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 04A.
W72-14347

STRATIGRAPHIC RECORD OF POLLUTION IN SHAGAWA LAKE, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W72-14349

SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05G.
W72-14377

HEATED-EFFLUENT DISPERSION IN LARGE LAKES: STATE-OF-THE-ART OF ANALYTICAL MODELING. PART 1. CRITIQUE OF MODEL FORMULATIONS,
Agronne National Lab., Ill. Center for Environmental Studies.
For primary bibliographic entry see Field 05B.
W72-14409

GROWTH INVESTIGATION OF RUFFE (ACERINA CERNUA L.) IN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
P. Biro.
Ann Inst Biol (Tihany) Hung Acad Sci. 38: p 131-142. 1971. Illus.
Identifiers: *Perches, Acerina cernua, *L:ke Balaton, *Growth rates, Hungary, Lakes, *Ruffe.

The growth rate of ruffe was investigated by scalimetric measurements in Lake Balaton. Annual rings of the scales are regularly formed in the majority of cases, accessory rings are rare, whereas injured, regenerated scales are frequent. A linear connection exists between the standard length and the total oral radius of the scales. The specific values of body weight calculated on the basis of the parabola describing the allometric relation of body length and weight for both sexes hardly differ from those obtained by direct measurements. The value of the allometric exponent is 3.0855. The growth of ruffe is slow in Lake Balaton. It is about the same rate in the first 4 yr (up to age group 3+). The slow growth probably bears a direct relation to the amount of food. Among the mathematical models applied for the description of the growth rate of the standard length, Kruger's (1965) proved more reliable than Bertalanfey's (1957). However, there are no great differences between the values calculated by the 2 methods. The growth rate of standard length and weight of ruffe in Lake Balaton is slower as compared to those of waters abroad. It is near to the values observed in the waters of Czechoslovakia.--Copyright 1972, Biological Abstracts, Inc.
W72-14415

THE PLAN FOR RECREATION DEVELOPMENT,
National Park Service, Western Regional Office. San Francisco, Calif.
For primary bibliographic entry see Field 06B.
W72-14421

PROCEEDINGS OF CONFERENCE ON INLAND LAKE RENEWAL AND SHORELAND MANAGEMENT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W72-14439

DAILY AND SEASONAL DRIFT OF ORGANISMS IN A WARMWATER STREAM,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02I.
W72-14440

DIURNAL CHANGES IN THE SCHOOLING BEHAVIOR OF CERTAIN SPECIES OF LAKE BAIKAL FISHES,
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsh (USSR).
L. A. Volkova.
Vopr Ikhtiol. Vol 11, No 4, p 707-719. 1971.
Identifiers: *Lake Baikal, Coregonus autumnalis migratorius, Cottocomephorus grewingki, *Diurnal change, *Fishes, Lake, Leuciscus leuciscus baicalensis, Perca fluviatilis, Rutilus rutilus lacustris, *Schooling behavior, Thymallus arcticus baicalensis, USSR.

Investigations were conducted on the diurnal school behavior in Lake Baikal of the following fishes: Coregonus autumnalis migratorius, Cottocomephorus grewingki, Leuciscus leuciscus baicalensis, Rutilus rutilus lacustris, Thymallus arcticus baicalensis, and Perca fluviatilis. Complete dissolution of the schools occurred in the evening when the lumination fell to about 0.1 lux. This was the same intensity of illumination in the morning which resulted in school formation. Thus, this degree of illumination seems to serve as a signal for the formation and break-up of schools which requires not more than 20-30 min. During ontogenesis the schooling behavior of the younger fishes differs from that of the mature adults, and satiate fishes formed schools more readily than did hungry fishes.--Copyright 1972, Biological Abstracts, Inc.
W72-14529

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-14544

ANNOTATED BIBLIOGRAPHY ON GREAT LAKES HYDROLOGY,
Illinois Univ., Urbana. Water Resources Center.
L. B. Buetikofer, and D. D. Meredith.
Available from the National Technical Information Service as PB-212 251, $4.50 paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 56, 1972. 62 p. OWRR B-062-ILL (1).

Descriptors: *Great Lakes, Precipitation (Atmospheric), Evaporation, Runoff, *Hydrologic budget, Water temperature, *Bibliographies, Currents (Water), Winds, *Lake stages.
Identifiers: Lake levels.

This bibliography contains 233 literature references on Great Lakes hydrology. The references are listed alphabetically by author for the following topics: precipitation; evaporation; runoff; lake levels and flows; hydrologic budget; currents, winds, and water temperature; and general.
W72-14681

ICHTHYOMASS AND FISH NUMBERS IN A ROACH AND PERCH LAKE (M RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
G. P. Rudenko.
Vopr Ikhtiol. Vol 11, No 4, p 630-642. 1971. Illus.
Identifiers: *Fish populations, *Demenets Lake, Esox lucius, Fish, Ichthyomass, Lakes, Numbers, Perca fluviatilis, *Perches, Roach, Rutilus rutilus, USSR.

The ichthyomass and number of fishes were studied in Demenets Lake in the Pskov region in July of 1961 on the basis of catch and following treatment of the lake with poly-chloropipene (an ichthyocide). Roach (Rutilus rutilus) and perch (Perca fluviatilis) were the dominant species in the lake, followed by pike (Esox lucius). Results of the studies obtained with numerical evaluation of the killed fishes showed that the ichthyomass in the lake amounted to 193 kg/ha, and the annual increment in the ichthyomass amounted to 57.3 kg/ha (29.6%). The corresponding values obtained when yearlings and 2 yr olds were included came to 228 kg/ha, and 98.3 kg/ha (42.9%), respectively.--Copyright 1972, Biological Abstracts, Inc.
W72-14709

A SYNOPTIC STUDY FOR EVALUATING THE ROLE OF THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
J. MacDowall.
In: World Water Balance, Proceedings of the Reading Symposium, July 1970. IASH-UNESCO-WMO, 1972. Vol 3, p 600-612, 4 fig, 12 ref.

Descriptors: *Great Lakes, *Limnology, *Climatology, *Water balance, International Hydrological Decade, United States, Canada, Dispersion, Water circulation, Water temperature, Evaporation, Heat balance, Weather forecasting, Water resources development.
Identifiers: *International Field Year for the Great Lakes.

The International Field Year for the Great Lakes (IFYGL) is a synoptic study of the Lake Ontario basin being conducted jointly by the USA and Canada. The program aims at better understanding of lake currents, dispersion, mass movement and thermal structure to assist in water quality modelling studies and in assessing the effects of effluents; at improving knowledge of relationships between inflows and outflows within the basin to better lake management techniques; at the establishment of better methods of measuring heat, vapour and momentum exchanges between the lake and the atmosphere for forecasting wind-driven currents and to help improve weather forecasts; and to define the climatic effects of the lakes with a view to future planning and development of shoreline areas. Four main scientific programmes are being carried out: water movements, meteorology, energy balance, and terrestrial water budget. The IFYGL, now in its fourth year, is moving to the implementation phase with the appointment of task forces to execute the scientific programme. (Knapp-USGS)
W72-14719

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05A.
W72-14728

FOUR-DIMENSIONAL MODEL FOR BEACH AND INNER NEARSHORE SEDIMENTATION,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 02J.
W72-14735

THE PATHOLOGY OF LAKE ERIE,
For primary bibliographic entry see Field 05G.
W72-14782

THE INFLUENCE OF VARIOUS CONCENTRATIONS OF NATURAL FOOD ON THE DEVELOPMENT, FECUNDITY AND PRODUCTION OF PLANKTONIC CRUSTACEAN FILTRATORS,
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W72-14799

SEGREGATION BETWEEN ADULT CUTTHROAT TROUT (SALMO CLARKI) AND DOLLY VARDEN (SALVELINUS MALMA) IN SMALL COASTAL BRITISH COLUMBIA LAKES,
British Columbia Dept. of Recreation and Conservation, Cranbrook. Fish and Wildlife Branch.
H. Andrusak, and T. G. Northcote.
J Fish Res Board Can, Vol 28, No 9, p 1259-1268, 1971, Illus, Map.
Identifiers: *Trout, *Fish diets, *Fish behavior, British Columbia, Canada, Coasts, Lakes, Plankton, Salmo clarki, Salvelinus malma, Segregation.

Comparison of spatial distributions and food of allopatric populations of S. clarki and S. malma in 2 lakes and of sympatric populations in a third lake suggested interactive segregation. Allopatric cutthroat changed their depth distribution throughout the spring and summer but no diel migration was noted. Changes in food habits closely corresponded to seasonal changes in vertical distribution. A wide range of food organisms was eaten from surface, midwater, and benthic sources. Allopatric Dolly Varden underwent diel changes in spatial distribution, with many being caught in onshore waters near the surface at night. They were absent from such areas in the day, apparently occupying offshore waters at greater depths. Their diet throughout summer consisted largely of surface insects and zooplankton, with lesser amounts of bottom fauna. Sympatric cutthroat trout and Dolly Varden were spatially segregated throughout the summer. Cutthroat trout occurred and fed mostly near the surface in littoral areas. In contrast, Dolly Varden were offshore and benthic in distribution and fed primarily on bottom organisms. By comparing distribution and food habits in allopatric and sympatric populations, it was suggested that competition for food may contribute to their segregation in sympatry. Although segregation of these species when conhabiting may involve interactive processes, the possibility of selective differences being of importance cannot be dismissed.--Copyright 1972, Biological Abstracts, Inc.
W72-14801

SOME DATA ON THE ROLE OF FOOD IN THE BIOLOGY OF EUDIAPTOMUS ZACHARIASI POPPE,
Instytut Rybactwa Srodladowego, Warsaw (Poland).
For primary bibliographic entry see Field 05C.
W72-14805

THE DEPENDENCE OF PRIMARY PRODUCTION UPON PHYSICAL AND CHEMICAL FACTORS IN A SMALL, SENESCING LAKE, INCLUDING THE EFFECTS OF COMPLETE WINTER OXYGEN DEPLETION,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.; and North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 05C.
W72-14806

THE TOXICITY OF MICROCYSTIS AERUGINOSA KUTZ FROM SOME ENGLISH RESERVOIRS,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W72-14824

HYDROBIOLOGY OF SOUTHEASTERN LAKES: PHYSICOCHEMICAL CHARACTERISTICS OF THE WATERS,
Bordeaux Univ. (France). Lab. of Botany.
For primary bibliographic entry see Field 05C.
W72-14825

OVOGENESIS AND MATURATION OF THE BLUE BREAM (ABRAMIS BALLERUS) IN THE KIEV RESERVOIR,
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
N. A. Konstantinova, and V. L. Zubenko.
Vopr Ikhtiol. Vol 11, No 4, p 744-749. 1971. Illus.
Identifiers: *Fish reproduction, Fish physiology, Abramis ballerus, *Blue bream, Maturation, Ovogenesis, Kiev Reservoir, USSR.

Ovogenesis and sexual maturation were studied on 198 female A. ballerus from April through Oct., 1968, in the Kiev Reservoir. The specimens were 2.7 yr old, 17-35 cm in length, and weighed 70-650 g. Histologic determinations showed that from April-June the post-spawning stage of maturation was VI or VI-II, and there was resorbtion of the empty follicles and remaining ovocytes; the coefficient of maturation was 1.3-1.4%. At the end of June-Aug. a new generation of ovocytes appeared, there was vacuolization and accumulation of yolk; the stage of sexual maturation was III and the coefficient of maturation was 2-3%. Ovaries were in the IVth stage of maturation in the Sept.-April phase and the ovocytes were filled with yolk. The coefficient of maturation was 4-7% in Oct. and 8-12% in April. Large scale sexual maturation in the blue bream females takes place when they are 4 yr old and attain a length of 23-26 cm. A small fraction of the population attains sexual maturity at the age of 3 yr and an average length of 21 cm. The increase in the spawning capabilities of the reservoir population in comparison with the river populations of the blue bream is due to increased rate of growth and fecundity and not to increased rate of sexual maturation.--Copyright 1972, Biological Abstracts, Inc.
W72-14849

QUANTITATIVE INVESTIGATIONS ON MICROPHYTOBENTHOS IN 25 TRANSVERSE SECTIONS OF LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
G. Tamas.
Ann Inst Biol (Tihany) Hung Acad Sci. 38:p269-283. 1971. Illus. Maps.
Identifiers: *Algae, *Lake Balaton, Benthos, Chlorophyta, Chrysophyta, Cyanophyta, Euglenophyta, Hungary, Mycophyta, Pyrrophyta.

In 175 mud samples collected on 25 transverse sections of the lake in Sept., 1968, 108 spp. of algae were identified showing the following distribution: Cyanophyta 12; Euglenophyta 4; Pyrrophyta 1; Chrysophyta 68; Chlorophyta 22; Mycophyta 1. Some of the identified species were more frequent in the southwestern while others in the northeastern part of the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-14859

FOUR PROBLEM AREAS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 05C.
W72-14908

ERIE HARBOR, PENNSYLVANIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14927

DEEP LAKE, CAPE BARNE, ANTARCTICA,
Institute of Nuclear Sciences, Lower Hutt (New Zealand).
For primary bibliographic entry see Field 02C.
W72-14958

2I. Water in Plants

PLANT POPULATION EFFECTS ON THE EFFICIENT USE OF WATER: WATER UPTAKE CHARACTERISTICS,
Agricultural Experiment Station, Stillwater. Okla.
For primary bibliographic entry see Field 03F.
W72-14433

DAILY AND SEASONAL DRIFT OF ORGANISMS IN A WARMWATER STREAM,
Illinois Univ., Urbana. Water Resources Center.
R. W. Larimore.
Available from the National Technical Information Service as PB-212 266, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 55, July 1972. 105 p, 25 fig, 5 tab, 10 ref, 4 append. OWRR B-001-ILL (1).

Descriptors: Winds, Rain, Light, *Illinois, *Invertebrates, *Aquatic drift, *Seasonal, Impoundments, Water quality, Turbidity, Water temperature, Water level, Aquatic animals.
Identifiers: *Kaskaskia River (Ill), Stream drift organisms, *Diel cycles, *Annual cycles, Fish feeding habits.

The drift of stream organisms in the Kaskaskia River was investigated over a 2-year period and associated with the time of day, season of the year, turbidity, temperature, water level, and several other environmental factors. The amount and composition of drift showed definite diel and annual patterns. The diel cycle was characterized by a drastic increase in abundance of drifting organisms with the evening reduction of light intensity and a decline in abundance with an increase in light in the very early morning. The annual pattern shows an increase during the spring and into the summer with a gradual decline in the late fall to very low numbers of drift organisms during the winter months. The occurrence of terrestrial organisms in the drift was influenced strongly by heavy rain and strong winds and showed an increase during the autumn when leaves were falling into the water. A mainstream impoundment changed the composition and abundance of drift and contributed great amounts of fish food to the river. Diel and seasonal changes were obvious also in drift coming from the reservoir. Drifting organisms comprised a substantial part of food supplies of river fishes. Drift did not seem to be modified by the minor differences in water quality found along the Kaskaskia River but was demonstrated to be a good index of pollution in an adjacent watershed.
W72-14440

AVAILABILITY OF SOIL MOISTURE (BESCHIKBAARHEID VAN WATER IN DE GROND),
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02G.
W72-14528

DYNAMICS OF METABOLISM IN THE CARP (CYPRINUS CARPIO) DURING HIBERNATION
State Research Inst. of Lake, River Pisciculture Volgograd (USSR).

E. Moroz.
opr Ikhtiol. Vol 11, No 4, p 702-706. 1971.
lentifiers: *Carp, Cyprinus-Carpio, *Hiberna-
on, *Metabolism, USSR.

letabolic dynamics were evaluated for hibernat-
g C. carpio during the winter of 1968-69 in the
olgograd region. Determination of the concentra-
on of protein, nonprotein nitrogen, ATP
iosphorus, fat, glycogen, glucose and fructose in
e muscle and liver showed that during this
inter, which was unusally severe with ice in the
nds attaining a thickness of 75 cm, metabolism
as greatly depressed and the fish were able to
mmence active life in the spring with greater
ergy reserves than is commonly the case. Ener-
expenditures during hibernation were primarily
the expense of the liver and muscle glycogen
d glucose.--Copyright 1972, Biological Ab-
racts, Inc.
72-14682

CO-PHYSIOLOGICAL STUDIES ON SEED ERMINATION OF DESERT PLANTS OF AJASTHAN: I. PONGAMIA PINNATA VENT,
daipur Univ. (India). Dept. of Botany.
. D. Ramdeo.
p J Ecol. Vol 20, No 1: p 26-30. 1970. Illus.
lentifiers: *Plant physiology, *Germination, Am-
onium chloride, Desert, India, Intensity, Light,
ants, Pongamia pinnata D, Potassium,
ajasthan, Seeds, Temperature.

nbibition and germination were both 100% in or-
nary laboratory conditions of light and tempera-
re within 4-5 days. Seeds were subjected to dif-
rent intensities of light such as artificial light,
ffused light; darkness; colored light (red,yellow,
een and blue) and the germination behavior
ted. Seeds were also treated with growth-
omoting chemicals such as NH4Cl. Root/shoot
tio and oven-dry weight were also studied in
tail.--Copyright 1972, Biological Abstracts, Inc.
72-14794

CREASED PREDATION BY THE TORRENT CULPIN, COTTUS RHOTHEUS, ON COHO ALMON FRY, ONCORHYNGHUS KISUTCH, URING MOONLIGHT NIGHTS,
ational Marine Fisheries Service, Seattle, Wash.
orth Pacific Fisheries Research Center.
G. Patten.
ish Res Board Can, Vol 28, No 9, p 1352-1354,
71, Illus.
entifiers: *Predation, *Moonlight, Cottus
otheus, Fry, Oncorhynchus kisutch, *Salmon,
ulpin.

stream aquaria, the percentages of coho salmon
removed by the torrent sculpin averaged 70 in 4
ts on moonlight nights and 24 in 7 tests on dark
hts.--Copyright 1972, Biological Abstracts, Inc.
72-14811

E PRODUCTIVITY OF ATTACHED ALGAE RIVER, (IN JAPANESE),
search Inst. for Natural Resources, Tokyo
pan).
r primary bibliographic entry see Field 05C.
2-14821

LATIONSHIPS BETWEEN THE AMOUNT TRANSPIRATION AND THE STOMATE ENING OF SOME PHANEROPHYTES FROM E ZAGREB FOREST (YUGOSLAVIA),
titut za Botaniku, Zagreb (Yugoslavia).
primary bibliographic entry see Field 02D.
2-14828

YSIOLOGICAL AND BIOCHEMICAL SPONSES OF PLANTS TO DIFFERENT IN-RNAL WATER POTENTIALS,
braska Univ., Lincoln. Water Resources
earch Inst.
E. J. Kinbacher, C. Y. Sullivan, and J. D. Eastin.
Available from the National Technical Information Service as PB-212 378, $3.00 in paper copy, $0.95 in microfiche. Nebraska Water Research Institute, Lincoln, Project Completion Report, July 1972. 52 p, 9 tab, 9 fig, 69 ref. OWRR A-015-NEB (1).

Descriptors: *Plant physiology, *Biochemistry, *Drought resistance, *Environmental effects, *Moisture stress, *Photosynthesis, *Drought tolerance, *Crop response, *Retardants, *Stomata, Growth stages, Physiological ecology, Respiration, Water untilization, Plant growth, Management, Diffusivity, Soil-water-plant relationships, Transpiration control.
Water potential.

Transpiration of plants accounts for a tremendous amount of water utilization under both irrigated and dryland conditions. Much attention has been given to measuring this loss, but relatively little attention has been given to controlling this loss by manipulating plant responses to different conditions of water availability, or to increase their efficiency in water utilization. Objectives of this study, from July 1, 1969 to June 30, 1972, were to gain an understanding of plant biophysical mechanisms and responses by: (1) analyzing the biochemi cal effects of internal water stress on physiological processes such as photosynthesis and respiration, and (2) analyzing the mechanisms by which plant water potentials and water use are controlled or influenced by the plants. 'Harvester' snapbeans (Phaseolus vulgaris L.) were used for these investigations. The effects of a growth retardant, succinic acid 2,2-dimethylhydrazide (Alar) on photosynthesis and water potentials of 'Red Kidney' snapbeans (Phaseolus vulgaris L.) were also studied. Wide differences were found in plant types to tolerate drought and heat. Stomata were found to close sooner in some species when under drought stress. Internal resistances became increasingly more important as stomata of a drought resistant sorghum hybrid from India responded rapidly to an initial reduction in leaf water potential, but only partially closed when rewatered and reexposed to drought conditions. A technique for evaluating plant desiccation tolerance and over-all drought resistance was established. (Black-Arizona)
W72-14835

INTERRELATION OF THE MORPHOLOGY AND PHYSIOLOGY OF A PLANT AND THE RESISTANCE TO FLOW OF WATER WITHIN A PLANT,
Connecticut Univ., Storrs. Inst. of Water Resources.
B. E. Janes, and G. W. Gee.
Available from the National Technical Information Service as PB-212 366, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 7 p, 4 fig, 5 ref. OWRR A-034-CONN (1).

Descriptors: *Soil-water-plant-relationships, *Photosynthesis, *Root systems, *Moisture stress, Hydrostatic pressure, Photoperiodism, Transpiration, Resistance.
Identifiers: *Environmental stress, *Total plant resistance, Pepper plants, Corn plant.

Measurements were made of corn and pepper plants under environmental stress. Solid soil water potential was measured by a thermocouple psychrometer located in the root zone of each plant. Leaf water potential was inferred by pressure bomb readings. Transpiration of corn was measured by weight change, and pepper by microchamber. Water potential and transpiration were determined during periods of light and darkness. Light period resistance appeared relatively constant, dark period resistance was almost 5 times that of the light period. Resistances for partial darkness were found to have a total plant resistance lying between the light and dark period resistances. Pepper subjected to a drying cycle had a dark to light total plant resistance ratio of more than 20. Hydrostatic pressures were applied to roots growing in nutrient solution and rates of transpiration, net CO2 (--) assimilation and leaf temperatures were monitored in microchamber. With applied pressures of more than 2 bar, transpiration remained below original level as long as pressures were applied. On release of pressures there was a rapid increase in transpiration, followed by a decrease to a level much below the original level. Generally, net CO2 (--) assimilation responded similarly.
W72-14842

STUDIES ON THE PLANTS OF THE GENESEE COUNTRY (WESTERN NEW YORK STATE): IX. SOME ASPECTS OF THE ECOLOGY OF ORLEANS COUNTY, NEW YORK,
E. Lyman, and B. B. Coleman.
Proc Rochester Acad Sci. Vol 12, No 2, p 160-232. 1971. Illus. Map.
Identifiers: *Plant populations, *New York, Orleans County (NY), Beech D, Ecology, Hardwoods, Hemlock G, Liverworts, Maple D, Mosses, Plants, Succession.

Tables showing the county distribution for mosses and liverworts collected and studied and for vascular plants observed, are presented. The genera of the group are arranged alphabetically, with the species of the genus similarly arranged. For each species of moss and liverwort the number of times it was collected in the several habitats is indicated. For the vascular plants a table shows the number of times a given species was observed in a habitat, based on the field records. Habitat type designations of the tables attempt to suggest the ecology of the collecting sites and broadly, therefore, of the county. They are adapted from Shanks for the present study. They represent the vegetation types evolved and apparent at the present time in the county. They suggest that the beech-sugar maple climax forest was extensive and that remnants of the hemlock-northern hardwoods, mixed mesophytic aspects of the latter, and also kinds of swamp forest still remain in evidence. The habitat designations also indicate the presence of successional stages in this vegetational development and represent some of the major seres which precede the climax forests above. Among these are bog forests, bogs, swamp shrub vegetation, marsh meadows, marshes, and emergent and submersed aquatic plants of hydrophytic habitats.--Copyright 1972, Biological Abstracts, Inc.
W72-14867

COMPARATIVE STUDIES OF PLANT GROWTH AND DISTRIBUTION IN RELATION TO WATERLOGGING, IV THE GROWTH OF DUNE AND DUNE SLACK PLANTS,
University Coll. of South Wales and Monmouthshire, Cardiff.
R. Jones, and J. R. Etherington.
Journal of Ecology, Vol 59, No 3, p 793-801, November 1971. 4 fig, 3 tab, 8 ref.

Descriptors: *Dunes, *Soil formation, *Arid lands, *Dune sands, *Sands, *Dune succession, *Laboratory tests, Plant growth, Saturation, Eluvium, Geomorphology, Soil investigations, Soil tests, Soil erosion, Grasses.

Sand dune systems with their alternation of dunes and slacks (spaces between dunes) present a sequence of conditions for soil formation and plant colonization which is strictly related to topography and is independent of the parent sand material. Gross differences between the dune and slack habitats are a reflection of differences in soil water regimes. An investigation of the effect of three different water regimes (waterlogged, half-waterlogged, and freely draining) on the growth of Agrostis stolonifera, Festuca rubra, Carex flacca, and Carex nigra, was made in pots of dune and

slack sand in a glasshouse. Waterlogging (simulated slack moisture regime) caused a reduction in soil compared with a freely draining control treatment (simulated dune moisture regime). Tiller production and root growth of the grasses were stunted by waterlogging, while growth of the Carices was not significantly affected. Growth of Carex flacca was greatest in the half-waterlogging treatment. (Black-Arizona)
W72-14874

AN EPILITHIC DIATOM COMMUNITY OF A NORTH CAROLINA SANDHILLS STREAM,
Western Kentucky Univ., Bowling Green. Dept. of Biology.
G. E. Dillard.
Rev Algol. Vol 10, No 2, p 118-127. 1971. Illus.
Identifiers: *Diatoms, Eunotia pectinalis var minor, *North Carolina, Sandhills, Seasonality, Streams, Water temperature.

A description is given of a permanent epilithic diatom community inhabiting rapids and high current velocity parts of a North Carolina sandhills stream. The dominant species was Eunotia pectinalis var. minor, and the community was termed the Eunotia-Tabellaria community. Water temperature appeared to be the primary factor responsible for seasonal changes of associated species.--Copyright 1972, Biological Abstracts, Inc.
W72-14875

A SURVEY OF THE PHREATOPHYTIC TREES OF THE REPUBLICAN RIVER VALLEY, NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 03B.
W72-14914

2J. Erosion and Sedimentation

GEOCHEMISTRY OF FERROMANGANESE OXIDE CONCRETIONS AND ASSOCIATED DEPOSITS IN LAKE ONTARIO,
Ottawa Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02K.
W72-14202

ENVIRONMENTAL CONSTRAINTS ON THE SUBSTITUTION OF SPACE FOR TIME IN THE STUDY OF NATURAL CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-14203

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 08B.
W72-14205

COARSE SEDIMENT TRANSPORT BY FLOOD FLOWS ON KNIK RIVER, ALASKA,
Colorado Univ., Boulder. Dept. of Geological Sciences.
W. C. Bradley, R. K. Fahnestock, and E. T. Rowekamp.
Geological Society of America Bulletin, Vol 83, No 5, p 1261-1284, May 1972. 14 fig, 4 tab, 62 ref.

Descriptors: *Sediment transport, *Sediment sorting, *Glacial sediments, *Alluvial channels, *Alaska, Sedimentation, Erosion, Particle size, Particle shape, Sediment distribution, Gravels.
Identifiers: *Knik River (Alaska).

Knik River of southern Alaska is a glacial river with a valley train which was, until recently, swept each summer by a brief large flood resulting from the sudden draining of an ice-dammed lake (Lake George). These flows were 10 to 20 times larger than the postflood summer discharge of approximately 20,000 cfs and were responsible for the morphological and alluvial characteristics of the valley train. Flooding stopped after the 1966 season. During its first 16 mi of travel, where alluvial contamination from side streams is unimportant, the coarse fraction of the valley train changes systematically in size and shape. Grain size decreases by 94 percent. At the same time, specimens of quartz and graywacke become progressively more elongated, and foliated specimens show the same change initially, but then deviate to become progressively more platy. Downvalley changes in size and shape of coarse gravel are caused chiefly by sorting processes, aided by frost action which splits foliated particles into platy fragments. During shape-sorting, platy specimens are the most transportable, elongated specimens are intermediate, and compact (equidimensional) specimens are the least transportable. (Knapp-USGS)
W72-14207

DEEP EROSION BY CONTINENTAL ICE SHEETS,
North Carolina Univ., Chapel Hill. Dept. of Geology.
W. A. White.
Geological Society of America Bulletin, Vol 83, No 4, p 1037-1056, April 1972. 9 fig, 40 ref.

Descriptors: *Erosion, *Glaciers, *Glaciation, *Pleistocene epoch, Geomorphology, Glaciology, Glacial sediments, Glacial drift, North America, Europe, Great Lakes.
Identifiers: *Glacial erosion, *Ice sheets.

Erosion by continental ice sheets removed sedimentary cover to exhume some of the world's largest areas of exposed Precambrian crystalline rock. Of the world's large areas of exposed Precambrian rock, two were centrally located beneath great Pleistocene continental ice sheets that no longer exist, are proportionate to those ice sheets in size and similar in shape, and are great lowlands holding central seas. Around the Laurentian and Fennoscandian shields, arcs of exhumation control major topography and drainage. These are arcuate lowlands of continental scope encircling the shields at the Precambrian-Paleozoic contact where glaciation skinned Paleozoic rocks off crystalline basement. They are geometrically similar and are proportional in size to the ice sheets that excavated them. They form the St. Lawrence and upper MacKenzie valleys, including America's greatest lake basins-Great Bear, Great Slave, Athabaska, Reindeer, Winnipeg, Winnipegosis, Lake of the Woods, Rainy Lakes, Great Lakes, and St. Lawrence Trough. European counterparts are Skagerrak, Baltic, Gulf of Finland, Lakes Ladoga and Onega, Onega Bay, Gulf of Dvinsk, and White Sea. Erosion by the Laurentide and Fennoscandian ice sheets has carved great ellipsoidal basins. (Knapp-USGS)
W72-14208

TURBIDITE MUDS WITHIN DIATOM OOZE OFF ANTARCTICA: PLEISTOCENE SEDIMENT VARIATION DEFINED BY CLOSELY SPACED PISTON CORES,
South Carolina Univ., Columbia. Dept. of Geology.
R. R. Payne, J. R. Conolly, and W. H. Abbott.
Geological Society of America Bulletin, Vol 83, No 2, p 481-486, February 1972. 3 fig, 11 ref.

Descriptors: *Bottom sediments, *Antarctic, *Sampling, *Stratigraphy, *Turbidity currents, Deposition (Sediments), Sedimentation rates, Cores, Diatoms, Sediments, Sedimentation, Sedimentology.
Identifiers: Siliceous ooze, Turbidite muds.

To test the ability to correlate sediments in deep ocean basins, 5 piston cores were taken from one station on U.S.N.S. Eltanin cruise 44, in one of the deepest and flattest regions of the Wilkes Abyssal Plain off East Antarctica. The 5 cores are characterized by interbedded siliceous ooze and terrigenous turbidite mud beds. The siliceous ooze is characterized by burrow mottling and high (90 to 95 percent) diatom and radiolarina content. The terrigenous mud beds have sharp basal contacts, lack evidence of burrowing except in the upper 10 to 20 cm, and are 20 cm to 2.5 m thick. Correlations from one core to another were made using the relative stratigraphic position and sequence of pelagic and turbidite zones, and also by using three major diatom assemblage zones. Not only could major pelagic ooze and turbidite zones in the five cores be correlated over the short distance at the drift station, but they could also be correlated with zones found in a sixth core taken 55 km away. Rates of sedimentation for the pelagic zones are 1 cm per 1,000 yrs, and total sedimentation rates are 5 cm per 1,000 yrs. (Knapp-USGS)
W72-14209

VERTICAL MIXING OF ICE-RAFTED VOLCANIC ASH IN NORTH ATLANTIC SEDIMENTS,
Naval Oceanographic Office, Washington, D.C.
W. F. Ruddiman, and L. K. Glover.
Geological Society of America Bulletin, Vol 83, No 9, p 2817-2835, September 1972. 12 fig, 7 tab, 22 ref.

Descriptors: *Sedimentation rates, *Tracers, *Dusts, *Volcanoes, *Stratigraphy, Igneous rocks, Distribution patterns, Provenance, Ocean currents, Sediment transport, Winds.
Identifiers: *Volcanic ashfalls, *Sedimentary markers.

Three times in the last 620,000 yrs, highly siliceous ash ejected from Icelandic or Jan Mayer volcanoes has been deposited in sediments over an area of several million square kilometers in the North Atlantic. Shards were initially deposited on ice cover on and near Iceland and later dropped from melting ice as far as 1,800 km to the south. Since the largest sand-sized shards cannot be that widely distributed by wind, they must be ice-rafted. The shards thus serve as localized injections into North Atlantic paleocirculation patterns, with the resulting geographic patterns of ash redistribution tracing the counterclockwise movement of the subarctic gyre. These geologically instantaneous ash falls are spread vertically through well-defined zones in cored sediments, providing models for vertical mixing of sand-sized microfossils. In cores with high sedimentation rates, strongly defined climatic spikes should be little disturbed: episodes of only 10 to 100 yrs duration will still be visible after mixing, and those lasting 1,000 to 5,000 yrs should be left largely intact. (Knapp-USGS)
W72-14210

MECHANISMS OF CLAST ATTRITION IN BASAL TILL,
Iowa Univ., Iowa City. Dept. of Geology.
L. D. Drake.
Geological Society of America Bulletin, Vol 83, No 7, p 2159-2165, July 1972. 2 fig, 4 tab, 15 ref.

Descriptors: *Glacial sediments, *Till, *Particle size, *Particle shape, *Provenance, Sedimentology, Regimen, Scour, Erosion, Glacial drift, Weathering, Sediment transport.
Identifiers: *Abrasion (Till), *Glacial erosion.

Sources of 1,852 basal till pebbles from sites in east-central New Hampshire were identified using measurements of pebble size, shape, roundness, breakage, lithology, and weathering. Roundness, breakage, and size distributions of the pebbles when compared to their distance from source, indicate that a state of dynamic equilibrium is reached between the processes of abrasion and

rushing. The average pebble survives long nough to abrade to a roundness of .5 on Krumein's scale, then is crushed again. The early atainment of this equilibrium within a mile of ource, suggests that the clasts go through at least everal cycles of crushing and abrasion per mile ransport. Spheres are the most stable shapes, iscs and rods less so, and blades are least stable n the subglacial environment. Abrasion and crushng are about equally effective mechanisms in the roduction of subglacial till. (Knapp-USGS)
V72-14212

IGNIFICANCE OF ATMOSPHERIC DUST AND CE RAFTING FOR ARCTIC OCEAN SEDIIENT,
Visconsin Univ., Madison. Dept. of Geology and Geophysics.
. E. Mullen, D. A. Darby, and D. L. Clark.
Geological Society of America Bulletin, Vol 83, No 1, p 205-211, January 1972. 5 fig, 3 tab, 10 ref.

Descriptors: *Sedimentation, *Provenance, *Arctic Ocean, *Bottom sediments, *Glacial drift, Dusts, Particle size, Mineralogy, Sea ice, Sedimentation rates, Deposition (Sediments), Sediment distribution, Sediment transport.

Atmospheric dust fallout and ice-rafted glacial detritus are significant factors in the Arctic Ocean sediment budget. Atmospheric dust amounting to 09 mm/1000 yrs is being delivered to the Canada Basin, Chukchi Plain and Alpha Cordillera areas today. This is 10 percent of the sedimentation rate for some parts of the Arctic Ocean during the past to 3 m.y. The modern atmospheric dust and the Arctic Ocean sediment is approximately 40 percent illite with almost equal amounts of chlorite and kaolinite. Ice-rafted detritus is widespread on the Arctic Ocean floor today. No pattern of lithologic and vertical distribution correlation of erratics is present. The oldest erratic occurs in sediment approximately 3.5 m.y. old. More than 30 percent of some Arctic sediment consists of particles larger than 62 microns. This is largely ice-rafted material. Together with the atmospheric dust fallout, this is a significant part of the average sedimentation rate of 2 to 3 mm/1,000. (Knapp-USGS)
W72-14213

EOPHYSICAL STUDY OF UNCONOLIDATED SEDIMENTS AND BASIN STRUCURE IN CACHE VALLEY, UTAH AND DAHO,
eological Survey, Denver, Colo.
. D. Stanley.
eological Society of America Bulletin, Vol 83, o 6, p 1817-1830, June 1972. 15 fig, 11 ref.

escriptors: *Geophysics, *Seismic studies, lectrical studies, *Hydrogeology, Stratigraphy, luvium, Groundwater basins, Sediments, Sedientology, Borehole geophysics, Gravity studies, ploration, Subsurface mapping.
entifiers: *Cache Valley (Idaho, Utah).

n integrated geophysical study was completed in che Valley near the state line between Utah and ho. The west side of Cache Valley is underlain a trough which is about 5 mi wide and which is ed with as much as 7,000 ft of Quaternary and rtiary sedimentary units. Magnetic data ealed a probable mafic dike intruded into eozoic and Precambrian bedrock in the wiston area and possibly a buried volcanic flow t in the Tertiary sediments. Interpretations of vertical electrical soundings supported by three ll logs showed that an area of about 8 sq mi in center of the surveyed area is underlain by nductive clays. Most of the area surveyed is unlain at depths of 100 to 500 ft by more resistive terials interpreted to contain a higher percentof coarse-grained sediments. These sediments y constitute an aquifer. Seismic reflection data further confirmed the existence of the massive clays in the central part of the surveyed area, revealed complex sedimentary geology at the valley margins, and defined subtle structures within the valley fill. (Knapp-USGS)
W72-14214

THEORETICAL APPROACH TO THE ORIGIN OF BEACH CUSPS,
Western Washington State Coll., Bellingham. Dept. of Geology.
M. L. Schwartz.
Geological Society of America Bulletin, Vol 83, No 4, p 1115-1116, April 1972. 1 fig, 14 ref.

Descriptors: *Sediment transport, *Beaches, *Littoral drift, *Sand waves, Beach erosion, Surf, Waves (Water), Rip currents, Bed load, Sedimentary structures.
Identifiers: *Beach cusps.

Beach cusps are depositional over the beach surface, and their size increases with wave energy. A theoretical approach to their origin invokes littoral zone shore drift in the form of longshore sand waves. Shore drift occurs not as a sheet flow of sediment but as a series of evenly spaced sand waves or ripples transported longitudinally along the foreshore with their crests oblique to the shoreline. These sand waves in turn present a crest and trough relief profile to the swash and backwash operating in this zone. Swash-backwash reworking of the sediments comprising this microtopography fashions beach cusps. (Knapp-USGS)
W72-14215

RELATIVE SIGNIFICANCE OF HEAD AND BODY SPILL FROM A CHANNELIZED TURBIDITY CURRENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
P. D. Komar.
Geological Society of America Bulletin, Vol 83, No 4, p 1151-1155, April 1972. 3 fig, 15 ref.

Descriptors: *Turbidity currents, *Sediment transport, *Sedimentation, *Submarine canyons, *Deposition (Sediments), Density, Suspended load, Bed load, Alluvial fans, Alluvial channels, Turbulence.
Identifiers: *Submarine fans.

The relationship between the thickness and rate of flow of the head and body of a turbidity current traveling through a deep-sea fan channel governs which part spills out of the confines of the channel and is, therefore, important in submarine fan deposition. For a Froude number of about 0.75 (a channel slope of 0.0022), the head and the body will be approximately equal in thickness and, therefore, would both spill from the channel. At higher channel slopes and Froude numbers the head would be thicker and more significant in spilling, while at lower slopes and Froude numbers, the body would be thickest and spilling. (Knapp-USGS)
W72-14216

ORIGIN OF THE MORMON MESA CALICHE, CLARK COUNTY, NEVADA,
South Carolina Univ., Columbia. Dept. of Geology.
R. L. Gardner.
Geological Society of America Bulletin, Vol 83, No 1, p 143-155, January 1972. 7 fig, 2 tab, 37 ref.

Descriptors: *Caliche, *Nevada, *Diagenesis, *Soil formation, Calcium carbonate, Evaporation, Limestones, Chemical precipitation, Calcite, Stratigraphy, Mineralogy, Sedimentation rates.
Identifiers: *Mormon Mesa Caliche (Nev).

The Mormon Mesa caliche of Nevada formed primarily as the result of pedogenetic processes, probably under slowly aggrading, aeolian conditions. The reasons for postulating aggrading aeolian conditions are (1) the absence of A and B soil horizons, (2) the absence of laminated petrology horizons, (3) the lack of quartz grain dissolution and brecciation, (4) the relatively high content of clay and silt in the calcrete (caprock) horizon, (5) the presence of aeolian sand drifts on the present mesa surface, and)6) the presence of fresh red sand in joint fillings of laminated CaCO3. At least 25 percent of the secondary CaCO3 in the caliche was derived from dissolved Ca and HCO3 in rainwater, with the remainder probably furnished by aeolian carbonate dust. It is estimated that development of the caliche probably required at least 400,000 yrs and possibly as long as 2,500,000 yrs. (Knapp-USGS)
W72-14225

SIGNIFICANCE OF SUPRATIDAL DOLOMITIZATION IN THE GEOLOGIC RECORD,
Pomona Coll., Claremont, Calif. Dept. of Geology.
D. H. Zenger.
Geological Society of America Bulletin, Vol 83, No 1, p 1-11, January 1972. 9 fig, 52 ref.

Descriptors: *Diagenesis, *Deposition (Sediments), *Dolomite, *Carbonate rocks, Water chemistry, Sedimentation, Sedimentology, Stratigraphy, Paleohydrology, Paleoclimatology.
Identifiers: Dolomitization.

There is considerable evidence that much Holocene dolomite, as well as a substantial part of the dolomite in the geologic record, formed under evaporitic conditions, especially in contact with brines of high Mg/Ca ratios. However, findings in Holocene sediments as well as the lack of indication of the initial presence of evaporites in many ancient dolomites suggest that dolomite need not be an evaporitic mineral. Detailed field and laboratory studies of three dolomitic units in New York (Little Falls, Upper Cambrian; Herkimer, Middle Silurian; and Lockport, Middle Silurian) and one in California (Lost Burro, Middle and Upper Devonian) show that the dolomite, apparently metasomatic, represents original calcium carbonate sediments of variable environmental deposition. Portions of the Little Falls and Upper Lockport Formations contain evidence algal stromatolites, desiccation cracks, intraclasts) of tidal flat deposition, whereas the other occurrences (Herkimer, Lost Burro, and lower Lockport) contain evidence (bioherms, abundant open-marine fossils) of subtidal accumulation. Dolomitization is primarily diagenetic. (Knapp-USGS)
W72-14226

IRON AND CLAY IN TROPICAL SAVANNA ALLUVIUM, NORTHERN COLOMBIA: A CONTRIBUTION TO THE ORIGIN OF RED BEDS,
Princeton Univ., N.J. Dept. of Geological and Geophysical Sciences.
F. B. Van Houten.
Geological Society of America Bulletin, Vol 83, No 9, p 2761-2770, September 1972. 3 fig, 2 tab, 40 ref.

Descriptors: *Sediments, *Iron, *Tropical regions, *Clays, *Clay minerals, Diagenesis, Geochemistry, Sedimentation, Soil formation, Weathering, Leaching, Laterites, Humid climates, Alluvium, Mineralogy.
Identifiers: *Colombia, *Tropical savanna soils.

Along the flanks of Sierra Nevada de Santa Marta, northern Colombia, tropical savanna uplands with reddish to reddish-brown soils yield brown alluvium which contains relatively abundant grains of fresh iron-bearing minerals: magnetite, amphibole, and biotite, with subordinate chlorite and ilmenite. Clay minerals consist of varying amounts of mont-

morillonite, illite, mixed-layer clay, kaolinite, and chlorite. Amorphous to very disordered aluminosilicate constitutes 10 to 26 percent of the clay fraction. Total iron makes up 3.1 to 7.6 percent of bulk samples. This is considerably higher than the iron content in Sonoran Desert alluvium, and its upper range exceeds that in many ancient red beds. With few exceptions most of the total iron is in the clay fractions and about 75 percent of that is combined in clay minerals. There is enough free brown hydrated ferric oxide in tropical savanna alluvium to produce hematite pigment in a red bed simply by post-depositional dehydration and crystallization in an oxidizing environment of burial. (Knapp-USGS)
W72-14227

SEDIMENT REDISTRIBUTION ON THE REYKJANES RIDGE: SEISMIC EVIDENCE,
Naval Oceanographic Office, Washington, D.C.
W. F. Ruddiman.
Geological Society of America Bulletin, Vol 83, No 7, p 2039-2062, July 1972. 17 fig, 47 ref.

Descriptors: *Bottom sediments, *Atlantic Ocean, *Sediment transport, *Oceanography, *Seismic studies, Ocean currents, Turbidity currents, Topography, Stratigraphy, Sedimentation, Sedimentation rates.
Identifiers: *Reykjanes Ridge (Atlantic Ocean).

East-West seismic reflection lines were obtained at 14-km intervals on the eastern flank of the Reykjanes Ridge. Patterns of sediment cover are controlled by the reaction of bottomwater movement to crustal topography. Bottom currents have piled sediment into drifts. Basement peaks with scoured and moated sedimentary envelopes, outcropping sedimentary strata, and dune topography indicate prevalent erosion and redeposition of bottom sediments. No conformable pelagic draping is visible. Two prominent sediment reflectors occur on crust as young as 17 m.y. and 37 m.y., which sets a maximum limit on their ages. Part of the fracture zone filling appears to be sediment redistributed by bottom currents, but the increased sediment smoothness and reflectivity in the fractures suggest localized turbid downslope flow within the ridge flank. In the last 5 to 10 m.y., coarse basaltic sand mainly from Iceland (at 64 degrees N.) has been spread across a broad trough-contained fan southwest of the Iceland-Faeroes Ridge. At 58 degrees N., the turbidite flow is funneled into Maury Channel, ultimately to be spread out onto the Biscay Abyssal Plain at and below 48 degrees N., 1,600 km to the south. (Knapp-USGS)
W72-14228

ALPINE SUBNIVAL BOULDER PAVEMENTS IN COLORADO FRONT RANGE,
Ohio State Univ., Columbus. Dept. of Geology.
S. E. White.
Geological Society of America Bulletin, Vol 83, No 1, p 195-200, January 1972. 3 fig, 10 ref.

Descriptors: *Geomorphology, *Alpine, *Colorado, *Sediment sorting, *Firn, Glaciers, Ice, Snowpacks, Cirques, Rock glaciers, Valleys, Topography, Glaciation.
Identifiers: *Boulder pavements, *Front range (Colo).

Boulder pavements on valley floors in or near stream channels, downstream from breaks in slope, beneath persistent snowbanks, and above treeline occur in four glaciated valleys east of the Continental Divide, Boulder District, Colorado Front Range. They are at altitudes of 3,230 to 3,620 m, are triangular to rectangular in ground plan, slope a few degrees downvalley with nearly all blocks or boulders tightly packed with a flat face upward, and are made of local bedrock or till. These pavements may be formed by the joint effort of frost action, meltwater saturation and removal of fine sediment with rotation and flattening of blocks by rock weight, snow pressure and snow creep. (Knapp-USGS)
W72-14229

DISCRIMINANT ANALYSIS OF BERMUDA CARBONATE STRAND-LINE SEDIMENT,
Michigan State Univ., East Lansing. Dept. of Geology.
S. B. Upchurch.
Geological Society of America Bulletin, Vol 83, No 1, p 87-94, January 1972. 4 fig, 5 tab, 29 ref.

Descriptors: *Beaches, *Sedimentology, *Particle size, *Sediment sorting, *Carbonates, Surf, Waves (Water), Statistical methods, Sediment distribution, Regimen, Regime, Dunes, Mineralogy.
Identifiers: *Discriminant analysis, *Bermuda.

Discriminant function analysis is an effective tool for differentiation of strand-line environments. Sediment samples from the beaches of Bermuda were separated on the basis of wave energy regime and tidal position: subtidal, intertidal, and supratidal (DUNE AND EOLIAN FLAT). Sediment from the beaches that face the lagoon is composed of fragments of (1) the green alga, Halimeda, (2) bivalves, and (3) Pleistocene, skeletal eolianite. Sediment from beaches that face the open ocean is composed of fragments of (1) the Foraminifera, Homotrema, (2) coral, (3) coralline algae, and (4) Pleistocene, skeletal eolianite. Differences in sediment texture and ability to discriminate depositional environments are related to skeletal composition of the sediment and to wave-energy regime. The combination of phi mean, phi standard deviation, skewness, and kurtosis is most efficient for separating all categories of strand sediment by discriminant analysis. Phi mean and standard deviation combined are also efficient variables for discrimination. (Knapp-USGS)
W72-14230

METHOD FOR STUDYING GEOCHEMISTRY OF SEDIMENT-WATER INTERFACE,
Stockholm Univ. (Sweden). Dept. of Geology.
For primary bibliographic entry see Field 05A.
W72-14302

DEVELOPMENT OF ALLUVIAL STREAM CHANNELS: A FIVE-STAGE MODEL,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
E. A. Keller.
Geological Society of America Bulletin, Vol 83, No 5, p 1531-1536, May 1972. 6 fig, 2 tab, 11 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Meanders, *Sediment transport, *Model studies, Sedimentation, Regime, Stream erosion, Scour, Braiding, Sediment load, Bed load.

Pools, riffles, and point bars are common bed forms in straight and meandering channels. Inflections in meandering channels correspond to riffles in straight channels. Both of these forms are shoals that are symmetrical across the channel for a short distance. Pool-riffle spacing appears to be independent of channel pattern, and as straight reaches merge with meandering reaches no change occurs in the spacing, form, or symmetry of the pools and riffles. Meandering processes which result in increasing channel length may result in the addition of new pools to keep spacing constant. A five-stage model is proposed to explain the development of alluvial channels. The model is based upon channel morphology, channel morphometry, and qualitative conclusions based on numerous field observations. (Knapp-USGS)
W72-14348

STRATIGRAPHIC RECORD OF POLLUTION IN SHAGAWA LAKE, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W72-14349

SEDIMENTS OF THE CONTINENTAL MARGIN OFF THE EASTERN UNITED STATES,
Woods Hole Oceanographic Institution, Mass.
J. D. Milliman, O. H. Pilkey, and D. A. Ross.
Geological Society of America Bulletin, Vol 83, No 5, p 1315-1333, May 1972. 14 fig, 2 tab, 81 ref.

Descriptors: *Sediments, *Continental shelf, *Atlantic coastal plain, *Provenance, Sediment transport, Sedimentation, Littoral drift, Pleistocene epoch, Sediment load, Sands, Beaches, Beach erosion, Sedimentology, Sediment yield, *Atlantic Ocean.
Identifiers: Continental margin.

The character and distribution of surficial sediments on the continental shelf and slope between northern Maine and southern Florida is defined on the basis of more than 6,000 bottom samples. Most shelf sediments were deposited in shallow water during the last lower stand of sea level. Modern sediments are accumulating only in estuaries, in certain nearshore areas and on the continental slope. A large portion of the shelf sediment north of lat 41 degrees N. was deposited by Pleistocene glaciers that covered the area. Holocene reworking has removed most fine-grained sediment, leaving only coarse to medium sand. Some fine grained fluvial sediment escapes the estuaries and nearshore during floods and storms, but this influ is not sufficient to offset the effect of winnowing by currents and waves. A significant portion of the modern nearshore sediment is probably derived from landward transport of fine-grained sediment from the central and outer shelf. Despite the active sediment movement on the shelf, the net lateral transport of sand and gravel is small. Because of the lack of present-day terrigenous sedimentation a primary source of modern shelf sediment is calcareous skeletal material. (Knapp-USGS)
W72-14350

SOME MOVEMENT PATTERNS OF TEMPERATE MUDFLOWS: EXAMPLES FROM NORTHEASTERN IRELAND,
Queens Univ., Belfast (Northern Ireland). Dept. of Geography.
D. B. Prior, and N. Stephens.
Geological Society of America Bulletin, Vol 83, No 8, p 2533-2543, August 1972. 8 fig, 10 ref.

Descriptors: *Mudflows, *Mass wasting, *Sediment transport, Landslides, Rainfall, Soil water, Degradation (Slope), Soil erosion, Soil mechanics.
Identifiers: *Temperate mudflows, *Ireland.

Movements of some temperate mudflows in Ireland were automatically monitored using modified water-level recorders. A complex variety of recorded movement patterns shows the pronounced accelerations and decelerations occurring. Surges of movement of varying magnitude and relatively high rates of movement exceeding 7 m/hr may take place. Comparisons between rainfall data and movements suggest that rainfall has important effects on the behavior of temperate mudflows because pronounced accelerations of movement usually follow periods of rainfall although surges may take place unaccompanied by heavy precipitation. (Knapp-USGS)
W72-14352

RIVER MOUTH AND BEACH SEDIMENTS, RUSSIAN RIVER, CALIFORNIA TO ROUGE RIVER, OREGON. PART A, INTRODUCTION AND GRAIN SIZE ANALYSES,
California Univ., Berkeley. Coll. of Engineering

M. Glogoczowski, and P. Wilde.
Available from NTIS, Springfield, Va 22151 AD-735 373, Price $3.00 paper copy; 95 cents microfiche. Hydraulic Engineering Laboratory Report HEL 2-36, November 1971. 73 p, 4 ref.

Descriptors: *Sedimentology, *Sands, *Beaches, *California, *Oregon, Coasts, Continental shelf, Sampling, Particle size, Analytical techniques, Sediments, Sediment transport, Sand bars, Projections, Curves, Statistical methods.

Sand samples of intertidal, beach, and river mouth and bar deposits from 65 sites in the Northern California and Southern Oregon Coast were analysed for grain size properties. These samples were taken to provide source area information for a projected study of the offshore sediments of the Northern California Continental Shelf. The data are presented graphically as cumulative weight percent curves and histograms with respect to grain size. The statistical parameters median, sorting coefficient, skewness and kurtosis are calculated for each sample. (Woodard-USGS)
W72-14371

METHOD OF CONTROLLING EROSION ON SEASHORES,
For primary bibliographic entry see Field 04D.
W72-14464

A SEDIMENTOLOGIC STUDY OF MOBILE BAY, ALABAMA,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
For primary bibliographic entry see Field 02L.
W72-14524

FACTORS AFFECTING SOLUTION RATE OF BIOGENIC OPAL IN SEAWATER,
Hawaii Univ. Honolulu., Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W72-14535

ENVIRONMENT PATTERN RECONSTRUCTION FROM SAMPLE DATA. II. SPATIAL CHARACTERISTICS--MISSISSIPPI DELTA REGION,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02L.
W72-14536

CHRONOLOGY OF THE BLACK SEA OVER THE LAST 25,000 YEARS,
Woods Hole Oceanographic Institution, Mass.
E. T. Degens, and D. A. Ross.
Chemical Geology, Vol 10, No 1, p 1-16, September 1972. 12 fig, 2 tab, 21 ref.

Descriptors: *Bottom sediments, *Water chemistry, *Paleohydrology, *Dissolved oxygen, *Salinity, Eutrophication, Sedimentation, Sedimentation rates, Stratification, Density stratification, Thermal stratification, Water circulation, Oceanography.
Identifiers: *Black Sea.

Deep-water sediments of the Black Sea deposited during Late Pleistocene and Holocene time are distinguished by three sedimentary units: (1) a microlaminated coccolith ooze mainly consisting of Emiliania huxleyi; (2) a sapropel; and (3) a banded lutite. The base of the first unit lies at 3,000 years B.P., that of the second at 7,000 years B.P., and that of the third at least at about 25,000 years B.P. Beginning with the base of the section dated at about 25,000 years B.P., the sea changed from anoxic marine to oxic freshwater conditions. By the time this stage ended, about 22,000 years B.P., the Black Sea had become a truly freshwater habitat. The lake phase lasted about 12,000 to 13,000 years. Sedimentation rates were in the order of 1 m/1,000 years, but began to decrease as sea level rose during the last 5,000 years of this phase (9,000-15,000 years B.P.). Starting at about 9,000 years B.P. and continuing to 7,000 years B.P., Mediterranean waters occasionally spilled over the Bosporus as a consequence of ice retreat and sea level rise. This marked the beginning of a gradual shift from freshwater to marine, and from well aerated to stagnant conditions. At about 7,000 years B.P. when deposition of unit 2 started, the H2S zone was well established. Sedimentation rates dropped to 10 cm/1,000 years. Environmental conditions similar to those of today finally became established around 3,000 years B.P. (Knapp-USGS)
W72-14732

MOLYBDENUM, ARSENIC, AND OTHER ELEMENTS IN STREAM SEDIMENTS, TOMAH MOUNTAIN, TOPSFIELD, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14733

FOUR-DIMENSIONAL MODEL FOR BEACH AND INNER NEARSHORE SEDIMENTATION,
Western Michigan Univ., Kalamazoo.
R. A. Davis, Jr., and W. T. Fox.
Journal of Geology, Vol 80, No 4, p 484-493, July 1972. 6 fig, 13 ref.

Descriptors: *Sedimentation, *Beaches, *Mathematical models, *Terrain analysis, *Lake Michigan, Sediment transport, Sand bars, Waves (Water), Surf, Littoral drift, Surveys, Time series analysis, Dunes, Geomorphology.
Identifiers: *Beach sedimentation.

Temporal changes in beach and nearshore morphology may be slow and subtle or rapid and quite obvious. In order to measure and assess all of these changes, it is necessary to conduct detailed sequential topographic surveys. Such detailed and closely spaced data can be used to construct a framework for beach and nearshore sedimentation. This framework is constructed from a time sequence of topographic maps and from time-distance diagrams, thus providing a four-dimensional model called an area-time prism. The prism graphically depicts the dynamic nature of the beach and nearshore environment by showing the changes taking place in various key surfaces which are contoured to show their changes through time. These surfaces include the terrace cliff, shoreline, shallow sand bars, and the 4-foot depth contour. The area-time prism makes it possible to show various temporal relationships among these dynamic surfaces. By comparing this four-dimensional model with monitored environmental variables such as barometric pressure, wave height, and longshore current velocity, it is possible to demonstrate how beach and nearshore morphology responds to these variables through time. The result is a comprehensive process-response approach to the study of this dynamic environment; however, it is applicable to any modern sedimentary environment. (Knapp-USGS)
W72-14735

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 14,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-14746

GEOLOGY OF THE FALL ZONE IN DELAWARE,
Delaware Geological Survey, Newark.
N. Spoljaric.
Delaware Geological Survey Report of Investigations No. 19, March 1972. 30 p, 7 fig, 1 plate, 29 ref.

Descriptors: *Geology, *Geologic formations, *Physiographic provinces, *Delaware, *Geomorphology, Sedimentology, Waterfalls, Erosion, Alluvium, Sediment transport, Geologic time, Stratigraphy, Rocks.
Identifiers: *Fall zone (Delaware).

The complex geologic framework of the Fall Zone in Delaware is primarily caused by diverse structural features in the crystalline basement rocks that have exerted influence on the distribution of the overlying sediments of the Coastal Plain. A lateral fault and three different sets of vertical faults were recognized in the crystalline basement complex. The vertical faults have broken the surface of the basement complex into horst-graben structures. Although these faults were probably formed before the deposition of the Potomac Formation (Lower Cretaceous), there are indications that they are still active. The deposits of the Potomac Formation were brought into the area through the ancient Delaware River Valley and through the Piedmont. Fine sediments, clay and silt, are predominant. Sands are generally confined to the main distributary valleys. The areal distribution and thickness of the Potomac Formation were greatly influenced by the structures of the underlying crystalline basement complex. A considerable amount of these sediments was eroded from the area before the overlying Pleistocene deposits were laid down. (Woodard-USGS)
W72-14749

SCOUR AND FILL IN THE MISSOURI RIVER AS RELATED TO THE WATER RESOURCES PLANNING,
South Dakota State Univ., Brookings. Water Resources Inst.
Fred F. M. Chang, and Tsan-Wen Wang.
Available from the National Technical Information Service as PB-212 379, $3.00 in paper copy, $0.95 in microfiche. Completion Report, August 1972. 93 p, 18 fig, 7 tab, 25 ref, 4 append. OWRR B-008-SDAK (3).

Descriptors: *Mathematical model, *Scour, *Sedimentation, *Planning, Deposition, Rivers, Reservoir silting, Unsteady flow, *Model studies.
Identifiers: Method of Characteristics, *Missouri River.

Two mathematical models are applied to simulate sediment deposit in the Missouri River between the Oahe Dam and the Big Bend Dam. The models are based on three characteristic and two characteristic equations. The Engelund-Hansen and Einstein-Brown formulas were chosen as the working equations for sediment transport. The sediment deposit in the study reach was studied to acquire the computation procedures. The computer time used for the model based on three characteristic equations is more than that used for the model based on two characteristic equations and hence the latter model is employed to compute the sediment deposit for clear water and non-clear water releases from the Oahe Dam with discharges 1,020 CMS and 1,586 CMS in the thirty and sixty day time periods. The results obtained by using the Einstein-Brown formula with both clear water and non-clear water releases showed that only depositions in the reach had occurred. The results computed by using the Engelund-Hansen formula with clear water release showed scour in the reach between the Oahe Dam and the mouth of the Bad River, but showed deposit in the rest of the reach. This phenomenon was also noticed in the field observation.
W72-14844

A RANDOM-WALK SIMULATION MODEL OF ALLUVIAL-FAN DEPOSITION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02E.
W72-14915

GLACIOLOGICAL INVESTIGATIONS IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W72-14940

AN INTERPRETATION OF RESERVOIR SEDIMENTATION. II. CLAY MINERALOGY,
California Univ., Riverside.
L. J. Lund, H. Kohnke, and M. Pauler.
Journal of Environmental Quality, Vol 1, No 3, p 303-307, July-September 1972. 2 fig, 2 tab, 12 ref.

Descriptors: *Sedimentation, *Reservoir silting, *Sediment yield, *Clay minerals, Mineralogy, Soil properties, Illinois, Indiana, Silts, Clays, Soil erosion, Kaolinite, Bottom sediments, Lakes.

The effect of mineralogical composition of the watershed soils on the rate of sedimentation and the mineralogy of the sediments in reservoirs was studied in 13 watersheds in Indiana and Illinois which were similar in soil clay composition. There were only small differences between the composition of the soil clay of the watershed and that of the resulting sediment clay. The amounts of vermiculite, mica, kaolinite, and amorphous alumina in the sediment clays could be accounted for by the amounts in the soil clays. In most cases montmorillonite occurred in larger proportions in the sediment clays, while in case of quartz this relationship was reversed. The estimation of sedimentation rates from geomorphological data, including soil texture, could not be improved by adding mineralogical parameters. (Knapp-USGS)
W72-14944

THE ELECTROCHEMICAL CHARACTERISTICS OF NATURAL REDOX CELLS,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 02K.
W72-14957

SEDIMENTS AND WATERS OF SOMES SOUND, A FJORDLIKE ESTUARY IN MAINE,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 02L.
W72-14959

SEDIMENTATION AND EROSION ON HORIZON GUYOT,
Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
P. Lonsdale, W. R. Normark, and W. A. Newman.
Geological Society of America Bulletin, Vol 83, No 2, p 289-315, February 1972. 18 fig, 95 ref.

Descriptors: *Sedimentation, *Pacific Ocean, *Data collections, Sedimentation rates, Sediment transport, Scour, Erosion, Marine geology, Stratigraphy, Sedimentology.
Identifiers: *Seamounts.

A small part of the 2-km-deep summit of Horizon Guyot, a flat-topped submarine ridge at the eastern end of the Mid-Pacific Mountains, was surveyed in detail with a deeply towed instrument package. The summit cap of Tertiary nannoplankton ooze has truncated horizons, including Eocene chert layers, which crop out at its margins. Continuing erosion has winnowed away the fine components of the sediment, while bedload transport of the remaining foraminiferal sand creates regular trains of ripples and dunes. All three current meters recorded currents faster than 15 cm/sec within 12 m of the sea floor. Scouring and sediment redistribution is performed by locally accelerated tidal currents. Net movement of sand is upslope. Hardrock terraces underlying the pelagic sediment are exposed at the margins of the summit platform. They are probably deposits of high mobile hyaloclastite. (Knapp-USGS)
W72-14961

2K. Chemical Processes

GEOCHEMISTRY OF FERROMANGANESE OXIDE CONCRETIONS AND ASSOCIATED DEPOSITS IN LAKE ONTARIO,
Ottawa Univ. (Ontario). Dept. of Geology.
D. S. Cronan, and R. L. Thomas.
Geological Society of America Bulletin, Vol 83, No 5, p 1493-1501, May 1972. 5 fig, 2 tab, 23 ref.

Descriptors: *Lake Ontario, *Manganese, *Chemical precipitation, *Water chemistry, *Oxidation-reduction potential, Trace elements, Diffusion, Geochemistry, Sampling, Variability.
Identifiers: *Manganese nodules.

A large deposit of ferromanganese oxide coated sands and scattered manganese nodules occurs in the northern portion of Lake Ontario. Their Ni, Cu, and Co contents are lower than in deep-sea nodules, but higher than in most previously described lacustrine concretions. Pb and Zn are high in the coatings and exceed the concentrations found in many previously analyzed Mn deposits. Within the deposit, Mn, Ci, Co, and Zn contents are correlated, and they vary inversely with Fe. Mn, Fe, Ni, Cu, and Pb are present in the interstitial waters of the sediments underlying the deposit in higher concentrations than in the overlying lake waters, thus providing a potential source of metals for concretion formation. Eh increases from south to north across the deposit in such a way that iron may be selectively oxidized and precipitated in the south and manganese in the north. Upward diffusion of Mn, Fe, and associated elements from the underlying sediments probably provides the principal source of the metals in the south of the deposit, while metal-enriched bottom waters are probably the principal source in the north. (Knapp-USGS)
W72-14202

BERYLLIUM-7 AND FISSION PRODUCTS IN THE GEOSECS II WATER COLUMN AND APPLICATIONS OF THEIR OCEANIC DISTRIBUTIONS,
For primary bibliographic entry see Field 05B.
W72-14220

TRITIUM PROFILE AT THE ATLANTIC 1970 GEOSECS TEST CRUISE STATION,
Heidelberg Univ. (West Germany). Institut fuer Angewandte Physik.
For primary bibliographic entry see Field 05B.
W72-14221

BARIUM AND STRONTIUM CONCENTRATIONS IN PACIFIC AND MEDITERRANEAN SEA WATER PROFILES BY DIRECT ISOTOPE DILUTION MASS SPECTROMETRY,
Institut de Physique du Globe, Paris (France).
For primary bibliographic entry see Field 05A.
W72-14222

BARIUM AT GEOSECS III IN THE SOUTHWEST PACIFIC,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
M. P. Bacon, and J. M. Edmond.
Earth and Planetary Science Letters, Vol 16, No 1, p 66-74, September 1972. 4 fig, 5 tab, 20 ref.

Descriptors: *Trace elements, *Sea water, *Pacific Ocean, *Ocean currents, Profiles, Water chemistry, Water circulation, Diffusion, Distribution patterns, Oceanography, Data collections, Sampling, Water analysis.
Identifiers: *Barium.

A detailed, highly precise barium profile was measured at Geosecs III, off Tonga, in the southwest Pacific. There is a smooth increase in barium concentration from the surface values of 4.7 micrograms/kg to a deep maximum of 18.4 micrograms/kg at 2.974 km. Below this maximum there is an abrupt decrease to 14.3 micrograms/kg in the deep Western Boundary Current. Comparison with published data shows recent Pacific and Antarctica barium profiles to be consistent within 2%. Model calculations do not require any in situ injection of barium (or of silicate or alkalinity) in the water column; the form of the profile can be explained by vertical diffusion and advection between horizontally advecting water masses. A layer of more saline water, possibly derived from Ross Sea bottom water, or the North Atlantic deep water core in the Circumpolar Current, is present immediately above the deep Boundary Current. (Knapp-USGS)
W72-14223

STRONTIUM DISTRIBUTION IN SEA WATER PROFILES FROM THE GEOSECS I (PACIFIC) AND GEOSECS II (ATLANTIC) TEST STATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W72-14224

SIGNIFICANCE OF SUPRATIDAL DOLOMITIZATION IN THE GEOLOGIC RECORD,
Pomona Coll., Claremont, Calif. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-14226

STUDY OF PH AND EH CHANGES OF WATER-LOGGED SOIL AND IN PURE SYSTEMS,
National Commission on Agriculture, New Delhi (India).
For primary bibliographic entry see Field 02G.
W72-14269

MECHANISM OF THE FORMATION OF EXCHANGEABLE AMMONIUM NITROGEN IMMEDIATELY AFTER WATERLOGGING OF RICE SOILS,
Palli Siksha Sadana, Sriniketan (India).
For primary bibliographic entry see Field 02G.
W72-14287

USE OF FIBER OPTICS IN THE STUDY OF CHEMILUMINESCENT REACTIONS,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
For primary bibliographic entry see Field 05A.
W72-14344

A HIGH PRESSURE OPTICAL CELL FOR STUDY OF BIOCHEMICAL SOLUTIONS,
Columbia Univ., New York. Dept. of Mechanical Engineering.
T. Papanek, and T. L. Fabry.
The Review of Scientific Instruments, Vol 43, No 5, p 738-739, May 1972. 1 fig, 4 ref.

Descriptors: *Spectroscopy, *Biochemistry, Instrumentation, Measurement, Spectrophotometry
Identifiers: Optical cells, Biochemical solutions, Myoglobin, Biological samples.

The construction and use of an optical cell described for spectrographic studies of biochemical solutions under pressures up to 4080 atm and data from studies of myoglobin are presented. The optical cell described incorporates the following design features: It is a monoblock configuration comprising both a pressure intensifier and an optical portion; the sample contacts only glass and

araffin; the cell interfaces easily with spec-rophotometric equipment commonly used in iochemistry; it is relatively easy to operate and urvives repeated use; it is constructed of Almar 8-250 maraging steel, a material not previously sed for this application. (Mortland-Battelle)
V72-14345

ILICON, RADIUM, THORIUM, AND LEAD IN EAWATER: IN-SITU EXTRACTION BY YNTHETIC FIBRE,
'ata Inst. of Fundamental Research, Bombay (In-ia).
. Krishnaswami.
'arth and Planetary Science Letters, Vol 16, No 1, 84-90, September 1972. 1 fig, 3 tab, 24 ref.

)escriptors: *Water analysis, *Sea water, Sampling, *Trace elements, *Adsorption, Silica, :adium radioisotopes, Lead, Analytical :chniques, Equipment, Radioisotopes, Stable :otopes, Oceanography.
dentifiers: *Thorium.

\crilan fibre loaded with ferric hydroxide may be sed to concentrate Si and trace elements from sea vater. This synthetic fibre is cheap, relatively lank free and easily processed. Activity ratios of :a-228 and Ra-226 were measured by this :chnique in the Indian Ocean and the Mediter-anean; the results are consistent with those made irectly on seawater. Data on fibre enrichment ictors to seawater for Si, Ra, Th, and Pb are sted; these factors range from 200 to 10,000. (K-app-USGS)
/72-14353

EOSECS II, THE 1970 NORTH ATLANTIC TATION: HYDROGRAPHIC FEATURES, OX-GEN, AND NUTRIENTS,
'oods Hole Oceanographic Institution, Mass.
. W. Spencer.
arth and Planetary Science Letters, Vol 16, No 1, 91-102, September 1972.

escriptors: *Sea water, *Water chemistry, ialinity, *Nutrients, *Dissolved oxygen, :eanography, *Atlantic Ocean, Sampling, Water alysis, Mixing, Tracers, Temperature, Water :culation, Strontium, Silica, Nitrates, iosphates, Carbon dioxide, Radium dioisotopes.

ofiles of salinity, temperature, oxygen and trients for a station at 35 deg 46.5 min N and 67 g 59.8 min W show the influence of the five jor sources of deep water in the North Atlantic ean. The presence of distinct, identifiable cores water types, far removed from their sources, ;ether with linear relationships between salinity d both oxygen and silicate in the deep water sug-it that horizontal mixing processes predominate er vertical dissipation and in situ production or s processes in determining the distribution of se tracers in the deep western Atlantic Ocean. napp-USGS)
'2-14354

TAL CO2, C-13, AND DISSOLVED OXYGEN - 8 AT GEOSECS II IN THE NORTH ATLAN-
Sipps Institution of Oceanography, La Jolla, Calif.
Kroopnick, R. F. Weiss, and H. Craig.
Earth and Planetary Science Letters, Vol 16, No 1, p13-110, September 1972. 1 fig, 3 tab, 24 ref.

Descriptors: *Water chemistry, *Atlantic Ocean, *Carbon dioxide, *Carbon radioisotopes, *Dissolved oxygen, Stable isotopes, Oxygen isotopes, Sampling, Profiles, Oceanography, Water analysis.

This paper presents profiles of total CO2, C-13 in CO2, dissolved O2, and 0-18 in dissolved O2, measured at Geosecs II in the North Atlantic. The O2 minimum at 1000 m in accompanied by a minimum in C-13 and a sharp maximum in 0-18; CO2 increases downward through this layer. All four parameters are remarkably uniform in the deep and bottom water below the O2 minimum. In contrast to the North Atlantic, there is a very large gradient of dissolved O2 in the vertical profile of North Pacific Deep Water; however, if the mean deep-water O2 concentration is compared with the uniform value in North Atlantic Deep Water, the O2 and CO2 differences in North Atlantic and North Pacific Deep Water are essentially equimolar at 160 micromoles/kg. If 77% of deep-water O2 consumption is used for oxidation or organic carbon, the increase of CO2 in Pacific deep water is about 25% due to dissolution of carbonate, and 75% due to oxidation of organic matter, in the vertical particulate flux. These proportions are in agreement with those estimated from alkalinity - CO2 variations. (Knapp-USGS)
W72-14355

SHIPBOARD ANALYSIS OF STRONTIUM-90 IN SEAWATER ON GEOSECS II,
For primary bibliographic entry see Field 05A.
W72-14356

ANOMALOUS WATER AND OTHER POLYMERIC MATERIALS,
Maryland Univ., College Park. Center of Materials Research.
For primary bibliographic entry see Field 01B.
W72-14365

WATER PHENOMENA PHASE II: THEORETICAL STUDY OF WATER CLUSTERS AND A SEARCH FOR A NEW ALLOTROPE OF LIQUID WATER,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
For primary bibliographic entry see Field 01B.
W72-14366

COMPOSITION OF FLUID INCLUSIONS,
Geological Survey, Washington, D.C. Geologic Div.
E. Roedder.
Geological Survey Professional Paper 440-JJ (Chapter JJ), 1972. 164 p, 4 fig, 12 plate, 8 tab, 1,606 ref.

Descriptors: *Geochemistry, *Chemical properties, *Rocks, Mineralogy, *Liquids, Water chemistry, Water types, Gases, Reviews, Data collections, Chemical analysis, Geology, Chemical reactions, Analytical techniques.
Identifiers: Fluid inclusions (rock and minerals), Composition, Liquid phases.

Fluid inclusions in minerals and rocks preserve tiny samples of the fluids that have been present during a number of geological processes, including ore deposition. Although the original material trapped in them was generally a homogeneous fluid at the time of trapping most inclusions have undergone changes on cooling to surface temperatures, resulting in the formation of new phases such as a gas bubble, immiscible liquids, or daughter minerals. This report is mainly a compilation of the world literature on the methods and results of study of their composition, but it also includes various unpublished data. Although inclusions of organic liquids and gases are common in some localities, most fluid inclusions consist of a liquid water solution. At room temperature, the gas bubble usually contains only water vapor at 0.03 atmosphere pressure, but it may consist of carbon dioxide at pressures up to 70 atmospheres. (Woodard-USGS)
W72-14519

HYDROLOGIC RECONNAISSANCE OF THE PROMONTORY MOUNTAINS AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14526

RADIUM--228 PROFILE AT THE SECOND GEOSECS INTERCALIBRATION STATION, 1970, IN THE NORTH ATLANTIC,
Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
R. M. Trier, W. S. Broecker, and H. W. Feely.
Earth and Planetary Science Letters, Vol 16, No 1, p 141-145, September 1972. 1 fig, 3 tab, 7 ref.

Descriptors: *Radium radioisotopes, *Atlantic Ocean, *Trace elements, *Tracers, Sampling, *Water analysis, Oceanography, Data collections, *Tritium, Thermocline, Water circulation, Diffusion, Mixing, Salinity, Ocean currents.

Ra-228 concentrations were measured in 12 subsurface water samples collected during August-September 1970 in the North Atlantic at the Second Geosecs Intercalibration Station. Ra-228 concentrations ranged from 1.5 to 2.1 dpm/100 kg in the water layer between 100 and 600 m depth, above the main thermocline, but decreased with increasing depth to less than 0.5 dpm/100 kg at 1.5 km, below the main thermocline. The two deepest samples, collected below 5 km depth, indicated that the Ra-228 concentration increased again to at least 1.2 dpm 100 kg as the interface with the sea floor sediments was approached. Above the 4 km level, the Ra-228 profile was roughly similar to the tritium profile. (Knapp-USGS)
W72-14532

TRACE ELEMENT PROFILES FROM THE GEOSECS-II TEST STATION IN THE SARGASSO SEA,
Woods Hole Oceanographic Institution, Mass.
P. G. Brewer, D. W. Spencer, and D. E. Robertson.
Earth and Planetary Science Letters, Vol 16, No 1, p 111-116, September 1972. 4 fig, 1 tab, 11 ref.

Descriptors: *Water chemistry, *Tracers, *Sea water, *Atlantic Ocean, *Water circulation, Ocean currents, Provenance, Oceanography, Sampling, Profiles, Data collections, *Trace elements, Distribution patterns.

During the GEOSECS-II test cruise a profile of 25 large-volume water samples were collected, filtered and stored in the acidified condition. Two laboratories have together determined Fe, Cu, Zn, Co, Sb, Cs and U in these samples. Both laboratories determined Zn and the correlation is good; Zn, Fe and Cu show a maximum in the North Atlantic Deep Water, Cs and U are essentially conservative and Sb show variability within the uncertainty of the technique. Sc is more abundant in deep water than surface water in both the Atlantic and Pacific Oceans. An intensely layered water column exists and all five sources of deep North Atlantic water can be identified in the profile. The profiles of zinc, iron and copper are clearly related to the cores of deep water. The Antarctic Bottom Water with a core at about 4800-4950 m is characterized by relatively uniform zinc and copper concentrations of 2.4 micrograms/kg and 0.6 micrograms/kg respectively. Dissolved iron appears to show a maximum at this same depth. The pronounced peak in the zinc profile at 1000 m is coincident with the oxygen minimum and maxima in the nutrient profiles. Some trace elements have distributions that are clearly related to the water mass structure and hence, their determination should provide important information to the Geosecs program. (Knapp-USGS)
W72-14533

EXCESS HE-3 IN THE ATLANTIC OCEAN,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
W. J. Jenkins, M. A. Beg, W. B. Clarke, P. J. Wangersky, and H. Craig.
Earth and Planetary Science Letters, Vol 16, No 1, p 122-126, September 1972. 2 fig, 2 tab, 14 ref.

Descriptors: *Sea water, *Helium, *Atlantic Ocean, *Water chemistry, Radiochemistry, Geochemistry, Oceanography, Water analysis, Data collections, Sampling, Trace elements, Tritium.

Measurements of helium isotopic ratios at two stations in the Atlantic show that the deep water contains far less excess He-3 than previous measurements have shown for the Pacific Ocean. The anomaly relative to atmospheric He is approximately 5% for the deep Atlantic compared to about 20% for the deep Pacific. The North Atlantic He-3 profile shows much more structure than the South Atlantic profile, with maxima observed at 500 m, 1900 m, and 3200 m. The maxima at 500 m and 1900 m are probably due to in situ tritium decay, whereas the 3200 m maximum cannot be due to tritium, and is probably due to leakage of He-3 into the Atlantic water from the mantle. Maxima in the trace elements Cu, Zn and Fe are also observed at 3200 m at this station. (Knapp-USGS)
W72-14534

FACTORS AFFECTING SOLUTION RATE OF BIOGENIC OPAL IN SEAWATER,
Hawaii Univ. Honolulu., Dept. of Oceanography.
D. C. Hurd.
Earth and Planetary Science Letters, Vol 15, No 4, p 411-417, August 1972. 3 fig, 2 tab, 25 ref.

Descriptors: *Solubility, *Silica, *Sedimentation, Plankton, Aquatic microorganisms, Sedimentation rates, Sedimentology, Deposition (Sediments).
Identifiers: *Biogenic opal.

The rate of solution of a single particle of biogenic opal is a function of solution temperature, degree of saturation, available surface area, and any coating or protective layer the test may have. Disturbance by grazing may have both adverse and beneficial effects on test preservation. Solution of opal within the first few tens of centimeters of the sediment is rapid, but below 1000 m water depth where temperature and dissolved silicate changes are small, the relative solution rates for the world's oceans should be within 10 to 12% of one another. While solution rates are highest in oceanic surface waters, significant amounts of solution occur at all depths. (Knapp-USGS)
W72-14535

QUALITY OF SURFACE WATER IN THE BEAR RIVER BASIN, UTAH, WYOMING, AND IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14539

THE ANALYSIS OF AROMATIC COMPOUNDS IN WATER USING FLUORESCENCE AND PHOSPHORESCENCE,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W72-14541

WATER QUALITY PROBLEM IN EASTERN OSAKA, JAPAN,
Osaka City Univ. (Japan).
For primary bibliographic entry see Field 02F.
W72-14606

A SEDIMENTOLOGIC STUDY OF PERDIDO BAY AND ADJACENT OFFSHORE ENVIRONMENTS,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
For primary bibliographic entry see Field 02L.
W72-14615

MOLYBDENUM, ARSENIC, AND OTHER ELEMENTS IN STREAM SEDIMENTS, TOMAH MOUNTAIN, TOPSFIELD, MAINE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14733

BEHAVIOR OF BERYLLIUM SULFATE IN HARD AND SOFT WATER,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05B.
W72-14744

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 14,
Woods Hole Oceanographic Institution, Mass.
L. S. Waterman, F. L. Sayles, and F. T. Manheim.
In: Initial Reports of the Deep Sea Drilling Project, Vol 14, p 753-762, 1972. 1 fig, 2 tab, 1 ref.

Descriptors: *Water chemistry, *Sediments, *Atlantic Ocean, *Chemical analysis, Sampling, Cores, Sedimentology, Data collections, Water analysis, Soil types, Inorganic compounds.
Identifiers: *Sediment waters.

The interstitial waters from the sediments cored from the Atlantic Ocean on Leg 14 (Woods Hole Oceanographic Institution) exhibited characteristic compositional trends with three important exceptions. At most of the sites, the changes in Na and Cl are very small while enrichment of Ca and Sr and depletion of Mg and SO4 was typical of patterns observed in similar types of sediment recovered on previous legs. At Sites 139 and 140, off the African coast, and Site 144, off the coast of South America, systematic increases in concentration with depth were found for Na and Cl. At these sites, the concentration changes in Ca, Mg, SO4 and Sr generally followed diagenic patterns observed previously, but there is some indication of other factors affecting Mg concentrations. All analyses reported, with the exception of bulk water content and pH, were made on water samples which were squeezed from the sediments on board ship and preserved by heat-sealing in lengths of polyethylene tubing. The most striking feature of Sites 130, 140, and 144 was the increase in Na and Cl with depth. Chlorinities increased to values of 44, 32, and 2.8% respectively. Corresponding increases in Na concentrations occurred at all three sites. (Woodard-USGS)
W72-14746

NITRATE LEACHING UNDER BARE FALLOW AT A SITE IN NORTHERN NIGERIA,
Reading Univ. (England). Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W72-14942

STABLE ISOTOPE SURVEY OF THE FRESH WATER OCCURRENCES IN ISRAEL AND THE NORTHERN JORDAN RIFT VALLEY,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
J. R. Gat, and W. Dansgaard.
Journal of Hydrology, Vol 16, No 3, p 177-211, July 1972. 15 fig, 9 tab, 16 ref.

Descriptors: *Stable isotopes, *Water balance, *Water chemistry, Precipitation (Atmospheric), Water sources, Hydrologic budget, Hydrologic cycle, Evapotranspiration, Tracers, Hydrogeology, Groundwater, Surface waters.
Identifiers: *Jordan Valley (Israel).

The stable isotope composition (Oxygen-18 an Deuterium) of the meteoric water cycle in Isra was surveyed. The survey comprised space an time variations of isotopic abundance in precipit tion, surface and groundwater sources. Both th effect of the geomorphology on cloud evolutio and the effect of secondary evaporation fro falling droplets affect the isotope composition precipitation. In mountainous aquifers, the isoto composition matches that of precipitation on t recharge areas. In the coastal plain and the inla valleys heavy isotopic species are enriched groundwaters relative to local precipitation. T degree of aridity in different regions in the count is reflected in the isotopic composition. Isoto data were used to assess the hydrographical stru ture of the combined Jordan flow and the role water loss by evaporation in the system's wat balance. The isotope composition of the surfa waters of the Dead Sea is also given. (Knap USGS)
W72-14945

PERTURBATION ANALYSIS OF THE EQU TION FOR THE TRANSPORT OF DISSOLVE SOLIDS THROUGH POROUS MEDIA, PA III, INFLUENCE OF BOUNDARY CON TIONS,
Wisconsin Univ., Madison. Dept. of Soil Science
For primary bibliographic entry see Field 02F.
W72-14949

THE ELECTROCHEMICAL CHARA TERISTICS OF NATURAL REDOX CELLS,
Commonwealth Scientific and Industrial Resear Organization, Cronulla (Australia). Div. of Fish ries and Oceanography.
M. Whitfield.
Limnology and Oceanography, Vol 17, No 3 383-393, May 1972. 7 fig, 2 tab, 18 ref.

Descriptors: *Oxidation-reduction potent *Sediments, *Instrumentation, *Calibratio *Water chemistry, Electrochemistry, Electri properties, Electrodes, Chemical potential, Ir Manganese.
Identifiers: *Redox cells (Natural).

The electrical characteristics of a range of natu redox cells were measured. The equilibri exchange current densities (i) were calculated compared with the current drains imposed modern electrometers. Instrumental loading negligible, but the small values of i observed result in the slow attainment of a steady-st potential. This effect may not be so serious reduced sediments where the Eh is closely co lated with sulfide activity. In other cases som the irregularities in electrode behavior may removed by discharging the cell in situ and m suring its recharge characteristics. (Knapp-USG
W72-14957

SEDIMENTS AND WATERS OF SOM SOUND, A FJORDLIKE ESTUARY IN MAIN
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 02L.
W72-14959

AN ANALYSIS OF THE CONCENTRATIO OF HEAVY METALS IN MONTEREY HARB UTILIZING THE METHODS OF ATOMIC SORPTION SPECTROPHOTOMETRY AN POLAROGRAPHY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-14964

USE OF X-RAY FLUORESCENCE TO DE MINE TRACE METALS IN WA RESOURCES,
Dayton Univ., Ohio. Dept. of Physics.

For primary bibliographic entry see Field 05A.
W72-14965

2L. Estuaries

SALTWATER INTRUSION EXTRACTION BARRIER,
California State Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 02F.
W72-14204

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14279

EVIDENCE FOR THE RECOVERY OF THE WATERS OFF THE EAST COAST OF NOVA SCOTIA FROM THE EFFECTS OF A MAJOR OIL SPILL,
Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanography Lab.
For primary bibliographic entry see Field 05C.
W72-14292

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES. A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-14298

PRODUCTIVITY OF THE BENTHIC MICROFLORA OF SHOAL ESTUARINE ENVIRONMENTS IN SOUTHERN NEW ENGLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W72-14317

EFFECTS OF THE OIL INDUSTRY ON SHORE LIFE IN ESTUARIES,
University Coll. of Swansea (Wales). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-14318

THE ECOLOGY OF MORECAMBE BAY. II. INTERTIDAL INVERTEBRATES AND FACTORS AFFECTING THEIR DISTRIBUTION,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
For primary bibliographic entry see Field 05C.
W72-14338

THE ECOLOGY OF MORECAMBE BAY. IV. INVERTEBRATE DRIFT INTO AND FROM THE RIVER LEVEN,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W72-14339

SEDIMENTS OF THE CONTINENTAL MARGIN OFF THE EASTERN UNITED STATES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-14350

HYDROLOGY OF WESTERN COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W72-14359

RESULTS OF HYDRAULIC AND SHOALING STUDIES IN MARCUS HOOK-SCHUYLKILL REACH OF DELAWARE RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14370

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05C.
W72-14376

RELATIONS OF FRESH AND SALTY GROUND WATER ALONG THE SOUTHEASTERN U.S. ATLANTIC COAST,
Geological Survey, Brunswick, Ga.
R. L. Wait, and J. T. Callahan.
Ground Water, Vol 3, No 4, p 3-17, October, 1965. 14 fig, 50 ref.

Descriptors: *Saline water - freshwater interfaces, *Saline water intrusion, Barrier islands, *Atlantic coastal plain, Permeability, *Southeast U.S..
Identifiers: *Piezometric surface, *Chloride concentrations, Total dissolved solids.

Studies of the hydrogeologic environments and the dynamic and equilibrium relations of fresh and salt water in aquifers have been intensified at several places along the southeastern Atlantic Coast. Some salt-water problems involve the coastal water-table aquifer, and others involve parts of the artesian system. On the sandy coastal islands of North Carolina, fresh-water lenses under water-table conditions float on salt water. In the Savannah, Georgia, and South Carolina area, salt-water encroachment along two of five water-bearing zones in the principal artesian (limestone) aquifer has been caused by the decline of artesian pressure due to pumping. Along the southeast Florida coast drainage canals have been the primary cause of salt-water contamination of the highly permeable Biscayne aquifer. (Campbell-NWWA)
W72-14518

A SEDIMENTOLOGIC STUDY OF MOBILE BAY, ALABAMA,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
J. J. Ryan.
Available from NTIS, Springfield, Va, 22151 as COM 72-10295. Price $3.00 paper copy; $0.95 microfiche. Florida State University Sedimentological Research Laboratory Contribution No 30, June 1969. 110 p, 17 fig, 12 tab, 54 ref.

Descriptors: *Estuaries, *Sedimentology, *Currents (Water), Sediments, *Alabama, Bays, Quartz, Clay minerals, Tidal effects, Geomorphology, Bathymetry, Shoals, Reefs, Sand bars, Bed load.
Identifiers: *Mobile Bay (Ala).

Mobile Bay, a 392 sq mi estuary on the northeast Gulf of Mexico, is the terminus of the fourth largest river system in terms of discharge in the United States. The estuary is 31 mi long and ranges in width from 8-10 mi in the northern part to 24 mi in its lower reaches. Circulation patterns are controlled primarily by river discharge, tides and bay geometry; important short term variations are due to meteorological tides. The estuary is highly stratified, moderately stratified, or, with exclusion of the ship channel, vertically homogeneous on the basis of its circulation pattern, depending on season and/or the year. Dominant terrigenous clastics are quartz, kaolinite, and montmorillonite. Comparisons of bathymetries of 1847-51 and 1960-62 indicate an average shoaling rate of 1.7 ft per century. Distribution and ages of buried oyster reefs indicate progressive downbay migration in response to progradation of the bay-head delta and changing circulation patterns in the estuary over the past five thousand years. (Lang-USGS)
W72-14524

REMOTE SENSING OF SEA SURFACE TEMPERATURE FROM EARTH SATELLITES,
Natioanl Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 07B.
W72-14531

ENVIRONMENT PATTERN RECONSTRUCTION FROM SAMPLE DATA. II. SPATIAL CHARACTERISTICS--MISSISSIPPI DELTA REGION,
Illinois Univ., Chicago. Dept. of Geological Sciences.
R. B. McCammon.
Available from NTIS, Springfield, Va 22151 as AD-740 336; Price $3.00 paper copy; $0.95 microfiche. Technical Report No 2, March 1972. 14 p, 16 fig, 6 tab, 5 ref. ONR N00014-69-A-0090.

Descriptors: *Sedimentology, *Deposition (Sediments), *Spatial distribution, *Deltas, *Louisiana, Mississippi River basin, Sampling, Optimization, Numerical analysis, Environment, Swamps, Marshes, Beaches, Bays, Lakes, Sand bars, Data collections.
Identifiers: *Depositional environments, Spatial structure, Natural levee.

The spatial structure of the map pattern for the Mississippi Delta region of southeast Louisiana can be represented by the mean distances which separate the seven major types of depositional environments. This information provides a basis for devising an optimal sampling strategy which takes into consideration the costs of sampling. For areas where it is desired to reconstruct the underlying depositional pattern based on the fewest numbers of samples, such a strategy could yield the greatest economic savings. Random sampling of the environmental map pattern of the Mississippi Delta region is nearly as effective as that obtained by systematic sampling. Any significant reduction in the sample size necessary for reconstructing the underlying pattern based on sampling requires that information on the spatial structure be obtained. As a first approximation, the distance between nearest boundary points for the seven major types of depositional environments in the Mississippi Delta region can be described by a family of gamma distributions. An optimal sampling strategy is proposed whereby the probability for intersecting environmental boundaries between successive samples is maximized whereas the probability of remaining within a boundary between successive samples is minimized. (Woodard-USGS)
W72-14536

FIELD AND LABORATORY STUDIES-NAVIGATION CHANNELS OF THE COLUMBIA RIVER ESTUARY,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 08B.
W72-14537

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 06G.
W72-14564

DETERMINATION OF THE RELATION BETWEEN GROUNDWATER LEVEL, PRECIPITATION AND OVERDRAFT,
Aegean Univ., Bornova (Turkey).

For primary bibliographic entry see Field 02F.
W72-14601

A SEDIMENTOLOGIC STUDY OF PERDIDO BAY AND ADJACENT OFFSHORE ENVIRONMENTS,
Florida State Univ., Tallahassee. Sedimentological Research Lab.
N. M. Parker.
Available from NTIS, Springfield, Va. 22151, as Com-72-10286, Price $3.00 paper copy; $0.95 microfiche. M. Sc. Thesis, January 1968. 57 p, 13 fig, 7 tab, 34 ref. (NOAA report NOAA-72021125).

Descriptors: *Sedimentology, *Estuaries, *Bottom sediments, *Alabama, *Florida, Mineralogy, Sediments, Clay minerals, Sampling, Analytical techniques, Data collections, Benthos, Sedimentary petrology.
Identifiers: *Perdido Bay (Ala.-Fla. Coast).

The distribution of textural and mineralogical properties of bottom sediments from Perdido Bay and the adjacent continental shelf along the Alabama-Florida coast are analyzed using non-linear multiple regression. Both the offshore and the Perdido Bay estuary and back barrier bay complex are characterized by terrigenous clastics. The deeper water bottoms of the estuary system are composed predominantly of silt and clay with kaolinite, montmorillonite mixed-layer montmorillonite-illite and traces of illite comprising the clay mineralogy. Montmorillonite/kaolinite ratios are highest near the center of Perdido Bay. Quartz sand forms the nearshore region of the bays. Offshore, the average silt and clay content comprises less than one percent of the sediment and quartz sand dominates. (Woodard-USGS)
W72-14615

EFFECTS OF REMOVAL OF SHOOTERS ISLAND AND SHORE MODIFICATIONS ON TIDES, CURRENTS, AND SHOALING IN THE KILL CHANNELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14617

DISPERSION OF POLLUTANTS IN THE COASTAL WATERS OF THE SOUTHEASTERN UNITED STATES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05B.
W72-14651

WATER POLLUTION BY SEWAGE FROM WATER CRAFT,
Washington, Univ., Seattle. Coll. of Engineering.
For primary bibliographic entry see Field 05B.
W72-14663

RESOURCES, ENVIRONMENTAL PROBLEMS AND TECHNOLOGICAL SOLUTIONS IN CHESAPEAKE BAY,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 05C.
W72-14664

WATER POLLUTION BY OIL. THE PROBLEM OF PERSISTENT CHEMICALS PRESENT IN THE ENVIRONMENT, (VERUNREINIGUNG DER GEWASSER DURCH OL. ZUM PROBLEM DER PERSISTENTEN CHEMIKALIEN IN DER UMWELT),
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-14670

EFFECTS OF MIREX ON SELECTED ESTUARINE ORGANISMS,
Environmental Protection Agency, Gulf Breeze, Fla.
For primary bibliographic entry see Field 05C.
W72-14710

GRAYS HARBOR ESTUARY, WASHINGTON, REPORT 1, VERIFICATION AND BASE TESTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14727

CHRONOLOGY OF THE BLACK SEA OVER THE LAST 25,000 YEARS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-14732

EFFECTS OF ARTHUR KILL-KILL VAN KULL CHANNEL DEEPENING ON TIDES, CURRENTS AND SHOALING: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14740

COMPARATIVE CHARACTERIZATION OF THE GROWTH OF GOBIIDAE AND THE LEE PHENOMENON, (IN RUSSIAN),
Akademiya Nauk USSR, Kiev. Insytytu Hidrobiologii.
V. P. Bil'ko.
Vopr Ikhtiol. Vol 11, No 4, p 650-663. 1971. Illus.
Identifiers: *Fish physiology, *Growth rates, *Gobiidae, Gobius batrachocephalus, Gobius fluviatilis, Gobius melanostomus, Gobius syrman, Lee phenomenon, Estuaries, *Dnepr-Buh estuary.

Comparative studies were conducted in 1962-1963 in the Dnepr-Buh estuary on the growth of Gobiidae (Gobius melanostomus, G. fluviatilis, G. batrachocephalus, and G. syrman) and the Lee phenomenon. Evaluation of the rate of growth of the males and females showed that males with a smaller weight gain during the first yr of life had a compensatory gain during the second yr in comparison with fish that had a higher rate of growth during the first yr. In females the absolute rate of growth during the second yr of life decreases, but in relative terms increases somewhat. Thus, the Lee phenomenon appears to be a natural result of phylogenesis, ontogenesis, and the effects of environmental factors.--Copyright 1972, Biological Abstracts, Inc.
W72-14771

TOXICITY OF KRAFT MILL EFFLUENT TO SELECTED ESTUARINE ORGANISMS FROM YAQUINA BAY, OREGON,
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 05C.
W72-14792

FLUORIDE CHLORINITY RATIOS IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
G. R. Miller, Jr., K. Woosley, and D. R. Kester.
Available from the National Technical Information Service as AD-740 861, $3.00 in paper copy, $0.95 in microfiche. Office of Naval Research Reference No. 72-1, February 1972. 16 p, 5 fig, 17 ref. ONR N00014-68-A-0215-003.

Descriptors: *Bays, *Fluorides, *Chlorides, Domestic water, Tracers, Estuaries, Freshwater, Sea water, Salinity, Water pollution sources, Fluoridation, Distribution.
Identifiers: *Narragansett Bay (RI), Providence River (RI).

The occurrence of fluoride in Narragansett Bay was examined to test its usefulness as a chemical tracer in this estuarine environment. Fluoride and chlorinity measurements were made at 12 stations in Narragansett Bay. The fluoride concentration was expressed as mg F/kg of seawater so that the values and the fluoride-chlorinity ratios were independent of temperature. Typical estuarine flow is evident with water from Rhode Island Sound wedged beneath the lower salinity water of the Providence River. The low salinity contribution and hence the greatest mixing effects, occur primarily in the upper six meters at these stations. One remarkable feature about the fluoride distribution is that even though the fresh water input reduces the salinity of the incoming seawater by 20%, the fluoride concentration varies by less than 2%. The fluoride content of the fresh water, therefore, is comparable to that of the seawater (approximately 1 mg/l) which is typical of fluoridated rather than natural, fresh water. The observations of the fluoride-chlorinity ratio in Narragansett Bay indicate that fluoride mixes conservatively along the main axis of the Bay. (Jones-Wisconsin)
W72-14813

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-14817

PRIMARY PRODUCTION IN THE BAIE-DES-CHALEURS (SAINT-LAWRENCE GULF),
Station Zoologique, Villefranche-sur-Mer (France).
For primary bibliographic entry see Field 05C.
W72-14823

HYDROBIOLOGICAL EVALUATION OF THE SEPETIBA BAY,
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil). Div. of Zoology.
For primary bibliographic entry see Field 05C.
W72-14826

DYE DISPERSION PATTERNS FOR THREE OUTFALL LOCATIONS FOR THE WARWICK RIVER SEWAGE TREATMENT PLANT, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14951

SEDIMENTS AND WATERS OF SOMES SOUND, A FJORDLIKE ESTUARY IN MAINE
Geological Survey, Woods Hole, Mass.
D. W. Folger, R. H. Meade, B. F. Jones, and R. J. Cory.
Limnology and Oceanography, Vol 17, No 3, p 394-402, May 1972. 8 fig, 2 tab, 14 ref.

Descriptors: *Bottom sediments, *Water chemistry, *Fjords, *Maine, Estuaries, Sedimentation, Water circulation, Currents (Water), Sediment transport, Sediment sorting, Suspended load, Particle size, Sedimentation, Salinity, Water temperature, Organic matter, Aquatic life, Dissolved oxygen.
Identifiers: *Somes Sound (Maine).

Bottom sediments in the Somes Sound estuary, Maine, coarsen progressively seaward from clay in the upper and middle parts through silt and s

to gravel at the mouth. Most contain less than 5% CaCO3. Organic carbon and H2S are abundant in the clay of the upper sound. Epifauna, especially holothurians, cover most of the bottom near the mouth of the sound. Infauna predominate in the fine sediments of the middle and upper sound but are absent where H2S is high. Waters in the sound during August 1969 were well mixed and well oxygenated (6.7-4.7 ml/liter) from surface to bottom, despite the shallow sill that restricts water circulation at the narrow mouth. The net direction of flow of bottom water is landward, and the distributions of some sediment components show that bottom-water flow is counterclockwise. Particulate matter suspended in the water ranged from 0.6-4.1 mg/liter, with greatest concentrations in bottom waters above areas covered with fine-grained sediments. (Knapp-USGS)
W72-14959

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

METHOD AND APPARATUS FOR REMOVING DISSOLVED IMPURITIES FROM WATER,
G. S. Light.
U. S. Patent No. 3,565,767, 4 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1611, February 23, 1971.

Descriptors: *Patents, *Desalination, Potable water, *Heat exchangers, *Demineralization, Saline water, Evaporation, *Condensation, Water purification.
Identifiers: Scale formation.

A quantity of pressurized air is fed into a position of contact with an evaporating surface of a solution to provide air pressure acting on the surface. The solution is pressurized and heated without internal vapor formation. An increased solution temperature promotes increased evaporation or volatilization of the liquid into the air space above the evaporating surface. The evaporate is then fed into a condensation area and returned to its liquid form as demineralized water or purified water. (Sinha-OEIS)
W72-14467

METHOD FOR OPEN MULTICONDENSATION OF VAPORS FROM MULTIFLASH EVAPORATIONS,
O. F. Othmer.
U. S. Patent No. 3,567,591, 6 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 286, March 2, 1971.

Descriptors: *Patents, Evaporation, *Condensation, *Vaporization, Water purification, Water quality, Sea water, Saline water, Potable water, Equipment, Treatment, *Desalination, *Heat transfer, *Flash distillation.
Identifiers: *Multiflash evaporation.

A method is provided of condensing a series of vapor streams from multiflash evaporations of successively lower pressures by means of a series of sprays discharged by pumps to give a direct heat transfer surface of large surface area and very great heat transfer rates between vapor and liquid. Each pump lifts the cooling or condensing liquid, together with the condensate formed, through the range of pressure of one of the several stages. The condensation system may be used in conjunction with the vapor reheat system of multiflash evaporation. (Sinha-OEIS)
W72-14472

PROCESS FOR ELECTRICAL POWER GENERATION AND WATER PURIFICATION SYSTEM,
G. D. Doland.
U. S. Patent No. 3,567,952, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 356-357, March 2, 1971.

Descriptors: *Patents, *Distillation, *Electric power plants, Power plants, Water purification, Water quality, Treatment facilities, Equipment, Desalination, *Heat budget, *Steam.

This combined plant consists of a system for producing steam, at least one turbine prime mover for an electrical power generator, a system for heating power plant feedwater, a power plant exhaust steam condenser, a multistage distillation unit, and other equipment normally associated with water and power plant facilities. The systems are designed so that the power plant feedwater and steam do not mix with the water plant feed, product vapor or product water. Steam provides energy to the water plant as thermal energy is released. The thermal energy is used to preheat the water plant feed prior to entering the distillation unit. (Sinha-OEIS)
W72-14474

FISCAL YEAR 1973 AUTHORIZATION OF APPROPRIATIONS FOR THE FEDERAL SALINE WATER CONVERSION PROGRAM.
For primary bibliographic entry see Field 06E.
W72-14555

MULTICOMPONENT REVERSE OSMOSIS MEMBRANES,
Akron Univ., Ohio.
D. McIntyre, S. Krishnamurthy, and B. H. Meyer.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.00. Office of Saline Water Research and Development Progress Report No 766, May 1972. 247 p, 67 fig, 61 tab, 276 ref.

Descriptors: *Desalination, *Reverse Osmosis, *Membranes, *Synthesis, *Xray diffraction.
Identifiers: Triblock polymers, *Polymer synthesis, *Phase separation, *Cellulose acetate, *Solution properties, Polymer morphology, Acetylation, Hydroxylation, Bromination.

The possibility was studied of making reverse osmosis membranes by controlling the structure of polymeric membranes either by using a well defined two phase polymeric membrane or by attempting to control the structure of cellulose acetate. In the first phase of this study, small angle Xray scattering studies revealed the existence of regularly arranged phases in triblock polymer systems. In the second phase of study, acetylation, hydroxylation and bromination reactions were carried out on the triblock polymers in order to improve their reverse osmosis performance by increasing their hydrophilic character. Since cellulose acetate membranes were the most successful reverse osmosis membranes at the time this program was initiated thermodynamic, morphological, structural and solution studies were carried out to attempt to determine if cellulose acetate had a unique polymeric structure essential for effective desalination. (OSWabstract)
W72-14647

THE ECONOMICS AND USE OF LARGE SCALE ELECTRODIALYSIS PLANTS ON SELECTED TIDAL ESTUARIAL WATERS,
Stone and Webster Engineering Corp., Boston, Mass.
D. H. Guild.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.75. Office of Saline Water Research and Development Report No 777, December 1971. 280 p, 15 ref, 3 append.

Descriptors: *Desalination, *Water conservation, *Water supply, Water purification, Water treatment, *Electrodialysis, Optimization, *Systems analysis, *Waste water treatment.
Identifiers: *New York City Emergency Water Supply, *Wilmington (Del), Emergency water supply, Crodon Point, Indian Point, Hudson River.

The economics of providing potable water from treatment plants located on tidal estuaries was investigated. Treatment plants in the 25-300 MGD size range were assumed to be sited at specific locations on the estuaries on the Hudson and Delaware Rivers, for which hydrology data were available on salinity encroachment profiles in maximum drought years. A comprehensive computer optimization program was developed to determine the least cost of potable water supply from these specific plants and sites, balancing the dynamic elements of flow, temperature, seasonal salinity variation of the estuarial water against the cost of water treatment, sterilization, desalination and transport. The computer program may be applied to other river estuaries for which adequate hydrologic data on salinity characteristics are available. This methodology may be applied to determine the most economic location for a large-scale river water treatment plant to augment the water supply of a metropolitan area. Such location may or may not require the inclusion of desalination equipment in the plant complex, depending on the hydrology and cost of salinity hydrodynamics of the river estuary, the volume of potable water augmentation required and its cost of delivery to the point of distribution. (OSW abstract)
W72-14648

REVERSE OSMOSIS MEMBRANE MODULE, (SPIRAL-WOUND CONCEPT),
Gulf General Atomic Co., San Diego, Calif.
T. J. Larson, and B. C. Gibbons.
Available from the National Technical Information Service as PB-203 824, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 442, June 1969, 22 p, 4 fig, 1 tab, 2 ref. OSW 14-01-0001-1245.

Descriptors: *Reverse osmosis, *Membranes, *Brackish water, *Desalination plants.
Identifiers: *Spiral-wound module, Cellulose acetate.

Problems experienced with the spiral module were studied including comparison of glass head versus reinforced tricot backing materials, preventing leaks at the glue lines and reinforcing the membrane fold in the spiral to prevent leakage. The merits of Dacron cloth over glass beads as membrane support material and the proper use of a polypropylene reinforcing strip for the membrane fold are described. (See also W72-14069) (OSW abstract)
W72-14649

A METHOD OF DEMINERALIZATION USING STRONGLY ION EXCHANGE RESINS,
New Mexico State Univ., University Park. Engineering Experiment Station.
W. S. Midkiff.
Available from the National Technical Information Service as PB-212 272, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Completion Report, August 1972. 55 p, 25 fig, 12 ref. OWRR A-033-NMEX (1).

Descriptors: *Ion exchange, *Demineralization, *Water treatment, *Cation exchange, *Anion exchange, Water softening, Salt removal, Brackish waters, Resins.
Identifiers: Marginally Brackish waters, *Partial demineralization, *Ion exchange resins.

A new approach to demineralization of marginally brackish waters for individual domestic use is being proposed. The results of this investigation suggest that partial demineralization using a weak acid - weak base ion exchange system should offer simplicity and economy. In order to be satisfactory for domestic use, water need not be completely demineralized, however, in many cases it is desirable to provide more extensive treatment than hardness removal by sodium exchange. A system which will selectively remove multivalent anions and cations with a net reduction in total dissolved solids is needed. Regeneration characteristics must be favorable for the system to be economical. A system composed of a weakly acidic ion exchange column in hydrogen ion form and a weakly basic ion exchange column in hydroxide ion form will remove an increment of multivalent anions and cations and replace them with an equivalent amount of water. Additional increments of multivalent ions can be removed if desired by multiple units of weak acid and weak base ion exchangers in series. (Creel-New Mexico State)
W72-14679

ION-EXCHANGE SYSTEM BOASTS MORE PULLING POWER,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 05D.
W72-14816

WATER BROUGHT TO HIGHWAY REST AREA THE 'HARD' WAY.
For primary bibliographic entry see Field 04B.
W72-14886

PROPOSED DIABLO CANYON DESALTING PROJECT (DRAFT ENVIRONMENTAL STATEMENT).
Office of Saline Water, Washington, D.C.; and California State Dept. of Water Resources, Sacramento.

Available from the National Technical Information Service as PB-207 272-D, $3.00 in paper copy. March 2, 1972. 95 p, 11 fig, 5 tab, 29 ref, 1 append.

Descriptors: *California, *Environmental effects, *Desalination, *Desalination plants, Water sources, Water quality, Water supply, Sea water, Industrial water, Aquatic habitats, Breakwaters, Coastal structures, Effluents, Discharge (Water), Thermal water, Water demand, Water supply development, Municipal water, Desalination wastes, Water treatment.
Identifiers: *Environmental Impact Statements, *San Luis Obispo County (Calif).

The proposed project is the design, construction, and operation of a prototype seawater desalting plant and associated conveyance system. The plant, to be located in San Luis Obispo County, California, will be a multistage flash design with a capacity of approximately 40 million gallons per day. The immediate environmental impact of the project will be minor. High quality, desalted seawater will be used for municipal and industrial purposes in the service area in lieu of the State Water Project. The breakwater, intake and outfall structures will eliminate a small amount of natural marine habitat. However, the loss could be mitigated by proper design and construction of the breakwater. The intake of seawater will destroy an unknown amount of marine plankton, fish and food chain organisms. Proper intake location and design and limitation of flow velocity through the fish screens would minimize this loss. The discharge of effluent may destroy an unknown amount of marine resources due to dislodgement and possible thermal effects in the immediate outfall vicinity. The alternatives considered include no action, various alternative sites, water conveyance system alignment, and alternate effluent discharge systems. (Ellis-Florida)
W72-14925

MICROWAVE HEATING IN THE DESALINATION OF WATER,
S. J. Nesbitt, and E. M. Knapp.
U. S. Patent No. 3,577,322, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 96, May 4, 1971.

Descriptors: *Patents, *Desalination, *Vaporization, *Heat exchange, *Water purification, Freshwater, Potable water, Saline water, Brackish water, Water quality.
Identifiers: Microwave energy.

This method for the desalination and purification of water consists of indirect countercurrent heat exchange between cold saline water and the hot condensate leaving the system to preheat the saline water. The preheated saline water is exposed to microwave energy to further heat it to 213 deg F. It is then passed into indirect counter current heat exchange with superheated steam derived from a subsequent step to completely vaporize the saline water. Then by centrifuging, the vaporized saline water separates vapor from the salt. The separated vapor is heated by indirect heat exchange with liquid conveying waste heat from the source of microwave energy to provide the superheated steam. The superheated steam leaves the system as fresh water condensate. (Sinha-OEIS)
W72-14975

DISTILLATION APPARATUS WITH VACUUM CONTROLLED BY RATE OF DISTILLATE FLOW,
Weir (G. and J.) Ltd., Glasgow (Scotland). (assignee).
F. T. Randell.
U. S. Patent No. 3,577,320, 2 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 95, May 4, 1971.

Descriptors: *Patents, *Distillation, *Evaporation, *Condensation, Equipment, *Desalination, *Water quality, Water purification, Water treatment.

This apparatus comprises a casing housing an evaporation section and a condensing section including a vapor cooling device in open communication with the evaporation section. An air pump is used to create a sub-atmospheric pressure within the casing to permit the free flow of vapor between the sections. The rate of distillate outflow regulates the pressure within the casing which in turn maintains the rate of production of vapor in the evaporation section. (Sinha-OEIS)
W72-14976

MULTIEFFECT DISTILLATION PROCESS AND SYSTEM WITH DOWNWARD REMOVAL OF VAPOR,
Aluminum Co. of America, Pittsburgh, Pa. (assignee).
M. H. Brown.
U. S. Patent No 3,575,817, 7 p, 11 fig, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 588, April 20, 1971.

Descriptors: *Patents, *Distillation, *Desalination, Sea water, Brackish water, Saline water, Evaporation, Condensation, Potable water, *Heat transfer.

The liquid is passed through successive evaporation zones each situated beneath its preceding zone. A portion of the liquid passing through each zone is evaporated to produce a vapor and leave an unevaporated liquid portion at a reduced temperature. The relative pressures in successive zones are maintained at steadily decreasing levels to effect steadily decreasing pressure and temperature gradients proceeding downward through the successive zones. The vapor formed in each zone is moved along and is in heat transfer relation with the unevaporated liquid. Heat exchange causes condensation from the vapor on the inside of the chamber together with some heating and evaporation of the liquid on the outside of the chambers. (Sinha-OEIS)
W72-14985

COUNTERFLOW, MOVING BED TYPE, ION EXCHANGE APPARATUS,
Nippon Rensui Kabushiki Kaisha (Japan).
M. Hirowatari, and T. Kawai.
U. S. Patent No 3,575,294, 7 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 465, April 20, 1971.

Descriptors: *Patents, *Resins, *Ion exchange, Water quality, Water purification, Separation techniques, Water treatment, *Desalination, *Demineralization.

Portions of the resin layer which have decreased their ion exchange ability are removed from the ion exchange treating zone and sent to a regeneration system; at the same time regenerated resin is added to the treating zone. The system can continuously treat a large quantity of liquid. (Sinha-OEIS)
W72-14986

VAPORIZATION APPARATUS WITH FILMING AND COMPRESSION MEANS,
H. H. Bahrenburg.
U. S. Patent No 3,575,814, 3 p, 3 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 587, April 20, 1971.

Descriptors: *Patents, *Distillation, *Desalination, Sea water, Brackish water, Saline water, Potable water, *Evaporation, *Condensation, Water quality, Water treatment.

A falling film of hot sea water flowing down a tower cell surface and fins, heated by latent heat of condensation, produces fresh water vapor which is then compressed and conducted to the interior of the cells to produce additional condensation. The compressed vapors have a condensation temperature slightly higher than that of the boiling point of water, and so are effective in evaporating fresh water vapors and the sea water film on the fins and adjacent surface. (Sinha-OEIS)
W72-14989

MULTISTAGE EVAPORATION UNIT AND GAS-LIQUID DIRECT CONTACT DISTILLATION APPARATUS,
Kurita Industrial Co. Ltd. (Japan). (assignee).
J. Kijima, and T. Bekki.
U. S. Patent No 3,574,066, 3 p, 3 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 885, No 1, p 178, April 6, 1971.

Descriptors: *Patents, *Distillation, Evaporation, Condensation, Water purification, Water quality, Water treatment, Equipment, Treatment, Flash distillation, *Desalination.

This multistage flash evaporating water purification unit includes heaters, evaporators, and condensers for receiving impure water, evaporating some of it, and disharging pure cooled water. A second unit comprises a gas-liquid contact tower including a lower gas inlet, a fan to direct gas upwards toward the tower, and a spray for spraying impure water downward. (Sinha-OEIS)
W72-14991

WATER STORAGE SYSTEM FOR REVERSE OSMOSIS PURIFICATION UNIT,
Desalination Systems, Inc., San Diego, Calif. (assignee).
R. M. Brown.

U. S. Patent No 3,568,843, 4 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 884, No 2, p 579, March 9, 1971.

Descriptors: *Patents, *Desalination, *Reverse osmosis, Brine, Membranes, *Semipermeable membranes, Water quality, Equipment, Potable water, Water purification.

Impure liquid is supplied under pressure to a module containing a semipermeable membrane, and a flow control device is provided for brine release and to maintain pressure in the module. Purified liquid is stored in a tank and held under pressure greater than atmospheric pressure. (Sinha-OEIS)
W72-14996

TRANSPORT PROPERTY REQUIREMENTS OF MEMBRANES FOR USE IN THE REVERSE OSMOSIS PROCESS AS DEFINED BY THE METHOD OF IRREVERSIBLE THERMODYNAMICS,
Office of Saline Water, Washington, D.C.
H. E. Podall.
Available from the National Technical Information Service as PB-207 944, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report 303, June 1968, 44 p, 9 fig, 6 tab, 3 ref.

Descriptors: *Reverse osmosis, *Membranes, Ion transport, *Sea water, *Brackish water, Desalination, Membrane processes, Osmosis, Saline water.
Identifiers: *Transport property requirements, Irreversible thermodynamics, Phenomenological coefficients, Flux, Hydraulic permeability, Solute permeability, Polluted water.

The transport property requirements of membranes for use in the reverse osmosis process are defined in terms of three phenomenological coefficients, Lp, w' and o (for salt in water) derived by application of irreversible thermodynamics to the reverse osmosis process. These coefficients are, in turn, quantitatively related to various process and performance parameters and are enumerated for three concentrations of saline waters representative of sea water, 'brackish' waters and 'polluted' waters. Finally, the phenomenological coefficients are related to the 'permeability constants,' A and previously derived utilizing a simple diffusional model. (OSW abstract)
W72-14999

FEASIBILITY STUDY OF CHEMICAL SEALING OF SOILS,
Diamond Alkali Co., Painesville, Ohio.
For primary bibliographic entry see Field 05B.
W72-15000

3B. Water Yield Improvement

FUTURE EFFECTS OF WEATHER MODIFICATION ON STREAMFLOW, UPPER MISSOURI RIVER BASIN,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
J. E. Dunn.
Termination Report, 1972. 3 p, 1 ref. OWRR A-(-MONT (2).

Descriptors: *Weather modification, *Cloud seeding, Streamflow, *Missouri River, *Montana, Model studies, Data collections, Hydrologic data, Input-output analysis, Streamflow forecasting, Precipitation (Atmospheric), Snowfall, Snowmelt, Hydrology.
Identifiers: *Boulder River (Mont).

The future effects of weather modification on streamflow in the Upper Missouri River Basin were derived from a simulation of the hydrograph of a mountain stream in Montana. The hydrograph was first simulated using actual weather data input and subsequently simulated with winter snowfall data input augmented. The effects of winter cloud seeding on the hydrograph were simulated by increasing the snowfall input to snow-cover by ten percent. The first prototype hydrograph studies was for the 1965-66 water-year of the Boulder River (near Contact) which drains 226 square miles of the rugged Beartooth Mountains south of Big Timber, Montana. The correspondence between simulated and prototype hydrographs was good enough to suggest that computed response to weather input was analogous to the actual response of the prototype drainage basin. The most obvious effect on the hydrograph was the augmentation of a snowmelt peak which occurred between June 27 and July 3. The true value of this peak was approximately 1080 CFS (cubic feet per per second) on June 29. The peak value of the unmodified simulation was 1024 CFS on June 29. The peak produced by augmenting snowfall by ten percent was 2017 CFS on June 27. This suggests that cloud seeding would have nearly doubled this peak, and the augmented peak would have been the second highest peak in the water-year. (Woodard-USGS)
W72-14201

ATMOSPHERIC WATER RESOURCES RESEARCH,
Fresno State Coll., Calif.
W. F. Rowland.
Available from the National Technical Information Service as PB-207 845, $3.00 in paper copy, $0.95 in microfiche. Fresno State College Foundation, Atmospheric Water Resources Research Final Contract Report, December 31, 1971. 77 p, 21 fig, 5 tab, 18 ref. USBR Contract 14-06-D-6592.

Descriptors: *Weather modification, *Cloud seeding, *Precipitation (Atmospheric), *Silver iodide, *California, Meteorological data, Cloud physics, Computer models, Radar, Storms, Aircraft, Instrumentation, Data collections, Air masses.
Identifiers: *Sierra Nevada (Calif).

Research accomplishments are summarized (Central Sierra Research) on the completed Sierra Cumulus project, and on the continuing CENSARE (Central Sierra Research) project during the period July 1, 1968 through June 30, 1971. The Sierra Cumulus project investigated the potential for enhancing water supplies through seeding summertime orographic cumulus clouds over a high elevation portion of the southern Sierra Nevada of California. The project consisted of four phases: hydrologic studies, pair seeding, quantitative determinations, and forecast tools and physical models. Increases in runoff on the order of 100% to 250% were achieved from the seeded cumulus systems, at a statistical level of significance of 0.995. The CENSARE project comprises a cooperative wintertime cloud seeding and storm observation research effort in the central Sierra Nevada. An extensive surface and upper-air instrumentation network has been developed. Radar is used for weather surveillance and specialized measurements. Silver iodide nuclei are generated by manual and remote acetone and pyrotechnic devices. Aircraft seeding has utilized pyrotechnic units. Precipitation increases are maximized when the 600 mb (about 16,000 ft above mean sea level) temperature is colder than -14 deg C. (Woodard-USGS)
W72-14232

LARGE SCALE EFFECTS OF CLOUD SEEDING--1970-1971 SEASON AND FOUR YEAR SUMMARY,
Aerometric Research, Inc., Geoleta, Calif.
K. J. Brown, and R. D. Elliott.
Available from NTIS, Springfield, Va 22151, as AD-740-128, Price $3.00 paper copy; $0.95 microfiche. Aerometric Research Inc. Final Report, October 1971. 159 p, 22 fig, 5 tab, 20 ref. Bur Reclam Contract 14-06-0-6841.

Descriptors: *Weather modification, *Artificial precipitation, *Cloud seeding, *Cloud physics, *California, Data collections, Meteorological data, Methodology, Silver iodide, Weather patterns, Winds, Velocity.

Four years of data are summarized on the large scale effects of cloud seeding in Santa Barbara County, California, sponsored by the Naval Weapons Center, China Lake, California. Seeding was accomplished from a point source using pyrotechnic seeding devices. The seeding and observation unit was a convective band. Substantial statistical evidence shows that precipitation has been significantly increased over a large area 70 to 125 miles from the seeding source. The seeding effect is highly temperature dependent, and the time duration of bands is significantly increased as a result of seeding. Shown are the interactions between convective bands, the possible effects of seeding on surface pressure, and the diurnal effects of seeding. (Woodard-USGS)
W72-14538

STOMATAL RESISTANCE AND TRANSPIRATION POTENTIAL OF BOG PLANTS,
New Hampshire Univ., Durham. Dept. of Soil and Water Science.
For primary bibliographic entry see Field 02D.
W72-14543

PROPOSED CLOSED BASIN DIVISION, SAN LUIS VALLEY PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-14573

PALEOZOIC SANDSTONE AQUIFERS IN SAUDI ARABIA,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
For primary bibliographic entry see Field 02F.
W72-14593

GROUND WATER IN CENTRAL ST. CROIX, U.S. VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 04B.
W72-14731

PLANT INDICATORS IN IRAQ, PART II - MINERAL COMPOSITION OF NATIVE PLANTS IN RELATION TO SOILS AND SELECTIVE ABSORPTION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14869

HARVESTING PRECIPITATION FOR A DEPENDABLE, ECONOMICAL WATER SUPPLY,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
M. L. Fairbourn, F. Rauzi, and H. R. Fardner.
Journal of Soil and Water Conservation, Vol. 27, No. 1, p 23-26. January/February 1972. 2 fig, 2 tab, 17 ref.

Descriptors: *Precipitation (Atmospheric), *Harvesting, *Water supply, Costs, Economic feasibility, Ranges, Data collections, Water storage, Durability, Planning.
Identifiers: *Harvesting precipitation, Catchment, Adaptability.

A solution to the water distribution problem in efficient use of range forage is to harvest and use

precipitation that falls on rangeland. The initial cost of precipitation is high, but the annual cost is relatively low, and the water supply is dependable. The design of a dependable water harvesting system requires long-term precipitation data, including the total average annual precipitation, the high and low variation from the average, and the months of the year when precipitation is most likely to occur. With such data, the potential water supply can be estimated. There are several types of commercially available catchment surface materials: steel, asphalt roofing, gravel-on-plastic, butyl rubber, asphalt-paved, and asphalt sealants. Adaptability of a ground cover to a particular site must be considered in terms of availability of materials and equipment, site accessibility, maintenance requirements, soil type, and total cost. Transportation charges from the manufacturer to the site may vary widely from one location to another. Some materials tested for water harvesting have not been observed long enough to determine their durability. Water storage structures must also be evaluated for adaptability to a particular site. The storage structure usually accounts for 60-80% of the cost of a water harvesting system. Provision for inlet, outlet, and emergency overflows and fencing must be included in the cost of any type of structure. Seepage and evaporation losses also should be controlled. Careful planning of this part of the water system is essential. The desirability of steel, butyl rubber, a polyethylene lining, and an open pond as storage structures are discussed. (Strachan-Chicago)
W72-14896

A SURVEY OF THE PHREATOPHYTIC TREES OF THE REPUBLICAN RIVER VALLEY, NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
P. J. Rand.
Available from the National Technical Information Service as PB-212 381, $3.00 in paper copy, $0.95 in microfiche. Nebraska Water Resources Research Institute Project Completion Report, June 1, 1972. 69 p, 13 fig, 14 tab, 51 ref, 3 append. OWRR A-019-NEB (2).

Descriptors: *Phreatophytes, *Trees, *Cottonwoods, Willow trees, Consumptive use, Vegetation, Nebraska.
Identifiers: Peachleaf willow, Republican River Valley (Neb).

The woody phreatophyte communities of the Republican River Valley were studied by means of 33 transects located at 4-8 mile intervals along the 285 miles of its course in Nebraska. Two principal types of communities are present and are located, respectively, on the west and east halves of the valley: (a) those in which cottonwood and peachleaf willow are the sole dominants and (b) those in which cottonwood and peachleaf willow have high importance values but in which there is a well-developed understory of mixed hardwood species. Thirteen species of trees were found in the transects and three others were seen in stands along the river. Of these, cottonwood is the most important. It averages over 100 trees per acre throughout the valley, contributed a third or more of the canopy coverage in all stands, and has an average basal area of 40.79 feet per acre. Peachleaf willow is the next most important tree in the phreatophyte stand and shares dominance to the west with cottonwood. Secondary species of importance are boxelder, mulberry, green ash and slippery elm, but their importance values are one-tenth as large as cottonwood. Humans have used the Republican River Valley and its plants for at least the last 2,000 years, but their influence on plant community structure and composition seems to have been less important than shifting climatic regimes and periods of flooding. What the present series of manipulations of water flow by man will do to the natural succession of phreatophytes remains to be seen. His management, however, will be less than successful unless he pays attention to the growth of cottonwood.
W72-14914

EFFECT OF CATCHMENT AREA ON FLOOD MAGNITUDE,
Australian Rivers and Water Supply Commission, Victoria, New South Wales.
For primary bibliographic entry see Field 02A.
W72-14946

PRELIMINARY STUDIES IN THE TERRESTRIAL DISPOSITION OF SILVER FROM CLOUD SEEDING,
Colorado State Univ., Fort Collins. Dept. Watershed Science.
For primary bibliographic entry see Field 05B.
W72-14953

THE ROLE OF ELECTRICAL FORCES IN THE DEVELOPMENT AND DISSIPATION OF CLOUDS AND FOGS,
University of Manchester Inst. of Science and Technology (England).
For primary bibliographic entry see Field 02B.
W72-14963

3C. Use of Water of Impaired Quality

A METHOD OF DEMINERALIZATION USING STRONGLY ION EXCHANGE RESINS,
New Mexico State Univ., University Park. Engineering Experiment Station.
For primary bibliographic entry see Field 03A.
W72-14679

PLANT INDICATORS IN IRAQ. PART I - NATIVE VEGETATION AS INDICATOR FOR SOIL SALINITY AND WATERLOGGING,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14868

ON THE DELIMITATION OF GROUNDWATER RECHARGE AREAS AROUND BERJESIYAH,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W72-14870

HYDROLOGICAL AND SOIL PHYSICAL CONDITIONS IN A PILOT AREA IN THE GREATER MUSSAYEB PROJECT,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14871

PRELIMINARY STUDIES ON GROUNDWATER IN SAMARATIKRIT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W72-14872

3D. Conservation in Domestic and Municipal Use

INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Wendell and Schwann, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14238

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W72-14390

THE IMPORTANCE OF ECONOMIC FACTORS IN URBAN WATER SUPPLY SYSTEMS,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 06B.
W72-14430

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
For primary bibliographic entry see Field 05G.
W72-14437

PLANNING OF REGIONAL WATER RESOURCE SYSTEMS FOR URBAN NEEDS,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14638

RELATIONSHIPS BETWEEN SUPPLIES AND PROJECTED DEMANDS FOR WATER IN A SIX-COUNTY URBANIZING REGION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14639

SUGAR AND BRIAR CREEKS PROJECT CATAWBA RIVER BASIN, NORTH CAROLINA AND SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14755

BALDWIN AND HANNON SLOUGHS, MONTGOMERY, ALABAMA, FLOOD PROTECTION (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14768

BLOMQUIST V. COUNTY OF ORANGE (STATE CONSERVATION LAW COMPLIANCE AS CONDITION TO WATER SUPPLY DEVELOPMENT).
For primary bibliographic entry see Field 06E.
W72-14777

RELATIVE POLLUTION STRENGTHS OF UNDILUTED WASTE MATERIALS DISCHARGED IN HOUSEHOLDS AND THE DILUTION WATERS USED FOR EACH,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W72-14839

ZONING FOR BEAUTY,
Ross, Hardies, O'Keefe, Babcock, McDugald & Parsons, Chicago, Ill.
For primary bibliographic entry see Field 06F.
W72-14880

THE PLANNING LAND-USE CONTROL RELATIONSHIP: A LOOK AT SOME ALTERNATIVES,
Illinois Univ., Urbana. Coll. of Law.
For primary bibliographic entry see Field 06B.
W72-14881

THE HOUSTON SOLUTION: THE CASE FOR REMOVING PUBLIC LAND-USE CONTROLS,
For primary bibliographic entry see Field 06F.
W72-14883

CITY PLANNING AND POLITICAL VALUES,
Rutgers - The State Univ., New Brunswick, N.J.; and Columbia Univ., New York.
For primary bibliographic entry see Field 06E.
W72-14884

PROPOSALS FOR A NON-ESCAPIST NATIONAL URBAN GROWTH POLICY,
For primary bibliographic entry see Field 06B.
W72-14885

OMAHA'S PLATTE RIVER WATER TREATMENT PLANT,
Omaha Metropolitan Utilities District, Nebr.
For primary bibliographic entry see Field 05D.
W72-14887

A CASE HISTORY IN GROUND WATER COLLECTION,
Public Utilities, Mankato, Minn.
For primary bibliographic entry see Field 04B.
W72-14889

THE PROFESSIONAL URBAN PLANNER,
Central Naugatuck Valley Regional Planning Agency, Waterbury, Conn.
For primary bibliographic entry see Field 06B.
W72-14894

EFFECTIVE USE OF TV SEWER INSPECTION AND SEALING,
Halliburton Co., Duncan, Okla.
For primary bibliographic entry see Field 08G.
W72-14898

OIL EXTRACTION, URBAN ENVIRONMENT, AND CITY PLANNING,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05G.
W72-14899

METROPOLITAN GROWTH -- ENCROACHMENT OR ORDERLY PROCESS,
Department of Housing and Urban Development, Washington, D.C. Land and Facilities Development Administration.
For primary bibliographic entry see Field 05G.
W72-14910

URBAN OPEN SPACE: PSYCHO-SOCIO AND LEGAL DIMENSIONS,
Colorado Open Space Foundation, Denver.
For primary bibliographic entry see Field 06B.
W72-14911

BOULDER, COLORADO: A STUDY IN GROWTH,
Colorado Univ., Boulder.
. E. Flack.
n: Man and the Quality of His Environment, Western Resources Conference, 1967, University f Colorado Press, Boulder, 1968, p 223-229.

escriptors: *Environment, *Growth rates, Technology, *City planning, Quality control, anagement, Design criteria, Water pollution, ater supply, Flood plains, Solid wastes, Transortation, Education, Research and development. entifiers: *Boulder (Colo), *Metropolitan water sources management.

case study of Boulder, Colorado was used to ow the impact of growth and technology on a community's natural environment. Invited speakers discussed problems associated with preserving and enhancing the environmental quality of Boulder. Following these presentations, a panel representing the Inter-Professional Committee for Environmental Design (IPCED) made recommendations for designing the environmental setting of the case study community. (1) Boulder has done a good job in most of its environmental problems. (2) Water supply and air pollution management programs are being pursued with vigor. (3) Recognition and concern with water pollution and problems related to the central core are receiving intensive study and plans will be developed. (4) Flood plain management needs additional concern in the form of action programs rather than planning as such. (5) The provision of greenbelts and an adequate transportation system will receive much support in the near future. (6) The solid wastes problem will continue to be of concern. (7) There is a need for educating the public in environmental quality and design. (Strachan-Chicago)
W72-14912

ECONOMIC GROWTH AND ENVIRONMENTAL COSTS,
Coe Coll., Cedar Rapids, Iowa.
For primary bibliographic entry see Field 06G.
W72-14913

3E. Conservation in Industry

GEOTHERMAL STEAM IN THE GEYSERS--CLEAR LAKE REGION, CALIFORNIA,
For primary bibliographic entry see Field 02F.
W72-14351

WATER CONSUMPTION STUDY FOR NAVAJO PLANT,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
For primary bibliographic entry see Field 05G.
W72-14413

EFFECTS OF POLLUTION CONTROL ON THE FIRM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05G.
W72-14420

EFFECTIVE POLLUTION CONTROL IN INDUSTRIALIZED COUNTRIES: INTERNATIONAL ECONOMIC DISINCENTIVES, POLICY RESPONSES, AND THE GATT,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 05G.
W72-14426

THE DEEP SEABED HARD MINERAL RESOURCES BILL,
Auckland Univ. (New Zealand).
For primary bibliographic entry see Field 06E.
W72-14549

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATER ALONG THE LOUISIANA COAST (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 05G.
W72-14756

THE NATIONAL OCEAN PROGRAM, IMPLEMENTATION AND BENEFITS,
For primary bibliographic entry see Field 06E.
W72-14780

RECYCLING: A PAPER COMPANY'S APPROACH.
For primary bibliographic entry see Field 05D.
W72-14888

OIL EXTRACTION, URBAN ENVIRONMENT, AND CITY PLANNING,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05G.
W72-14899

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AFB FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-14928

3F. Conservation in Agriculture

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.

Cooperative Regional Project Termination, Project No. NC-57, February 1972. 43 p, 168 ref.

Descriptors: *Water utilization, *Bibliographies, *Water resources development, Water management (Applied), Information retrieval, Technical writing, Water policy, Regulation, Reviews, Irrigation, Irrigation engineering, Water law, *Legal aspects, Water quality control, Water pollution, Watercourses (Legal aspects), Water supply, Water rights, Administration, Riparian rights, Appropriation, *Agriculture.
Identifiers: North Central US.

The research project was terminated because most of the work contemplated was completed and a new program for funding such regional research projects was developed. The project had four objectives: (1) to determine the economic considerations affecting use and management of water in agriculture and competing uses; (2) identify and describe rights in water and administrative arrangements regulating water use in the United States; (3) to analyze the economic consequences of different systems of water law; and (4) to develop principles which will serve as guidelines in efforts to bring about optimum management of water uses. This project related to both qualitative and quantitative aspects of water use problems in the midwestern states, referred to as the North Central Region. A bibliography and comments are included under each of the first three objectives. The information herein accumulated from the various studies contributed to the general fund of knowledge concerning economic and legal aspects of water-use and management in agriculture and the use-conflict problems arising within and between agriculture and other uses. (Brackins-Florida)
W72-14256

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO (PART 1).

Hearing--Subcomm. on Irrigation and Reclamation--Comm. on Interior and Insular Affairs, House of Representatives, 92d Cong, 2d Sess, March 11, 1972. 103 p.

Descriptors: *Idaho, *Water resources development, *Irrigation programs, *Legislation, Water conveyance, Water distribution (Applied), Water sources, Rivers, Impoundments, Prior appropriation, Water rights, Legal aspects, Water utilization, Multiple-purpose projects, Pumping, Pumped storage, Federal government, Federal jurisdiction, State governments, Groundwater recharge.

Identifiers: *Salmon Falls Division, *Snake River.

The report contains testimony from local residents, industry representatives and governmental officials concerning the proposed plan of development for the Salmon Falls division of the Upper Snake River project in Idaho. A copy of H.R 2474 which would initiate work is included. Testimony concerns the increased need for water in the region and the shortage of water which currently exists for agriculture. The project would divert 181,600 acre-feet of water annually from the Snake River for use in agriculture, fish and wildlife development, and groundwater recharge. Testimony also covers the complex situation of local appropriated water rights and how the proposed project might influence it. Members of several canal and irrigation companies present their viewpoints on the situation. The economic difficulties of the region, which stem from an inadequate water supply, are also discussed. Reaction to the project from witness is favorable to the project. (Grant-Florida)
W72-14257

EFFECT OF TREATMENTS GIVEN TO THE GRAIN, ON THE GROWTH OF WHEAT ROOTS UNDER DROUGHT CONDITIONS,
Buenos Aires Univ. (Argentina). Facultad de Agronomia y Veterinaria.
M. S. Carceller, and A. Soriano.
Can J Bot. 50 (1): 105-108. Illus. 1972.
Identifiers: *Drought, Grain, Growth, *Roots, Stress, *Wheat-M.

The effect of (desiccation) pretreatments given to wheat grains which are supposed to increase drought resistance was studied in young plants under controlled conditions of water stress. In one of the 2 cultivars used, root growth was found to be significantly greater in plants from pretreated seeds, during and after a period of water stress. Under conditions of ample water availability, root growth was not influenced by the pre-treatments.--Copyright 1972, Biological Abstracts, Inc.
W72-14293

AGRICULTURE RESEARCH DIVISION ANNUAL REPORT, 1970-1971.
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.

New Zealand Dept of Agriculture Winchmore Irrigation Station Annual Report, 1972. 15 p, 1 tab, 9 ref.

Descriptors: *Experimental farms, *Agriculture, *Irrigation, *Crop response, *Agronomy, Fertilizers, Methodology, Crop production, Soil moisture, Soil properties, Soil chemistry, Wheat, Barley, Clovers, Livestock, Food and cover crops, Pest control, Insects.
Identifiers: *New Zealand, Viner peas, Lucerne, Turnips, Tama.

Winchmore Irrigation Research Station, New Zealand, is located in Mid-Canterbury, a few miles from Ashburton. It consists of 750 acres, typical of much of the 1 million acres of flat land in the South Island. Research is concerned primarily with irrigation techniques and production of livestock and crops under irrigation. Crop response data are reported for wheat, grasses, clovers, peas, lucerne, turnips, barley, and tama. Data concerning the kind and amount of insects eaten by starlings also are reported. Four seasons (1967-71) of study on the irrigation of Aotea wheat show that the optimum is one watering when the soil moisture reaches wilting point. The increase in grain production ranged from 28 to 148 percent. (Woodard-USGS)
W72-14375

WATER RESOURCE MANAGEMENT IN NORTHERN MEXICO,
Resources for the Future, Inc., Washington, D.C.
R. G. Cummings.
Prepared by: Resources for the Future, for RFF Latin American program, and distributed by Johns Hopkins University Press, Baltimore, Md. 21218, p 1-68, 1972. 3 fig, 28 tab, 33 ref, 1 append.

Descriptors: *Mexico, *Dynamic programming, *Linear programming, *Water management (Applied), *Irrigation efficiency, *Water allocation (Policy), Crops, Farms, Income, Optimization, Model studies, Groundwater, Surface waters, Reservoirs, Land, Labor, Systems analysis, Rivers, Irrigation districts.
Identifiers: *Howard's Policy Iteration, *Comarca Lagunera (Mex), Water releases, Water quotas, Crop patterns, Evaporation losses, Southern Coahuila, Northern Durango.

Dynamic programming and Howard's Policy Iteration technique are used to derive efficient irrigation allocation policies for the Comarca Lagunera irrigation district in northern Mexico. These techniques are applied to the problem of determining the intertemporal pattern of annual water release, as well as the intratemporal use pattern for annual releases, crop patterns, water quotas for farm allocation, and interzonal distributions that maximize the present value of expected incomes, given the relevant structure of the technological and economic conditions in that district. Appropriate benefit functions are derived by linear programming. Alternatives to surface water storage are discussed as a means of stabilizing interannual income. The alternatives include insurance in the form of money or agricultural products, and conjunctive groundwater management. Evaporation losses from surface reservoirs in this arid region prove to be a major deterrent to holding large reservoir stocks, given surpluses of land and labor and an income maximization objective. (Bell-Cornell)
W72-14389

PLANT POPULATION EFFECTS ON THE EFFICIENT USE OF WATER: WATER UPTAKE CHARACTERISTICS,
Agricultural Experiment Station, Stillwater. Okla.
J. F. Stone.
Available from the National Technical Information Service as PB-212 263, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, July, 1972, 44 p, 8 fig, 11 tab. OWRR B-012-OKLA (1).

Descriptors: *Water utilization, *Water conservation, *Planting management, *Evapotranspiration, Soil-water-plant relationships, Energy budget, *Oklahoma, *Hydrologic budget, *Peanuts, Crops, Farm management, *Plant groupings.

Effects of crop geometry on the evapotranspiration (ET) of water were studied over two growing seasons at the Cadde Research Station, Ft. Cobb, Oklahoma. Peanuts were grown in 12-inch rows and 36-inch rows. Plots were oriented with rows north-south and east-west. The four combinations of these treatments were replicated three times each year. A water budget on accrued water was computed each year. Difference of water content between dates was sensed with a neutron probe. These differences were corrected for either drainage or accretion from below by the deduction of a computed integrated water flux. This flux was determined from tensionmetric measurement of total hydraulic head and pressure head across the fifth foot of the profile. In actual practice, the tensionmeter measurements did not permit useful estimates of the flux, being too erratic. However, they did indicate the periods of the season where there was zero or negligible flux through the fifth foot. During such periods, the neutron probe indication of water loss was a direct estimate of ET. The results indicated that during peak water use the 12-inch rows with north-south orientation lost water at nearly half the rate of the highest user: the 36-inch north-south rows. East-west rows were intermediate, but the higher population (12-inch rows) tended to lose the lesser. Plants grown in the 12-inch rows consistently yielded higher than the 36-inch rows' plants. Quality was about the same over the entire study.
W72-14433

THE SUN'S WORK IN A CORNFIELD,
Agricultural Research Service, Ithaca, N.Y.
E. Lemon, D. W. Stewart, and R. W. Shawcroft.
Science (Wash). Vol 174, No 4007, p 371-378. 1971. Illus.
Identifiers: *Model studies, *Soil-water-plant relationships, Air-earth interfaces, Atmosphere, Climate, Corn (field), Plants, Soils, Sun.

After extensive field experiments, SPAM (soil-plant-atmosphere model), a comprehensive mathematical model that simulates energy and material exchange in the plant-air layer at the earth's interface was developed. The model is based upon the conservation of energy, where the sun is the driving force. Understanding and deficiencies were gauged initially by testing model predictions against actual experience with a relatively simple system, a cornfield. Climatic predictions are physically and biologically good enough for many applications, but they reveal inadequacies in the understanding of the fluid dynamics of airflow within the plant stand. The present inability to measure or predict the degree of wetness of the soil surface hampers correct prediction of evaporation. Probably the most difficult problem to resolve is that of predicting how stomates open and close under drought stress, thus affecting both evaporation and photosynthesis in leaves. Along with resolution of these problems, the basic framework of the model can be adapted to more complex systems in nature, where variability is much greater than in an agricultural crop. The model in its present form can be used, with caution, as a powerful tool to help man order his priorities of plant community traits for whatever outcome he desires, be it food production, nature and water conservation, climate modification, or esthetic enjoyment.--Copyright 1972, Biological Abstracts, Inc.
W72-14436

CHANGES IN RESISTANCE TO FLOW OF WATER THROUGH A SOIL-PLANT SYSTEM,
Connecticut Univ., Storrs.
B. E. Janes, and G. W. Gee.
Available from the National Technical Information Service as PB-212 279, $3.00 in paper copy, $0.95 in microfiche. Connecticut University Research Project Technical Completion Report, Nov 3, 1970. 6 p, 1 ref. OWRR A-027-CONN (1).

Descriptors: *Soil-water-plant relationships, *Plant growth, *Plant physiology, Testing procedures, Root systems, Leaves, Water balance, Crop response, Soil moisture, Soil properties, Evapotranspiration, Agronomy.
Identifiers: *Pepper plants, Water potential gradients.

A method employing the use of both a hanging water column and a field type thermocouple psychrometer was developed to control and measure water potential gradients in pepper plants with confined root systems. Small soil containers were constructed with Millipore filters arranged so that they confined the root system but allowed water transport to the roots. Hydrostatic pressures in leaf petioles were in agreement with those found in the plant top and agreed well with the psychrometrically determined root zone water potential measurements. On the other hand, water potentials inferred from hydrostatic pressure measurements average 4 bars higher in the plant roots than in the plant tops. A nonlinear relationship between transpiration rate and decreasing root zone water potential was observed for plants allowed to dry to wilting and also plants controlled

at a high matric potential but subjected to controlled decreases in total water potential. (Woodard-USGS)
W72-14523

SOIL SURVEY OF TUCSON-AVRA VALLEY AREA, ARIZONA,
Soil Conservation Service, Tucson, Ariz.
For primary bibliographic entry see Field 02G.
W72-14576

TILLAGE AND HERBICIDES FOR SURFACE RESIDUE MAINTENANCE, WEED CONTROL, AND WATER CONSERVATION,
Southwestern Great Plains Research Center, Bushland, Tex.
P. W. Unger, R. R. Allen, and A. F. Wiese.
Journal of Soil and Water Conservation, Vol. 26, No. 4, p. 147-150, July-August, 1971. 5 fig, 3 tab, 28 ref.

Descriptors: *Herbicides, *Weed control, *Water conservation, *Wheat, *Soil moisture, Grain sorghum, Water table, Water wells, Harvesting, Planting management, Crop response, Fallowing, Precipitation (Atmospheric), Irrigation practices, Great Plains.

Declining water tables and well yields threated the future of irrigated agriculture in the Southern Great Plains. This study determines the effectiveness of tillage and herbicides for maintaining surface residues, controlling weeds and volunteer wheat, and storing precipitation as soil water during the period from wheat harvest to grain sorghum planting. The cropping sequence was an irrigated wheat-sorghum-fallow regimen. About 10,000 pounds of residue per acre were present in July when the study began. Surface residues ranged from less than 200 to 4,100 pounds per acre in the following spring. Weed control ranged from 44 to 100 percent. Increase in available soil water ranged from 2.0 to 5.6 inches. Increase in soil-water storage resulted from maintaining residues at the surface, suggesting a potential for storing precipitation for later plant use. Added soil-water stored by herbicide treatment compared with tandem-disk treatment nearly equaled that stored by preplant irrigations. (Popkin-Arizona)
W72-14577

CATTLE FEEDERS MUST COMPLY WITH ANTI-POLLUTION LAWS,
For primary bibliographic entry see Field 06E.
W72-14579

OPTIMIZING FURROW STREAMS TO PREDICT IRRIGATION SYSTEM EFFICIENCIES,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
T. C. Patterson.
Journal of Soil and Water Conservation, Vol. 26, No. 5, p. 201-204. Sept.-October, 1971, 8 fig., 4 ref.

Descriptors: *Irrigation efficiency, Hydraulic properties, *Furrow irrigation, *Continuity equation, *Mathematical studies, Optimization, Furrows, Forecasting, Planning, Slopes, Streams, Length, Intakes, Depth, Equations, Water conservation.
Identifiers: *Optimum stream concept.

Planning an irrigation development requires consideration of the effects of certain parameters such as: slope, stream size and length of run, and the actual application efficiency potential of the system. Sets of curves were developed for furrow system design and irrigation efficiency, hydraulic parameters versus depth, time-intake relationships, water advance, stream advance, and stream size versus efficiency. Theoretical advance prediction was checked against field data. Furrow hydraulics, time-intake relationships, computing the advance and optimizing the stream are discussed mathematically. A furrow stream's advance for a given set of conditions can be accurately predicted using continuity theory. Optimum stream concept is a legitimate means of establishing broad guidelines for the design of furrow irrigation systems. Important graphs and equations are presented. (Popkin-Arizona)
W72-14581

THE POTENTIAL, THE PROBLEMS, AND THE STATUS OF USING PROTEINS OF AQUATIC ORIGIN AS HUMAN FOOD,
Massachusetts Inst. of Tech., Cambridge. Education Research Center.
E. R. Pariser.
Food Technol. Vol 25, No 11, p 88-100. 1971. Illus.
Identifiers: *Algae, Aquatic plants, Arthropods, *Fish proteins, Food, Mollusks, *Proteins.

The status and future expectations regarding the use of aquatic plants (algae) and animals (molluscs, arthropods, fish) as human food are discussed. The resource and its harvesting, processing and use are described, with particular emphasis on fish protein concentrate and fish meat emulsions. The USA approach to the use of aquatic protein is contrasted with that of other countries.--Copyright 1972, Biological Abstracts, Inc.
W72-14582

THE USE OF WASTE HEAT IN AGRICULTURE,
Arizona Univ., Tucson. Environmental Research Lab.
M. H. Jensen.
In: Waste Heat Utilization: Proceedings of the National Conference, October 27-29, 1971, Gatlinburg, Tennessee. Oak Ridge National Laboratory, 1972, p 21-38. 4 tab, 2 photo, 1 fig, 6 ref.

Descriptors: *Environmental effects, *Greenhouses, Agronomy, *Crop production, *Environmental engineering, *Heated water, *Crop response, *Environmental control, *Waste heat disposal, *Reclaimed water, *Water reuse, Mexico, Steam, Economics, Thermal pollution, Arizona, Hydroelectrical plants, Soil conservation, Water conservation, Irrigation engineering, Industrial water, Structures, Water temperature, Water cooling, Microenvironment.
Identifiers: Gulf of California, Puerto Penasco.

Warm water from the Gulf of California and the Arabian Gulf is being used in Mexico and Abu Dhabi respectively to heat and cool greenhouse facilities developed by the University of Arizona at Tucson. Yields of vegetables grown in greenhouse environments where warm water is used have been extremely high when compared to the same crops grown outdoors. Since one of the major costs in greenhouse production is heating, the feasibility of using waste heat from power plants to enhance an environment for crop production holds great potential. Studies show that higher yields could offset cost of growing unit. (Black-Arizona)
W72-14584

BLACK CATTLE AND DRY WEATHER,
J. Jennings.
The Cattleman, Vol. 58, No. 1, p. 39, 58. June 1971. 2 fig.

Descriptors: *Feeding rates, *Drought tolerance, *Droughts, *Browse utilization, *Cattle, Pasture, Brush, Surface runoff, Water wells, Irrigation water, Weight, Winter, Wheat, Crop production.

Cattle feeding practices used in drought are reported. Pasture is kept brush-free by grubbing and reseeding. A year's supply of feed is kept for drought. Limited runoff and water wells which require investment water the cattle and provide an irrigation source. Black Angus cattle appear to gain weight in drought conditions on stored feed and winter pastures of irrigated rye and wheat. Experiences of an Angus rancher are recorded in his trials with black cattle and dry weather. (Popkin-Arizona)
W72-14585

WASH AWAY THOSE IRRIGATION BLUES,
J. K. Ballard.
American Fruit Grower, Vol. 91, No. 4, p. 13-14, 48, April 1971. 1 photo, 6 fig.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Fruit crops, *Irrigation efficiency, *Frost prevention, Costs, Labor, Dusts, Grasses, Rusts, Trees, Plant diseases, Control, Herbicides, Orchards, Heating, Calcium, Washington.

Overtree sprinkling and other permanent irrigation systems are becoming popular because of low cost, labor requirements, and convenience. Dust is washed away, and grass establishment is firm. Termites and fruit rust are controlled. Experiments with herbicides over orchards irrigated by overtree sprinklers indicate high efficiency and ease of operation. Overtree sprinkling gives a better finish to fruit. Other permanent irrigation systems in Washington include drop hoses, and trickle or drip hoses. Conversion from gas to water heating is also popular as a dual irrigation and heating system for fruit. Calcium is added to the fruit by overtree practices, which improves the fruit. (Popkin-Arizona)
W72-14588

DRIP IRRIGATION: NO LONGER A NOVELTY.
Citrograph, Vol. 58, No. 8, p. 247, 268-269. 1971. 5 fig.

Descriptors: *Irrigation practices, *Water conservation, *Citrus fruits, *Sprinkler irrigation, *Water conveyance, Irrigation efficiency, Agriculture, Standards, Filtration, Clogging, Irrigation systems, Movement, *California.
Identifiers: *San Diego County (Calif).

Drip irrigation is a novelty in most western agriculture, but the potential for water conservation and variety of systems currently available are attractive. About 600 commercial acres in San Diego County, California are drip irrigated. Individual cases of drip irrigation usage are reported. The systems are applied to avocados, oranges, lemons, tangelos, and all citrus. These systems improve efficiency and put the water where needed. Filtration of sprinklers and clogging of conveyances are problems. Water movement patterns for drip irrigation systems are presented. Such systems are widely accepted in Israel. (Popkin-Arizona)
W72-14589

AN EVALUATION OF IRRIGATION POTENTIAL IN THE BONANZA VALLEY,
Minnesota Univ., Benson. Agricultural Extension Service.
L. M. Ross.
1971. 19 P, 9 FIG, 16 TAB, 2 MAP, 24 REF.

Descriptors: *Groundwater, *Irrigation wells, *Aquifer characteristics, *Water quality, *Minnesota, Water supply, Water yield, Pumping, Crops, Soil properties, Irrigation systems, Costs, Precipitation (Atmospheric), Groundwater recharge, Hydrologic data, Water table, Crop production.
Identifiers: *Bonanza Valley (Minn).

This publication is the first specifically prepared for the Bonanza Valley (Minnesota) irrigation area. It provides an inventory of water resources and geological survey maps, defines the irrigable areas, and highlights important crop and economic considerations. The Bonanza Valley is a 320

square mile area of sandy glacial outwash in Pope, Stearns, and Kandiyohi Counties. Irrigation will increase productivity of the droughty and presently marginal land. Information on soils, water supply, climate, marketing, and management is presented to help evaluate the potential for irrigation in this area. Water tested was low in alkaline salts and boron, indicating that it is suitable for irrigation. Generally, high yielding wells are possible along the western and southwestern sides of the area. (Woodard-USGS)
W72-14611

THE MEASUREMENT OF THE DEMAND FOR IRRIGATION WATER WITH SPECIAL REFERENCE TO SOUTHWEST KANSAS,
Kansas Water Resources Research Inst., Manhattan.
A. W. Biere, and J. I. Perng.
Available from the National Technical Information Service as PB-212 281, $3.00 in paper copy, $0.95 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No 81, June 1972. 17 p, 24 fig, 2 tab, 12 ref. OWRR A-034-KAN (1).

Descriptors: *Irrigation water, *Dynamic programming, Evapotranspiration, Plant growth, *Model studies, *Water demand, Water utilization, *Evaluation, *Irrigation efficiency.
Identifiers: *Irrigation scheduling, Economic models.

The objective was to improve the estimates of the value of irrigation water. This information is essential to the development of efficient irrigation systems and groundwater management policies. The conventional method of evaluating the value of irrigation water (based on the agronomic production function) has lacked the desired level of precision. This study attempts to formulate an analytical model which incorporates various relationships associated with plant growth. The model has two major components: (1) the soil water budget and the crop evapotranspiration function; and (2) biological growth curves. Computer simulations were made to check the validity of the model and the estimated coefficients. The above mentioned growth model was incorporated into an economic irrigation scheduling model. This model was solved using dynamic programming. The objective was to schedule the irrigations so as to maximize the net returns from irrigated production. The model also points out the significance of the cost of water, and its impact on the quantity demanded for irrigation.
W72-14677

PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF PLANTS TO DIFFERENT INTERNAL WATER POTENTIALS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 02I.
W72-14835

AUTECOLOGICAL STUDIES ON RAJASTHAN DESERT PLANTS: III. SEED OUTPUT AND GERMINATION IN TRIANTHEMA PORTULACASTRUM L.,
Birla Inst. of Tech. and Science, Pilani (India).
M. C. Joshi, and B. C. Nigam.
Trop Ecol. Vol 11, No 2, p 140-147. 1970. Illus.
Identifiers: Desert, *Germination, India, Light, Plants, Scarification, *Seeds, Temperature, *Trianthema portulacastrum D.

The seed output, seed germination and reproductive capacity in T. portulacastrum L., an annual weed of crop and waste fields in tropical and temperate regions are discussed. The number of seeds per fruit differs from locality to locality, and in plants of different habits. The percentage seed germination falls with passage of time. Mechanical scarification quickly enhances the seed germination by allowing the water imbibition. Seed germination also increases under alternate light and dark conditions. High temperature treatment for short duration stimulates the germination in fresh as well as old seeds. Seedling survival (63%), reproductive and aggressive capacities (2634 and 1659, respectively) are quite high. The soil of cultivated fields, being rich in water holding capacity and organic matter, support the maximum occurrence of this weed.--Copyright 1972, Biological Abstracts, Inc.
W72-14857

STUDIES ON PHYSIOLOGICAL ECOLOGY OF BORRERIA ARTICULARIS (LINN. F.) F. N. WILL: A COMMON WEED OF BAJRA (PENNISETUM TYPHOIDES (BURM. F.)) (STAPF. ET C. E. HUBB.) FIELDS,
S. S. Coll., Alipur (India). Dept. of Botany.
V. Babu, and M. C. Joshi.
Trop Ecol. Vol 11, No 2, p 126-139. 1970.
Identifiers: *Plant physiology, Bajra-M, *Borreria articularis D, Cold, Dormancy, Ecology, Gibberellic acid, Inhibitors, Pennisetum typhoides M, Seeds, Weeds.

B. articularis has adapted to the monsoon climate in the arid and semi arid regions, through seed-dormancy. Seed production is high in certain localities. Dormancy is due to endogenous inhibitors and can be overcome by gibberellic acid or cold treatment together with prolonged washing. The mechanism of dormancy by the species helps in survival and perpetuation of the species. The seeds are negatively photoblastic and require a temperature of 30 to 35 degree C. The germination at 75% (12.61% soil moisture) field capacity is more. Causes of seed mortality are studied and the reproductive capacity of the plant was worked out.--Copyright 1972, Biological Abstracts, Inc.
W72-14861

IF THE PUMPS RUN DRY...,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 04B.
W72-14865

IRRIGATION AND FERTILIZATION WITH WASTEWATER,
Idaho Univ., Moscow. Dept. of Civil Engineering; and Idaho Univ., Moscow. Dept. of Hydrogeology.
D. D. Eier, A. T. Wallace, and R. E. Williams.
Compost Science Journal of Waste Recycling, Vol 12, No 3, May-June 1971, p 26-29. 2 fig, 1 ref.

Descriptors: *Irrigation, *Fertilization, *Waste water (Pollution), *Waste water disposal, *Water pollution control, Economic feasibility, Streams, Sewage effluents, Algae, Tourism, Recreation, Fisheries, Hydroelectric power, Navigation, Consumptive use, Water pollution, Oxygen, Soil properties, Idaho.

An economically palatable method of water pollution control is presented. The plan presents the entry into streams of the $18 worth of nutrients per acre foot of secondary treatment plant effluent. Drifting islands of algae in rivers, and fertilizer demands can be reduced. Tourism, recreation, fishery production, hydroelectric power, navigation, irrigation agriculture, and domestic and industrial use of the Snake River in southern Idaho are affected by water pollution. Particular problems include taste, odor, bacterial contamination, aquatic growth and thermal effects. The principal cause of this pollution is the disposal of untreated or inadequately treated wastes. The wastes reduce available oxygen and encourage growth of undesirable algae. Control of nutrient input would go a long way in reducing this pollution. Crop irrigation or surface application of domestic and industrial waste water for soil renovation is suggested. Investigations at the University of Idaho indicate irrigation and fertilization with waste water are feasible and economical. (Popkin-Arizona)
W72-14878

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

FUTURE EFFECTS OF WEATHER MODIFICATION ON STREAMFLOW, UPPER MISSOURI RIVER BASIN,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 03B.
W72-14201

ENVIRONMENTAL CONSTRAINTS ON THE SUBSTITUTION OF SPACE FOR TIME IN THE STUDY OF NATURAL CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 02E.
W72-14203

POTENTIAL UNITED STATES WATER--SUPPLY DEVELOPMENT,
Geological Survey, Washington, D.C.
C. H. Hardison.
American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 98, No IR3, p 479-492, September 1972. 5 fig, 4 tab, 8 ref.

Descriptors: *Water resources development, *United States, *Cost-benefit analysis, *Water storage, *Reservoirs, Water yield, Runoff, Safe yield, Planning, Low-flow augmentation, Water supply, Probability, Reservoir yield, Reservoir storage.

With no storage, the supply of surface water available in conterminous United States would be only 8% of the average annual runoff, whereas if one-half of the existing storage capacity were used to augment low flow, 23% of the average annual runoff would be available throughout all but 2% of the years. If all the existing storage capacity were so used, 34% of the average annual runoff would be available, and with unlimited storage capacity 86% would be available. The other 14% would be evaporated from the 3.5 billion acre-ft of storage that would be required to regulate the flow. For water worth $0.05 per 1,000 gal, development of 80% of the average annual runoff of conterminous United States would be economically justified. In 10 of the 17 water resources regions of conterminous United States, development of surface water resources is less than one-half of the potential development. (Knapp-USGS)
W72-14217

MOVING WATER TABLES IN TILE-DRAINED SOILS,
West Pakistan Univ. of Engineering and Technology, Lahore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W72-14218

NAVIGATION OF THE KANSAS RIVER, LAWRENCE TO THE MOUTH (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available in the National Technical Information Service as PB-209 050-D, $4.50 in paper copy. May 10, 1972. 36 p, 1 map.

Descriptors: *Kansas, *Environmental effects, *Dredging, *River training, Bank stabilization, Project planning, Project feasibility, Barges, Project benefits, River regulation, Navigation, Navigable rivers, Transportation, Industries, Fisheries, Feasibility, Water control, Water resources development, Benthic flora, Benthic fauna, Stream fisheries, Turbidity, Spoil banks, Maintenance.
Identifiers: *Environmental impact statement, *Lawrence (Kan).

The proposed harbor navigation project on the Kansas River from Lawrence to the mouth includes training, bank stabilization and dredging. The project will provide transportation on the Kansas River for barges loaded for Missouri River transport. The project will be 9.3 miles long with a channel width of 150 feet and a depth of 9 feet. Dredged material will be placed behind the dikes. Adverse environmental impacts of the project include destruction of benthic organisms and disruption of fisheries, rapid industrial development especially in areas requiring barge transportation, increased turbidity caused by dredging and powerboat traffic, and increased chances of accidental spills, leaks, and other discharges associated with commercial navigation. Spills would remain in the area for extended periods because of the slow current. Varying the lengths of the river channel proved unfeasible as did other alternatives. Several alternatives were considered. Construction of pipelines would restrict industrial diversity. Increased flow from lakes was judged unavoidable. Dredging the channel only proved unsatisfactory. Regulation by dikes and revetments would be possible, however the character of the river would be altered and the floodway capacity reduced. No action would result in loss of opportunities to encourage more rapid industrial expansion. The proposed project is designed to service existing industry and its potential for expansion. (Ellis-Florida)
W72-14260

SMALL BOAT HARBOR, PORTSMOUTH STATE PARK, OHIO, OHIO RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-198 883-F. 3.00 in paper copy. July 7, 1971. 32 p, 1 map, 11 tab.

Descriptors: *Ohio, *Recreation, *Environmental effects, *Dredging, Harbors, Ohio River, Recreation demand, Basins, Ecology, Boats, Boating, Boat-launching ramps, Benefits, Costs, Feasibility, Habitats, Water sports, Water utilization, Flood plains, Fishing, Turbidity, Excavation, Oil spills.
Identifiers: *Environmental impact statement, *Portsmouth State Park (Ohio).

The proposed project consists primarily of developing a harbor adjacent to the Ohio River in Scioto County about seven miles southwest of Portsmouth, Ohio, to provide docking and berthing facilities for recreational boats. The harbor will be created by enlarging Nace Run by excavating the low-lying flood plain at the confluence of the streams. Facilities for recreational boating in the area are presently inadequate. Some low, frequently flooded areas will be raised, thereby improving the area for development as a state park. The concentration of the boats will create a potential for oil and fuel pollution from spills and normal boating. Unavoidable adverse environmental effects include disruption of the ecosystem due to the removal of some vegetation, the excavation of the harbor, the minor filling of low-lying areas, and the resulting temporary increase in turbidity during construction will be in large part unavoidable. The usual secondary effects of land development can also be anticipated. Foregoing improvement would leave unabated the existing shortage of facilities. No feasible alternative sites are readily available. No irretrievable commitment of resources will be involved other than the labor and materials for construction, maintenance, and operation. (Ellis-Florida)
W72-14261

SCITUATE HARBOR, SCITUATE MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-202 804-F. $3.00 in paper copy. November 1971. 24 p, 3 fig.

Descriptors: *Massachusetts, *Harbors, *Dredging, *Environmental effects, Navigation, Recreation, Recreation demand, Basins, Channel improvement, Shellfish, Ecology, Boats, Boat-launching ramps, Benefits, Costs, Feasibility, Habitats, Water sports, Water utilization, Boating, Turbidity, Disposal.
Identifiers: *Environmental impact statement, *Scituate (Mass.), Coastal waters.

The proposed navigation project in Scituate Harbor, a natural cove in Massachusetts Bay, consists of constructing three mooring basins to a depth six feet below mean low water. The improvement is designed to alleviate crowded conditions experienced and to allow for future growth in the number of boats utilizing the harbor. Approximately 300,000 cubic yards of material will be dredged and dumped into the bay. The proposed dredging will adversely affect many life forms in the area. However, the effects should be temporary as the inhabitants will quickly recolonize the area and reestablish the ecological balance now present. A loss of harvestable shellfish will occur in one mooring basin which is to be dredged. An improved channel and mooring facilities would alleviate the present navigational problems. However, the potentiality for such problems as untreated sewage, oil, and garbage discharges will be increased. An alternative to the project would be the development of onshore boat launch and parking facilities which would destroy valuable natural areas and limit the boat size to those trailerable. Foregoing any improvement would not solve existing navigation problems nor would it allow growth. The project should have no adverse effects on the long-term productivity of the area in terms of fish and wildlife resources. (See also W72-14264). (Ellis-Florida)
W72-14263

MAINTENANCE DREDGING, SCITUATE HARBOR, MASSACHUSETTS (DRAFT ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-209 044-D. $3.25 in paper copy, $0.95 in microfiche. April 10, 1972. 18 p, 2 map, 1 tab, 6 ref.

Descriptors: *Massachusetts, *Environmental effects, *Navigation, *Dredging, Harbors, Water resources development, Turbidity, Sediments, Ships, Project benefits, Project purposes, Excavation, Spoil banks, Water pollution, Water pollution control, Fish, Biochemical oxygen demand, Chemical oxygen demand, Aquatic environment, Nitrogen compounds, Water quality.
Identifiers: *Environmental impact statement, *Scituate Harbor (Mass), Coastal waters.

This project consists of periodic maintenance dredging of Scituate Harbor, Massachusetts, to remove approximately 145,000 cubic yards of material from the federal navigation project within the harbor. The dredging will maintain the channels and anchorage basins of dimensions suited for safe navigation and mooring. The harbor is a natural cove designated by the Coast Guard as a harbor of refuge. No permanent adverse effects on fish and wildlife resources of the harbor will result from dredging, although there will be an increase in turbidity and in the biochemical and chemical oxygen demand in the water column. Upheaval of sediments might also release large enough amounts of nitrogen compounds to have some consequences on some marine organisms. The dredging and spoiling may cause some temporary environmental stresses on the associated marine biota but no persistent detriments are expected to result. Dredging may also cause some temporary adversities to the surrounding tidal marshes. No alternatives to the maintenance work other than a status quo situation are seen. An alternative to offshore spoil disposal would be onshore disposal. However, limited land availability poses a problem as well as the putrid smell of the sediments. (See also W72-14263). (Brackins-Florida)
W72-14264

CHOWAN RIVER, NORTH CAROLINA, BLACKWATER RIVER, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 08D.
W72-14266

BIG CREEK AND TRIBUTARIES, LOWER WHITE RIVER BASIN, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.

Available from the National Technical Information Service as PB-200 789-D. $3.00 in paper copy. July 8, 1971. 12 p, 1 map.

Descriptors: *Arkansas, *Environmental effects, *Channel improvement, *Flood control, Wildlife habitats, Flood protection, Stream stabilization, Channels, Surface drainage, Drainage engineering, Drainage effects, Turbidity, Fishing, Sedimentation, Dam construction, Stream beds, Stream fisheries, Aesthetics, Land clearing.
Identifiers: *Environmental impact statement, *Big Creek, Tenn., *White River Basin.

The planned project involves straightening, enlarging, and cleaning out the Big Creek channel for a distance of 68 miles from its mouth. Additionally work is planned for 46 miles of the upstream tributary of Big Creek. Big Creek rises in St. Francis County, Arkansas, and flows southwesterly to its confluence with White River. The project is designed to reduce flooding, reduce sedimentation, and improve drainage. Structural measures also include a series of low dams in the stream channel. The project will enhance the human environment by reducing flooding. Approximately 1600 acres of woodland habitat will be cleared for the project. Adverse environmental impacts include: reduced fishery values caused by turbidity, rapidly fluctuating stream flow, lack of deep water pools, and removal of stream side cover; loss of aesthetic value of the natural streambed; and reduced game resources resulting from clearing. Alternatives which were considered include: complete abandonment of the project, construction of floodwater retention structures, development of a levied flood plain, and flood plain zoning in the absence of channel improvement. Resource commitments to the project are neither irreversible nor irretrievable in the sense that if the project were not maintained pre-project environmental conditions would be gradually restored. (Grant-Florida)
W72-14267

BLACK ROCK CHANNEL AND TONAWANDA HARBOR, NEW YORK (OPERATION AND MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

For primary bibliographic entry see Field 05G.
W72-14272

ROCHESTER HARBOR, MONROE COUNTY, NEW YORK (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14273

ZUMBRO RIVER, MINNESOTA, KELLOGG TO MOUTH, WABASHA COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 08D.
W72-14274

SMALL NAVIGATION PROJECT, ANDREWS RIVER, HARWICH, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-202 919-F. $3.00 in paper copy. September 8, 1971. 24 p, 1 map, 1 tab.

Descriptors: *Massachusetts, *Navigation, *Jetties, *Environmental effects, Channel improvement, Harbors, Shore protection, Shoals, Coasts, Geomorphology, Shallow water, Turbidity, Fish habitats, Fisheries, Commercial fishing, Boating, Recreation, Dredging, Benthic fauna, Benthic flora.
Identifiers: *Environmental impact statement, *Cape Cod, *Andrews River (Mass), *Harwich Harbor (Mass).

The proposed project would involve construction of a jetty on the west side of the entrance to the Andrews River in order to prevent serious shoaling and erosion and provide navigation protection to Harwich Harbor. The project is part of the Harwich Harbor project, most of which is complete. Redredging will be necessary to restore the harbor entrance to its federally authorized depth. The Andrews River is a tidal river located on the southern side of Cape Cod. There is some fishing in the river, but no shellfish of significance. Environmental effects of the project include: shoaling in the entrance channel and on the beach west of the jetty, less frequent maintenance dredging will be needed, short-term turbidity during construction, elimination of benthic organism in the construction area, and safer boating. Pollution from boats will increase, however. No adverse environmental effects are anticipated at this time, however, the project may adversely affect commercial fish which use the area during adult or juvenile stages. The only alternative is to refrain from constructing the jetty in which case continual maintenance dredging will be needed to keep the harbor entrance navigable. (Grant-Florida)
W72-14276

NEW BEDFORD AND FAIRHAVEN HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-203 156F, $3.00 in paper copy. July 13, 1971. 25 p, 1 map, 5 tab.

Descriptors: *Connecticut, *Navigation, *Channel improvement, *Environmental effects, Recreation, Boating, Spoil banks, Commercial fishing, Marine fisheries, Shellfish, Shores, Silting, Turbidity, Odor, Water pollution effects, Aquatic habitats, Wildlife habitats, Salt marshes, Dredging.
Identifiers: *Environmental impact statement, *Fairhaven Harbor, Mass., *New Bedford Channel (Mass).

The proposed navigation project for New Bedford and Fairhaven Harbor, Connecticut, consists of channel improvements designed to aid navigation by eliminating the possibility of vessel groundings and making the channel navigable for commercial and recreational craft. Approximately 75,000 cubic yards of silt and sand will have to be dredged and disposed. The following environmental impacts are anticipated: temporary silting during construction, temporary odor in the project area during construction due to release of gases from disturbed bottom soil, and temporary turbidity during construction. No adverse effects are anticipated to occur to the fish population in the improved channel areas. Adverse effects include: temporary silting, turbidity, and offensive odors; adverse effects on fish and wildlife in the spoil area due to pollutants in the spoil; and loss of shellfish habitat and marshland if spoil is dumped onshore. Alternatives considered include a larger project, which was found to not have any greater benefits. If the project is not undertaken commercial fishing and navigation would remain dangerous and recreational boating would be safe only at higher tides. (Grant-Florida)
W72-14277

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-206 176-F, $3.00 in paper copy. September 15, 1971. 45 p, 1 map, 6 tab.

Descriptors: *Alabama, *Navigation, *Channel improvement, *Environmental effects, Wildlife habitats, Aquatic habitats, Estuarine environment, Saline water fish, Estuarine fisheries, Inflow, Mixing, Bays, Dredging, Turbidity, Fish conservation, Disposal, Spoil banks, Boating, Recreation, Commercial fishing.
Identifiers: *Environmental impact statement, *Mobile Bay (Ala), *Dog River (Ala).

The proposed project will involve the dredging of an 8 by 150 feet channel from 3,000 feet east of the Mobile Bay Ship Channel to and up Dog River for a distance of 26,200 feet. Spoil will be placed in designated areas along the banks and in open water of the bay. The project is designed to satisfy increased commercial and recreational navigation needs on the Dog River. Environmental impacts of the proposed project include: alteration of 104 acres of water bottom and 30 acres of marshland used as a disposal site; lessened chances of fishkills since channel improvement will increase salt water flow and increase dissolved oxygen content; and conversion of former upstream freshwater areas to estuarine habitats. Adverse impacts include: increased siltation and turbidity in the project area, short-term disruption of channel bottom fauna, partial loss of marshland habitats from spoil dumping, and a shift in fish population caused by the influx of salt water upstream. Alternatives to the proposed project include: no construction, placing all spoil on fast land, and variations in channel depths. (Grant-Florida)
W72-14279

OPTIMUM RESERVOIR OPERATION USING STOCHASTIC DYNAMIC PROGRAMMING,
Nevada Univ., Reno. Center for Water Resources Research.
W. S. Butcher, and J. W. Fordham.
Available from the National Technical Information Service as PB-212 146, $3.00 in paper copy, $0.95 in microfiche. Technical Report Series H-W, Hydrology and Water Resources Publication No 9, September 1970. 48 p, 10 fig, 7 tab, 48 ref, 2 append. OWWR C-1919 (3179) (2).
Descriptors: *Reservoir operations, *Model studies, *Systems analysis, *Computer programs, *Stochastic processes, Optimization, Statistical models, Hydrologic data, Streamflow, Regression analysis, Water utilization, Hydrologic budget, Streamflow forecasting.

An optimal operating policy for a multipurpose reservoir was determined, where the optimal operating policy is stated in terms of the state of the reservoir indicated by the storage volume and the river flow in the preceding month and uses a stochastic dynamic programming approach. Such a policy could be implemented in real time operation on a monthly basis or it could be used in a design study. As contrasted with deterministic dynamic programming, this method avoids the artificiality of using a single set of stream flows. The data are the conditional probabilities of the stream flow in successive months, the physical features of the reservoir in question, and the return functions and constraints under which the system operates. (Woodard-USGS)
W72-14347

THE EFFECTS OF RAINFALL INTENSITY, PAVEMENT CROSS SLOPE, SURFACE TEXTURE, AND DRAINAGE LENGTH ON PAVEMENT WATER DEPTHS,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 04C.
W72-14360

TRANSPORTABLE BREAKWATERS-A SURVEY OF CONCEPTS,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08A.
W72-14361

NATIONAL ENGINEERING HANDBOOK, SECTION 2-ENGINEERING PRACTICE STANDARDS: PART 1, ENGINEERING CONSERVATION PRACTICES.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08D.
W72-14364

DEADLY SURGES IN THE BAY OF BENGAL: DYNAMICS AND STORM-TIDE TABLES,
Harvard Univ., Cambridge, Mass. Earth and Planetary Physics Center.
For primary bibliographic entry see Field 02A.
W72-14367

RESULTS OF HYDRAULIC AND SHOALING STUDIES IN MARCUS HOOK-SCHUYLKILL REACH OF DELAWARE RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14370

THE 1969 UPPER MISSISSIPPI RIVER DREDGE SPOIL SURVEY FROM HASTINGS, MINNESOTA TO CAIRO, ILLINOIS,
Missouri Dept. of Conservation, Jefferson City.
For primary bibliographic entry see Field 05G.
W72-14374

STUDIES ON OYSTER CULTIVATION IN THE DRAINAGE BASIN OF OSTEND (BELGIUM) DURING 1969,
Institut Royal des Sciences Naturelles de Belgique, (Belgium).
E. Leloup.
Bull Inst R Sci Nat Belg. Vol 47, No 25, p 1-16. 1971. Illus.
Identifiers: Belgium, Carcinus maenas, Cardium edule, Codium tomentosum, Crassostrea gigas, Crepidula fornicata, Enteromorpha compressa,

Nassa reticulata, *Ostend, Ostrea edulis, *Oysters, Ulva lactuca, *Shellfish farming.

The basin floor was covered with the thallae of Ulva lactuca (green algae, sea lettuce) and Enteromorpha compressa, as well as Codium tomentosum. Dredging operations were done to correct this condition. Tons of Nassa reticulata (bivalve molluscs) were dumped into the bay to destroy the vegetation. This treatment was successful with most of the algae. The period April-Oct. 1969 was propitious for reproduction of organisms. Regular commercial bars were used, made of teakwood and weighing 15-20 lbs. On 21 Aug. 50 fixed oysters, 135 Mya, 71 mussels, 35 Crepidulae and 1 young oyster were found attached to the average 'baton'. The fauna attached to 'batons' by Sept. 18 included sponges, Bryozoa, Polydora and Amphipoda. Another device used for oyster production was the 'Japanese basket'. Results with the oyster, Ostrea edulis are reported in detail for size, whether attached to 'batons,' bottom or Japanese basket. Similar information is given for Crepidula fornicata, Cardium edule, Carcinus maenas and Crassostrea gigas.--Copyright 1972, Biological Abstracts, Inc.
W72-14378

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Water and Power Control Division.
D. M. Fults, and L. F. Hancock.
Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol 98, No HY9, Proceedings paper 9176, p 1497-1514, September 1972. 5 fig, 1 tab, 3 ref, 2 append.

Descriptors: *Central Valley project, *California, *River systems, Operation and maintenance, *Reservoirs, River basins, *Dynamic programming, *Optimization, Simulation analysis, Digital computers, Computer models, Constraints, Forecasting, Scheduling, Dams, Powerplants, Reservoir releases, Flood control, Multiple-purpose projects, Reservoir storage, Decision making, Operations research.
Identifiers: *Sacramento River, *Trinity River, Keswick reservoir, *Shasta reservoir, Shasta dam, Shasta-Trinity system.

A mathematical model is presented for optimizing water and power operations on a daily basis over a 30-day period for the northern portion of the Central Valley Project in California. The model uses state incremental dynamic programming to determine the daily optimum policy for the Shasta-Trinity Division of the project. This is a method of solving optimization problems which lead to an iterative functional equation that can be solved on a digital computer. Continuity and flood control are embodied in the model by simulation. The basic equations and constraints describing the Shasta-Trinity system are presented. The dynamic programming model and the FORTRAN IV computer program are described in detail, and application of the model in the project's real world environment is discussed. The model selects the operating strategy which maximizes electrical energy generation while satisfying firm water contracts, mandatory releases, and flood control commitments. Model input consists of deterministic streamflow, storage, electrical, and precipitation data. Up to now, operating policy for the project was solely computer simulation of the system and selection of the best operating strategy from several trials. But the recent need to operate the project more efficiently has led to the development and inclusion of the optimizing technique described herein. (Bell-Cornell)
W72-14384

RIVER DEE RESEARCH PROGRAM: 1. OPERATING MULTIPURPOSE RESERVOIR SYSTEMS FOR WATER SUPPLY AND FLOOD ALLEVIATION,
Water Resources Board, Reading (England).
D. G. Jamieson.
Water Resources Research, Vol 8, No 4, p 899-903, August 1972. 2 fig, 3 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Water supply, *Flood control, Optimization, Mathematical models, Systems analysis, Reservoir storage, River basin development, Computers, Simulation analysis.
Identifiers: *River Dee system, *Wales, *Retention levels, Direct supply reservoirs, Llyn Clen reservoir, Llyn Tegin reservoir.

The control policies for two of the most common purposes of multipurpose reservoirs, water supply and flood alleviation, are diametrically opposed. For water supply, reservoirs need to be kept as full as possible; for flood alleviation they should remain as empty as possible. Apportioning the available reservoir storage between these interests requires a compromise control policy. The lack of a suitable basis for deriving a single optimizing criterion has led to the use of a 'satisficing' model in which priority is given to water supply; rules are then formulated to optimize the operation of the reservoirs with respect to the secondary purpose, flood alleviation, provided the primary purpose of water supply is fulfilled to a predetermined standard. The resulting control policy, consisting of two interdependent control strategies, is described in detail and its application to the River Dee system in Wales is discussed. (See also W72-14387 and W72-14388) (Bell-Cornell)
W72-14386

RIVER DEE RESEARCH PROGRAM: 2. A LONG-TERM CONTROL STRATEGY FOR A MULTIPURPOSE RESERVOIR,
Lancaster Univ. Baillrigg (England).
J. C. Wilkinson.
Water Resources Research, Vol 8, No 4, p 904-910, August 1972. 5 fig, 2 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Water supply, *Flood control, Optimization, Mathematical models, Systems analysis, Reservoir storage, Water shortage, River basin development.
Identifiers: *River Dee system, Flood alleviation, *Retention levels, *Wales, Llyn Clen reservoir, Llyn Tegin reservoir.

The control policies for two of the most common purposes of multipurpose reservoirs, water supply and flood alleviation, are diametrically opposed. A 'satisficing' approach is applied to the River Dee system in Wales, whereby the water supply function is given priority over the subsidiary function of flood alleviation. Consideration is given to the secondary function provided that the primary function of water supply can be fulfilled to a predetermined standard. The resulting control policy consists of two interdependent control strategies, a long-term and a short-term strategy. The purpose of the long-term control strategy is to define retention levels for a multipurpose reservoir that permit maximum storage to be available for flood alleviation subject to shortages in its water supply function occurring with a specified tolerable frequency. A recursive relationship is derived to calculate the probability of no shortage occurring within a chosen interval of time for any given set of retention levels. This relationship is used in conjunction with an iterative search procedure that finds the optimal set of minimum retention levels necessary to meet a given demand with a specified acceptable frequency of failure, and thereby as much storage as possible is allowed for flood alleviation. (See also W72-14386 and W72-14388) (Bell-Cornell)
W72-14387

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
D. G. Jamieson, and J. C. Wilkinson.
Water Resources Research, Vol 8, No 4, p 911-920, August 1972. 2 fig, 11 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Flood control, *Water supply, *Digital computers, *Simulation analysis, *Dynamic programming, Hydrologic data, Optimization, Hydrographs, Hydrologic systems, Forecasting, Runoff, Rainfall, *Telemetry, Low flow, High flow, Reservoir storage, Mathematical models, Systems analysis, River basin development.
Identifiers: *River Dee system, *Wales, *Retention levels, Flood alleviation, Llyn Clen reservoir, Llyn Tegin reservoir.

With the primary purpose of water supply being fulfilled to a specified tolerable frequency of occurrence of shortages, attention can be turned to optimizing the operation of multipurpose reservoirs for the secondary purpose of flood alleviation. The short-term control strategy is confined to a time horizon of a few days. Its main purpose is to define the optimal releases from the reservoirs hour by hour. An automated control strategy has been developed for the short-term operation of multipurpose reservoir systems that will act as the basis for on-line processing of data obtained from a sophisticated telemetry scheme. The action of the computer is (1) to interrogate the outstations via the telemetry scheme to establish the existing state of the water resource system, (2) to forecast the future state of the system, and (3) to decide the optimal releases from the multipurpose reservoirs. The real-time forecasting stage uses digital simulation, and the decision-making stage is based on a dynamic programming formulation. The short-term control strategy is not confined to flood alleviation but operates continually over the complete range of flows. Its application to the River Dee system in Wales is described in detail. (See also W72-14386 and W72-14387) (Bell-Cornell)
W72-14388

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
W. J. Rawls, and J. W. Knapp.
Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol 98, No HY9, Proceedings paper 9206, p 1575-1585, September 1972. 5 tab, 10 ref.

Descriptors: *Urban drainage, *Costs, *Economic analysis, Equations, *Design criteria, Urbanization, Sewers, Storms, Drainage area, Planning, Rainfall, Land use, Mathematical models, Systems analysis.
Identifiers: Physical characteristics, *Cost prediction, Ground slope, Storm magnitude, Storm frequency.

The purpose of this study is to define the significant variables that determine the costs of urban drainage facilities and to develop equations for predicting their costs. Examination of more than 100 small urban drainage systems reveals that investment in conventional drainage systems depends upon design factors and physical characteristics of the drainage area. The most significant cost components are: average slope of the drainage area; smallest diameter of pipe; number of inlets and manholes; storm frequency; runoff coefficient; total capacity; and total developed area. Regression, multivariant, and nonlinear modelling techniques are used to explain differences in design methods and to develop cost prediction equations for various levels of design. Such time-saving prediction models will enable

agencies such as the Federal Housing Administration, municipal and regional planning commissions, and engineering offices to judge design cost alternatives rapidly and reasonably accurately, and choices will be able to be based upon public desires and planning objectives for land use and development. (Bell-Cornell)
W72-14390

PREDICTION OF COLUMBIA RIVER TEMPERATURES DOWNSTREAM FROM GRAND COULEE DAM FOR WIDE EXTREMES OF FLOW AND WEATHER CONDITIONS,
R. T. Jaske.
Pacific Northwest Laboratories, Battelle Memorial Institute, Richland, Washington, September 1965. 19 p, 8 fig, 5 ref.

Descriptors: *Water temperature, *Impoundments, *Computer models, *Grand Coulee Dam, Dams, Evaluation, Weather, Flow, Discharge, Heat budget, Water measurement, *Columbia River, Water resources development, Dam construction, Model studies.

The Columbia River environment was simulated by using a computer model and evaluating the effects of the annual Columbia River cooling program. The results pointed out the importance of estimating effects of the Canadian Treaty impoundments and resulting operational plans on the future thermal conditions in the Columbia River. The shift of warm water temperatures of the summer to later in the fall during and after construction of Grand Coulee Dam was illustrated. It was speculated that the peak discharge temperature from Lake Roosevelt after the Columbia Treaty dams are built could shift to late November. Recommendations were made for establishing stations for recording of water conditions at the international border and at a point below Grand Coulee Dam and for developing a computer program flexible enough for various reservoirs. (Hsieh-Vanderbilt)
W72-14402

PREDICTING QUALITY EFFECTS OF PUMPED STORAGE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 05C.
W72-14405

EFFECT OF SIZE OF RESERVOIR ON HYDRO PROJECT COST,
National Technical Univ., Athens (Greece); and Public Power Corp., Athens (Greece).
For primary bibliographic entry see Field 06C.
W72-14419

VACATION HOME LOCATION: A MODEL FOR SIMULATING THE RESIDENTIAL DEVELOPMENT OF RURAL RECREATION AREAS,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 06B.
W72-14425

RIPRAP STABILITY ON EARTH EMBANKMENTS TESTED IN LARGE AND SMALL SCALE WAVE TANKS,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W72-14427

SOME PROBLEMS WITH LOG-NORMAL MARKOV RUNOFF MODELS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14520

TECHNIQUES OF EVALUATING EFFECTS OF WATER ON DRAINAGE STRUCTURES IN ALABAMA,
Geological Survey of Alabama, Montgomery. Water Resources Div.
For primary bibliographic entry see Field 08G.
W72-14522

SCL SPONSORED 'EXCURSION' INTO FORESTRY, ECOLOGY, AND NATURAL RESOURCES IN SOUTH CAROLINA,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14547

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.
For primary bibliographic entry see Field 06B.
W72-14556

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 06G.
W72-14558

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 04D.
W72-14560

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK AT AND IN THE VICINITY OF BREWSTER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 08D.
W72-14567

MUD MOUNTAIN DAM AND RESERVOIR, WHITE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08D.
W72-14570

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-202 804D. $3.00 in paper copy, $0.95 in microfiche. August 3, 1971. 6 p.

Descriptors: *Environmental effects, *Dredging, *Harbors, *Marinas, Turbidity, Excavation, Spoil banks, Navigation, Recreation, Project benefits, Project purposes, Aquatic environment, Water quality, Water pollution, Shellfish, Channel improvement, Massachusetts, Boating.
Identifiers: *Environmental Impact Statements, *Scituate (Mass).

The project would consist of harbor improvement through the removal and disposal of about 300,000 cubic yards of material from thirty-two acres. The proposed project is designed to alleviate crowded conditions and to allow for future growth. Major features of the proposed improvement are three mooring basins. The dredging operation will create a temporary turbid condition in the project area. Prior to dumping of the spoil material, it will be subject to tests to check conformity with water quality standards. The spoil would be similar to the bottom already present at the disposal site, therefore, the bottom dwellers would repopulate the area in time. The loss of small shellfish area will be another adverse effect. The project would enhance the short-term use and increase the long-term productivity of the harbor without a loss of fish and wildlife production in the area. The only alternative considered was the development of another boat launch facility. (Brackins-Florida)
W72-14572

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.

Available from the National Technical Information Service as PB-200 797F. $3.00 in paper copy, $0.95 in microfiche. September 15, 1971. 85 p, 2 map, 3 tab.

Descriptors: *Maryland, *environmental effects, *Flood control, *Channel improvement, District of Columbia, Aquatic environment, Biological communities, Stream improvement, Wildlife habitats, Tributaries, Non-structural alternatives, Water resources development, Flood protection, Aesthetics, Turbidity, Sedimentation, Sediment control, Urbanization, Area redevelopment.
Identifiers: *Prince Georges County (Md), *Environmental Impact Statements, Anacostia River Project.

The project calls for widening, deepening, and realigning approximately 20,410 feet of the Anacostia River and its tributaries. The Anacostia River study area is part of the greater Metropolitan Washington statistical region. The proposed project will result in a reduction of flood damages but there will also be a reduction of natural biological productivity. Sections of some of the streams support a variety of aquatic, insect, and animal life. In developing the Anacostia River for flood control, many of these natural values along the Paint Branch and Indian Creek reaches will be lost. Before deciding on the present project, several other solutions were considered: reservoirs, evacuation of the flood plain, channel improvement, diversion, levees, and no development. It is the feeling of local residents that the long-term growth and aesthetic potential of the area is being adversely affected by the flooding, and that it is in the best interests of the area to prevent flood damage in the future. The most obvious resources involved will be the commitment of the labor, material, and financial resources associated with construction. (Waldron-Florida)
W72-14574

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.
For primary bibliographic entry see Field 08A.
W72-14575

TILLAGE AND HERBICIDES FOR SURFACE RESIDUE MAINTENANCE, WEED CONTROL, AND WATER CONSERVATION,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 03F.
W72-14577

THE PRACTICAL APPLICATION OF DYNAMIC PROGRAMMING TO RESERVOIR SYSTEMS WITH PUMPED INPUTS,
Water Research Association, Medmenham (England).

D. G. Thorn, and P. A. Mawer.
Presented at First Symposium on Water Resources Systems, Karlovy Vary, Czechoslavakia, May 1972. 12 p, 6 fig, 2 ref.

Descriptors: *Reservoir operation, *Pumped storage, *Reservoirs, *Operating costs, *Dynamic programming, Optimization, Algorithms, Long-term planning, Multiple-purpose reservoirs, River regulation, Recreation water supply, Pumps, Constraints, Storage, Electricity, Mathematical models, Systems analysis, Simulation analysis.
Identifiers: *Control rules, *Electrically driven pumps, *Operating rules.

Described is a method for deriving control rules that minimize long term operating costs of a pumped storage reservoir. A common control rule is to keep the reservoir as full as possible, pumping water from the river whenever there is space in the reservoir and the river flow allows. However, since unit pumping costs generally vary with both source and pumping rate, the above simple control is not optimal. Thus, the only way the long term running costs of such a system can be minimized, subject to reliability and amenity constraints, is to derive a control rule that specifies, for each reservoir state and time of year, which sources to be used and the corresponding maximum pumping rates to be employed. The technique described here utilizes dynamic programming and simulation. Computational refinements are given that result in an efficient dynamic programming algorithm. Cited is an example of a multipurpose reservoir supplied from two rivers by electronically driven pumps and used for river regulation, recreation and water supply. (Bell-Cornell)
W72-14646

MARSELLE-FOS: THE EQUIPMENT FOR A SEA SHORE; THE STABILITY TO PRESERVE, (MARSEILLE-FOS: L'EQUIPMENT D'UNE FACADE MARITIME; LES EQUILIBRES A PRE-SERVER),
Port Autonome de Marseille (France).
For primary bibliographic entry see Field 05G.
W72-14652

FILAMENTOUS ALGAE AS WEEDS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-14692

NATURAL REGENERATION OF THE KAMBUI HILLS FOREST IN EASTERN SIERRA LEONE: . ECOLOGICAL STATUS OF THE LOPHIRA/HERITIERA RAIN FOREST,
Forestry Dept., Sandakan (Malaysia). Research Branch.
. E. D. Fox.
Trop Ecol. Vol 11, No 2, p 169-185. 1970. Illus.
dentifiers: *Rain forests, Ecology, Forests, Heritiera d, Lophira d, Regeneration, *Sierra Leone, Status.

The rain forest of the Kambui Hills, Sierra Leone is discussed in relation to West African rainforest generally. This area is under intensive forest management and in an attempt to prepare the ground for a discussion of silviculture and results of silvicultural, its ecological status is described. Of the various factors influencing forests it is considered that past shifting cultivation is probably the most important in the area described. Representative enumeration data and profile descriptions are presented.--Copyright 1972, Biological Abstracts, Inc.
W72-14696

ADAIR IHD EXPERIMENTAL BASIN NO 14, 1970.
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
New Zealand Ministry of Works Hydrological Research Annual Report No 21, 1971. 6 p, 3 fig, append.

Descriptors: *Soil-water-plant relationships, *Hydrologic systems, *Demonstration watersheds, *Land management, *Pasture management, Foreign research, Vegetation, Grasses, Sheep, Soil conservation, Rainfall.
Identifiers: *New Zealand (Adair), Experimental basin.

Under the auspices of the International Hydrological Decade the Ministry of Works is establishing a network of experimental basins to study the hydrological characteristics of important soil and vegetation complexes of New Zealand. The study of the effect of cultural change on these characteristics is included. This is the second annual research report for Adair, and it describes the hydrologic system constructed in 1970. Following completion of the collecting channels in April, all pasture damaged during construction was re-sown. This involved a 3-4 meter strip of land immediately above the collecting channels in each catchment. Apart from maintaining rainfall totals, no analysis of data collected was made during the period. The precipitation for the period was 499 mm. The long-term mean annual precipitation for the area is 609 mm. (Woodard-USGS)
W72-14729

ILLINOIS LAWS RELATING TO WATERWAYS, 1971.
Illinois State Div. of Waterways, Springfield, Ill.

(1972). 185 p.

Descriptors: *Illinois, *Watercourses (Legal aspects), *Water law, *Legislation, Legal aspects, State governements, Local governments, Regulation, Water resources, Transportation, Navigation, Great Lakes Region, Lake Michigan, Flood control, Drainage, Port authorities, Interstate compacts, Navigable rivers, Water conservation, Environmental sanitation.
Identifiers: *Illinois Waterway laws.

Included are both federal and Illinois state statutes dealing with the Illinois and Michigan Canal. State statutes create eleven local port authorities, including the Chicago Regional Port District. Also included are the following: an interstate compact dealing with the Mississippi River; legislation dealing with flood control, sanitation and navigable waterways; and legislation concerning water terminal facilities, submerged lands, the level of Lake Michigan and drainage. The Illinois Drainage Code is contained. Another act vests in the state Department of Transportation jurisdiction and supervision over all of the rivers and lakes in Illinois wherein the state or the public has any rights. The act encompasses navigation, encroachments on any waters and permits for taking materials from the beds of public waters. Also included are acts which create River Conservancy Districts, Water Authorities, a Natural Resources Development Board and Surface Water Protection Districts. (Brackins-Florida)
W72-14752

PUEBLO DAM AND RESERVOIR, FRYING-PAN-ARKANSAS PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo. Region 7.
For primary bibliographic entry see Field 08A.
W72-14753

SUGAR AND BRIAR CREEKS PROJECT, CATAWBA RIVER BASIN, NORTH CAROLINA AND SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
Available from the National Technical Information Service as PB-203 232-F, $3.00 in paper copy, $0.95 in microfiche. July 28, 1971. 29 p, 7 map.

Descriptors: *North Carolina, *Environmental effects, *Channel improvement, *Flood protection, *Natural streams, Flood control, Canals, Open channels, Canal embankments, Excavation, Hydrologic aspects, Recreation, Aesthetics, Streamflow, Stream improvement, Water quality control, Mosquitoes, Dredging.
Identifiers: *Environmental Impact Statements, *Charlotte (NC).

The Sugar and Briar Creeks Project is located in metropolitan Charlotte, North Carolina and is designed primarily to provide flood control in that metropolitan area. The project would involve channelization of the two creeks for a total of 7.6 miles. The canal varies in size from a 50 to 40 to 30 foot bottom width. Construction of the Briar Creek portion has been held in abeyance and the impact statement refers only to Little Sugar Creek. Environmental impacts include alteration of stream hydrology to reduce flood damage, elimination of mosquito breeding areas, enhanced water quality, and increased outdoor recreation potential. Unavoidable adverse impacts include temporary aesthetic effects due to construction and loss of natural stream beauty. Alternative courses of action considered include levied floodways, construction of an upstream reservoir, and no action. (Grant-Florida)
W72-14755

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-14757

BLUE SPRINGS LAKE, LITTLE BLUE RIVER LAKES, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-14759

JACKSONVILLE HARBOR, FLORIDA (SECTION I). NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-199 880-F, $3.00 in paper copy, $0.95 in microfiche. December 1971. 103 p, 1 map, 8 tab.

Descriptors: *Florida, *Channel improvement, *Navigation, *Environmental effects, Recreation, Oil spills, Dredging, Spoil banks, Navigable rivers, Water quality control, Aquatic life, Fish conservation, Shellfish, Shrimp, Turbidity, Runoff, Water pollution sources, Aquifers, Wildlife habitats, Harbors, Disposal.
Identifiers: *Environmental Impact Statements, Jacksonville Harbor (Fla).

The proposed project will involve enlarging the navigation channel in the St. Johns River at Jacksonville Harbor. The project will require maintenance dredging of the existing ocean entrance channel, deepening the existing 34-foot project channel to 38 feet to the vicinity of municipal docks, and widening the channel at two other locations. The channel length involved is about 22 miles. Approximately 11,700,000 cubic yards of material will be dredged. Environmental impacts include temporary turbidity during construction and turbidity adjacent to disposal sites, possible adverse effects to fish and shellfish populations, loss of vegetation and the habitat of the 614 acre upland disposal areas, some penetration of the shallow aquifer underlying the project area, and

beneficial use of filled areas for building construction and recreational development. Adverse impacts include displacement of animal populations in the disposal area, recurring disturbance from maintenance dredging, and increased opportunity for oil spills from expanded river traffic. Alternatives include variations in the scope of project work, in port operations, and in spoil disposal methods. (Grant-Florida)
W72-14760

MANITOWOC HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.

Available from the National Technical Information Service as PB-201 843-F, $3.00 in paper copy, $0.95 in microfiche. September 2, 1971. 27 p, 1 map, 4 tab.

Descriptors: *Wisconsin, *Channel improvement, *Environmental effects, *Navigation, Recreation, Boats, Dredging, Spoil banks, Navigable rivers, Water quality control, Dikes, Benthic fauna, Aquatic microorganisms, Lake Michigan, Turbidity, Runoff, Soil contamination, Disposal, Food chains.
Identifiers: *Environmental Impact Statements, *Manitowoc Harbor (Wis).

The proposed project, located on the west shore of Lake Michigan, 80 miles north of Milwaukee, involves extending the existing channel upstream in the Manitowoc River for a distance of 720 feet at a depth of 12 feet. The project will require dredging 27,000 cubic yards of bottom material. The channel improvement will be carried out by use of hydraulic dredges, and a land based diked disposal area will be utilized. Environmental impacts include disruption of the present bottom population, which has become increasingly characteristic of polluted waters; some temporary turbidity and sedimentation during construction; dredge spoil overflow into the river with a minimum retention period of 48 hours; and loss of some vegetative cover in the disposal area, although the site will eventually be converted into a park. Adverse impacts include temporary turbidity and destruction of the benthic community in the extended channel. Alternatives considered were limited to varying project dimensions, features, alignments, dredging methods, and disposal sites. (Grant-Florida)
W72-14761

MAINTENANCE OF THE WESTCHESTER CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-206 394-D, $3.00 in paper copy, $0.95 in microfiche. January 6, 1972. 8 p, 1 map.

Descriptors: *New York, *Environmental effects, *Dredging, *Channel improvement, Maintenance, Channels, Alternate planning, Water management (Applied), Spoil banks, Turbidity, Water pollution sources, Benthic flora, Benthic fauna, Aquatic habitats, Oil spills, Navigation, Ships, Waterfowl.
Identifiers: *Environmental Impact Statements, *Westchester Creek (NY), Bronx County (NY).

The project is a maintenance action consisting of dredging the existing federal channel in Westchester Creek, Bronx County, New York, to its authorized project dimensions. Spoil from the channel will be deposited in Eaton's Neck disposal area unless the contractor finds a suitable upland site and secures the approval of the landowners and concerned governmental agencies. The action will provide continued safe and economical use of the channel, thus yielding transportation savings, alleviating oil and chemical spills, and causing temporary turbidity and slight disruption to local marine life in the dredging area. Adverse effects of the project include the following: impaired water quality from spoiling dredged materials, short-term turbidity, alteration of the food chain due to disruption of benthic organisms, temporary noise pollution disturbing migratory birds, and aesthetic impairment from continued navigation. The only alternative is discontinuance of the project. The dredging operation will remove some of the bottom materials, and, if the benthic organisms cannot re-establish their original habitat, an irreversible commitment will have occurred. (Widman-Florida)
W72-14762

TESORO TANK FARM AND BARGE SLIP, JUNEAU, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-206 579-D, $3.00 in paper copy, $0.95 in microfiche. January 1972. 62 p, 5 map, 2 tab, 16 ref, illus.

Descriptors: *Alaska, *Environmental effects, *Project planning, *Dredging, Administrative agencies, Water management (Applied), Water quality control, Stream improvement, Access routes, Pipelines, Planning, Wetlands, Aquatic habitats, Wildlife habitats, Oil spills, Water pollution sources, Navigation, Ships.
Identifiers: *Environmental Impact Statements, *Tesoro Tank Farm (Alaska), Juneau (Alaska).

The proposed plan of development involves the construction of a petroleum storage area, access road and pipelines, a barge slip and docking area, and dredging the Mendenhall River. The purpose is to supply aircraft, heating, and automobile fuels to the people of Juneau, Alaska. The environmental impacts resulting from the project can be categorized into three main headings: alteration of the river and wetlands, changes in land and water uses, and water quality. Present identifiable adverse effects include the following: loss of about five acres of wetland habitat and modification of at least another five acres of river habitat; alteration of river habitat from future dredging; precedent setting action for future wetlands development; potential for petroleum product spills and associated biological damage; and a decrease in the attractiveness of the area for waterfowl feeding, resting, and hunting. Alternatives include no development and seven alternative project locations. (Widman-Florida)
W72-14763

LONG HOLLOW CREEK CHANNEL CLEARING, NEZ PERCE, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.

Available from the National Technical Information Service as PB-205 676-D, $3.00 in paper copy, $0.95 in microfiche. January 12, 1972. 17 p, 2 map, 1 tab.

Descriptors: *Idaho, *Channel improvement, *Environmental effects, *Flood protection, Flood control, Dredging, Aesthetics, Rivers, River training, Watercourses (Legal aspects), Bank erosion, Channel flow, Flood proofing, Floodways, Flood profiles.
Identifiers: *Environmental Impact Statements, *Nez Perce (Idaho).

The proposed project involves clearing and reshaping the channel throughout a 5,000 foot reach of Long Hollow Creek through the village of Nez Perce, Idaho. The project is designed to help contain the flooding caused by the normal spring runoff and provide flood protection to the village. The channel will be altered so as to provide capacity for a maximum flow of 700 cubic feet per second. Grass will be planted to prevent bank erosion. The environmental impact of the project includes: clean-out dredging in 5,000 feet of the channel, spoil banks will be created on the left bank, reduced flood probability, aesthetic impairment of the natural stream, and some increased seasonal erosion downstream. The only adverse environmental impact is the temporary disruption of community life during construction. Alternatives include: allowing the village to assume the entire cost burden, flood plain management, a combination flood plain management-channelization program, rocklined low flow channel, and a upstream flood control structure. (Grant-Florida)
W72-14766

BALDWIN AND HANNON SLOUGHS, MONTGOMERY, ALABAMA, FLOOD PROTECTION (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as PB-200 023-F, $3.00 in paper copy, $0.95 in microfiche. June 2, 1971. 22 p, 1 map.

Descriptors: *Alabama, *Flood protection, *Environmental effects, *Channel improvement, Flood control, Flood damage, Rivers, Reservoirs, Bridges, Flood flow, Flood recurrence interval, Environment, Water control, Water quality, Streamflow, Benefits, Costs, Feasibility, Flood frequency, Wildlife habitats, Water quality control.
Identifiers: *Environmental Impact Statements, *Baldwin and Hannon Sloughs (Ala).

The proposed project will provide flood protection to a 1,022 acre area in and adjacent to Montgomery, Alabama. The project will involve clearing and snagging portions of the Baldwin and Hannon Slough channels and the replacement or modification of existing bridges and other structures which impede flood flows. Stream flow in the sloughs is intermittent with no flow occurring an average of three months each year. The general physical structure of the stream and its boundaries will be altered only slightly and the subsequent environmental changes will be minor. The significant effect will be the stabilization of the area through the elimination of flooding. There will be some loss of wildlife habitat and, during construction, a temporary adverse effect to water quality will occur. The alternatives studied and found unsuitable included levees, stream diversion, and reservoir protection. Foregoing action would result in continued yearly floods. There will be no conflict between local short-term uses of the environment and the maintenance and enhancement of the long-term productivity of the environment. Commitment of resources will include some wildlife habitat as well as labor and materials required for construction. (Ellis-Florida)
W72-14768

PANAMA CITY HARBOR, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.

Available from the National Technical Information Service as PB-200 196-F, $3.00 in paper copy, $0.95 in microfiche. October 8, 1971. 51 p, 1 map, 3 tab.

Descriptors: *Florida, *Environmental effects, *Channel improvement, *Harbors, Dredging, Navigation, Turbidity, Spoil banks, Excavation, Channeling, Channels, Water resources development, Coastal engineering, Water quality, Water management (Applied), Transportation, Boats, Water pollution sources, Inland waterways, Gulf of Mexico.
Identifiers: *Environmental Impact Statements, *Panama City Harbor (Fla), St. Andrew Bay.

The proposed project provides for increasing depths in the existing federal project channel from the Gulf of Mexico into St. Andrew Bay for 1.1 miles and for new channels of 3.9 miles into Bay Harbor and 4.1 miles into Dyers Point near Panama City, Florida. The project is designed to meet present and future navigation needs in Panama City, Harbor. Deepening of the channel will improve the tidal flushing of St. Andrew Bay, which is heavily loaded with wastewater nutrients. However, this advantage may be offset by increased pollution from additional boat traffic. Adverse impacts include a temporary increase in turbidity of the waters during construction. Some loss to marine ecosystems, wildlife, and water quality values can be expected from spoiling of dredged material. This loss will be minimal because of the depth of the channel and relatively sterile bottom materials. Alternatives considered include different depths of the channels in the same alignment and no action. Brief comments of other agencies; environmental setting of the area without the project; relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and any irreversible commitment of resources are included. (Brackins-Florida)
W72-14769

KINGSTREE BRANCH FLOOD CONTROL PROJECT, BLACK RIVER BASIN, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.

Available from the National Technical Information Service as PB-206 101-F, $3.00 in paper copy, $0.95 in microfiche. March 20, 1972. 35 p, 1 map.

Descriptors: *Environmental effects, *South Carolina, *Flood protection, *Channel improvement, Flood control, Water control, Mosquitoes, Drainage, Floods, Turbidity, Silts, Sediment control, Channels, Rivers, Fish, Fish eggs, Environment, Benefits, Costs, Feasibility, Dredging, Canals, Spoil banks, Erosion control.
Identifiers: *Environmental Impact Statements, *Black River Basin (SC), *Kingstree (SC).

The proposed project is designed to reduce flooding and drainage problems in Kingstree, South Carolina, and will consist of channel enlargement and appurtenant work, beginning at the confluence of Kingstree Branch and the Black River and extending upstream 1.83 miles to the northern city limits. Physical damages or losses to property and improvements as well as other flood damage will be eliminated. The project will result in improved health conditions by providing drainage of mosquito breeding areas. Adjacent landowners will be required to furnish a portion of their property for right-of-way purposes. During construction minor inconveniences, such as noise, dust, and the effects caused by replacement of bridges and relocation of power and sewer lines will be experienced. Increased levels of siltation and turbidity downstream during construction will be controlled by a sediment trap in the canal so as to minimize damage to the eggs and young of fish species. Dredged material will be shaped and seeded to prevent erosion. Alternatives studied and found less feasible than the proposed project included flood plain management, levees, reservoirs, and channel improvement. Foregoing action would result in continued flood damage to the area. (Ellis-Florida)
W72-14770

UPPER COLORADO RIVER BASIN.
For primary bibliographic entry see Field 06E.
W72-14786

THE LOCATION OF THE LOWER MARGIN OF GROWTH OF TREES, SHRUBS, AND HERBACEOUS VEGETATION OF RIVER FLOODPLAINS AS A FUNCTION OF HYDROLOGICAL CONDITIONS,
P. P. Arsenov.
Nauchn Tr Primorsk S-Kh Inst. Vol 5, No 1, p 81-86. 1968.
Identifiers: *Plant growth, Bur marigold D, *Flood plains, Hydrologic properties, Formulas, Location, Shrubs, Trees, Vegetation, Willow D.

On the basis of a study of the Don River floodplain forests, a table was compiled of the location of the lower margins of growth of 12 trees, 13 shrubs, and 35 of the most widespread herbs. For most plants the difference between the relative elevations of the lower margins of their distribution terracewards and streamwards is very large. For white willow this difference is 3.3 m, for French willow 4.3 m, and for bur marigold 4.7 m. The lower margin of growth of the species toward the stream is determined by its ability to tolerate the maximum duration of flooding, while toward the terrace it is determined by the ability to withstand for some time excessive moisture or even flooding by groundwater. The relation of elevations in the floodplain area to the long-term mean duration of flooding was established. For any point in the floodplain area studied, the mean duration of flooding can be found with adequate accuracy by the following formulas: (a) For points higher than 1 m above mean low water, $x = (566/(y = 2.6) - 49$, and (b) For points 1 m or less above mean low water, $x = (88/y) + 29$, in which x is the length in days of the average duration of flooding, and y is the relative elevation in m of the point above the mean low water mark.--Copyright 1972, Biological Abstracts, Inc.
W72-14829

THE PROBLEM OF ISOLATION IN THE LOWLAND TROPICAL RAIN-FOREST,
Smithsonian Institution, Washington, D.C.
F. R. Fosberg.
Trop Ecol. Vol 11, No 2, p 162-168. 1970.
Identifiers: *Rain forests, *Vegetation, Tropical regions, Environment, Floristics, Isolation, Lowlands.

The floristic wealth of the lowland tropical rainforest is far greater than might be expected, considering the apparent uniformity of the rain-forest environment. This may be accounted for by the abundance of most essential resources, by the enormous length of the history of this formation, giving time for countless species to evolve, by the very real, though not very conspicuous, habitat diversity and resulting spatial and ecological isolation, and perhaps by a combination of enormously broad geographic ranges coupled with extremely sparse occurrence and limited dispersal capacity, also resulting in spatial isolation. Other possible mechanisms for isolation are developed of populations with different flowering seasons, and isolation by slow change over great lengths of time. The richness of the resource-pool in the tropical rainforest thus is matched by a comparably rich species-pool developed over the enormous history of this vegetation formation. Only in a resource-rich habitat that does not suffer extreme climatic vicissitudes could such a floristic wealth accumulate and persist.--Copyright 1972, Biological Abstracts, Inc.
W72-14853

SEMI-ARID WOODLANDS,
R. M. Moore, R. W. Condon, and J. H. Leigh.
In: Australian Grasslands, R. M. Moore, ed., ANV Press, Canberra, 1970, p 228-245. 2 fig, 8 photo.

Descriptors: *Arid lands, *Grasslands, *Grasses, *Biomes, *Semiarid climates, *Terrestrial habitats, Vegetation, Australia, Grazing, Soil types, Range management, Shrubs, Pastures.

A commentary is presented on the climate, soils, agricultural industries, grazing lands, pastures, and animal production of Australia. Considerable detail is devoted to the vegetational patterns over much of Australia with major emphasis on shrub woodland communities. However, much information is also included on arid and tropical grasslands and dominant understory plants in the shrub woodlands. (Black-Arizona)
W72-14866

AN IMPROVED TEMPERATURE PREDICTION MODEL FOR SMALL STREAMS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 02E.
W72-14920

DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-14930

FLOOD PEAKS AS MODIFIED BY DAM SIZE AND LOCATION,
State Univ. of New York, Syracuse. Coll. of Forestry.
For primary bibliographic entry see Field 02E.
W72-14954

ROLE OF BASEFLOW IN RAINFALL-RUNOFF RELATIONS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02A.
W72-14955

4B. Groundwater Management

SALTWATER INTRUSION EXTRACTION BARRIER,
California State Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 02F.
W72-14204

GROUND-WATER OUTFLOW, SAN TIMOTEO--SMILEY HEIGHTS AREA, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA, 1927 THROUGH 1968,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F.
W72-14233

GEOTHERMAL STEAM IN THE GEYSERS--CLEAR LAKE REGION, CALIFORNIA,
For primary bibliographic entry see Field 02F.
W72-14351

HYDROLOGY OF WESTERN COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. McCoy.
Geological Survey Open-file Report (72018), 1972. 61 p, 11 fig, 3 tab, 9 ref.

Descriptors: *Hydrology, *Water resources, *Rainfall-runoff relationships, *Groundwater resources, *Florida, Water supply, Water demand, Aquifer characteristics, Water yield, Groundwater recharge, Water quality, Chemical analysis, Hydrologic data, Water table, Water levels, Water pollution sources, Saline water intrusion, Injection wells, Urbanization, Water quality control, Canals, Water conveyance.
Identifiers: *Collier County (Fla).

Western Collier County, Florida, has large freshwater supply potential because of its 54 inches of rainfall annually and its manmade surface flow system, hydraulically connected to a shallow permeable aquifer. However, water problems exist because the rainfall is not evenly distributed throughout the year, causing a threat of salt-water intrusion in the Naples well field during prolonged dry seasons. Contamination of existing and future groundwater supplies by man-related activities including urbanization is of concern. The controlled surface-water flow system and the distribution of weirs allow for water control without an excessive lowering of groundwater levels. The system also has the potential for recharging the coastal section of the shallow aquifer during the dry seasons. Variable water quality and inadequate flows during the dry season precludes the use of the surface-water flow system as a direct source of municipal water. (Woodard-USGS)
W72-14359

POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W72-14434

FLUCTUATIONS IN NITRATE CONCENTRATIONS UTILIZED AS AN ASSESSMENT OF AGRICULTURAL CONTAMINATION TO AN AQUIFER OF A SEMIARID CLIMATIC REGION,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W72-14435

UNDERGROUND WASTE MANAGEMENT AND ENVIRONMENTAL IMPLICATIONS - A SYMPOSIUM.
American Association of Petroleum Geologists, Inc., Midland, Tex.
For primary bibliographic entry see Field 05G.
W72-14480

EVALUATION OF LIMESTONE FORMATION CHARACTERISTICS FROM WELL LOGS,
Qater Petroleum Co. Ltd., Umm Said.
D. J. Cregeen, and H. Moir.
Journal of Petroleum Technology, Vol. 12, No. 11, p 1087-1092, November, 1961. 4 fig, 3 tab, 4 ref.

Descriptors: *Logging (Recording), *Limestones, Evaluation, *Aquifer characteristics, Saturation, Cores, Permeability.
Identifiers: Critical saturation, *Water-bearing limestones, *Well logs, Hydrocarbon saturation, Gamma ray logs, Neutron logs.

The evaluation of limestone formations by well logs has brought many interesting problems to light, some of which are as yet unresolved. While a major purpose of well logging is to ensure that zones containing producible hydrocarbons are not bypassed, this paper is more concerned with the further information that can be derived from the logs to assist in more clearly defining reservoir characteristics, fluid content, and performance. Five selected topics are discussed in light of their application to the hard limestone reservoirs under review. The topics are: (1) Water Saturation, Sw; (2) Critical Saturation for Water Production; (3) Residual Hydrocarbon Saturation; (4) Distinguishing Between Oil and Gas; and (5) Detection of Shale. By careful selection of the quantities to be measured and by correlation of the results from well-log analysis with those obtained by independent means, it is possible eventually to supplant such expensive operational procedures as coring, its attendant analysis and stage production testing (to some degree). (Campbell-NWWA)
W72-14491

WELL CONSTRUCTION AND WATER QUALITY,
Department of Agriculture, Beltsville, Md.
For primary bibliographic entry see Field 05B.
W72-14494

HORIZONTAL WELLS AND DRAINS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 08B.
W72-14500

ENVIRONMENTAL FRAMEWORK OF GROUND-WATER CONTAMINATION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14502

BACTERIOLOGICAL AND CHEMICAL FACTORS IN INDUCED INFILTRATION,
For primary bibliographic entry see Field 05G.
W72-14504

HYDROGEOLOGIC FACTORS IN PROBLEMS OF CONTAMINATION IN ARID LANDS,
Nevada Univ., Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 05B.
W72-14508

MAXIMUM YIELDS FROM MINIMUM AQUIFERS,
Johnson (Edward E.), Inc., St. Paul, Minn.
For primary bibliographic entry see Field 08B.
W72-14509

BASIC PRINCIPLES OF WATER WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W72-14512

GRAPHICAL METHOD FOR DETERMINING COEFFICIENT OF TRANSMISSIBILITY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 08G.
W72-14516

RELATIONS OF FRESH AND SALTY GROUND WATER ALONG THE SOUTHEASTERN U.S. ATLANTIC COAST,
Geological Survey, Brunswick, Ga.
For primary bibliographic entry see Field 02L.
W72-14518

HYDROLOGIC RECONNAISSANCE OF THE PROMONTORY MOUNTAINS AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
J. W. Hood.
Utah Dept of Natural Resources, Technical Publication No 38, 1972. 42 p, 1 plate, 4 fig, 8 tab, 22 ref.

Descriptors: *Water resources, *Groundwater resources, *Hydrogeology, *Hydrologic data, *Utah, Precipitation (Atmospheric), Aquifers, Water wells, Water yield, Groundwater recharge, Water quality, Specific conductivity, Dissolved solids, Salinity, Water temperature, Water utilization, Surface waters, Runoff, Well data, Basic data collections.
Identifiers: *Promontory Mts (Utah).

The Promontory Mountains area of Utah is in eastern Box Elder County, and its drainage is directly tributary to Great Salt Lake. The drainage area consists of 228,000 acres. Groundwater is most uniformly available from unconsolidated and semiconsolidated rocks of Cenozoic (Tertiary and Quaternary) age. Part of the water is derived from precipitation, which is estimated to average 240,000 acre-feet annually. Of this amount, about 93 percent is consumed at or near the point of fall. An estimated 4,000 acre-feet runs off in streams. The total runoff is estimated to average 6,000 acre-feet and includes unconsumed spring discharge. Average annual groundwater recharge and discharge are in balance and amount to 27,000 acre-feet each. Recharge derived from precipitation is estimated to average 12,000 acre-feet annually. Storage may have been depleted slightly only in the two small areas that contain a few irrigation wells. Estimates for groundwater discharge include evapotranspiration (14,000 acre-feet), subsurface outflow (9,000 acre-ft), wells (2,000 acre-ft), and unconsumed spring discharge (2,000 acre-ft). The dissolved-solids concentration in water samples analyzed ranged from 272 to 24,900 mg per liter. (Woodard-USGS)
W72-14526

A PRELIMINARY INVESTIGATION OF TERRESTRIAL AND LOW ALTITUDE AERIAL INFRARED PHOTOGRAPHY AS AN AID IN DETERMINING WATER TABLE DEPTHS AND BURIED GEOLOGICAL STRUCTURES IN THE PIERRE SHALE IN WESTERN SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City.
For primary bibliographic entry see Field 07B.
W72-14527

WATER RESOURCES OF NORTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14540

PROPOSED CLOSED BASIN DIVISION, SAN LUIS VALLEY PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.

Available from the National Technical Information Service as PB-202 805D. $3.00 in paper copy, $0.95 in microfiche. Revised May 1971. 9 p, 1 map.

Descriptors: *Colorado, *Groundwater, *Environmental effects, *Groundwater recharge, Aquifers, Impounded waters, Waterfowl, Wildlife conservation, Vegetation effects, Water level fluctuations, Water table, Surface-groundwater relationships, Wildlife habitats, Wetlands, Irrigation programs, Wells, Pumps, Pumping, Water management (Applied), Salt tolerance.
Identifiers: *Environmental Impact Statements, *San Luis Valley Project (Colo).

The project is designed to salvage an average of about 100,800 acre-feet of water annually in the Closed Basin Division of the San Luis Valley, Colorado, primarily by lowering the ground water level through pumping. Project features include a system of 136 wells and pumping stations, well field laterals and 55 miles of conveyance channels. A 13,800 acre wildlife refuge will also be established. The proposed plan would lower the water table in the area a minimum of about 8 to 10 feet. The level of the San Luis Lake would be stabilized, creating a much needed cold-water fishery and source of area recreation. The drainage of existing wetlands interspersed in the project area would involve loss or drastic reduction of over 100,000 acres of waterfowl habitat. There will also be a loss in the quality of dove nesting habitat. There are no unresolved conflicts concerning alternative uses of the water and land resources. To forego development in the Closed Basin would result in further degradation of the area from its natural state. The plan provides for stage development of the water salvage features and observation during operation to provide a check on ground water conditions. (Waldron-Florida)

W72-14573

PROCEDURE AND RESULTS OF GROUNDWATER POLLUTION STUDIES IN TEHERAN AREA, IRAN,
Ministry of Water and Power, Teheran (Iran). Research Div.
For primary bibliographic entry see Field 05B.
W72-14590

ON HYDROGEOLOGY AND GROUNDWATER WELLS OF ETHIOPIA,
Ministry of Public Water Works, Addis Ababa, (Ethiopia). Water Resources Dept.
A. O. Idris.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 8-9, 1972. 1 tab.

Descriptors: *Data collections, *Hydrologic data, *Water wells, Hydrogeology, Water quality.
Identifiers: *Ethiopia.

Information about groundwater wells in Ethiopia was collected from geological logs, water data, and drilling reports of the wells drilled by the Water Resources Department. The Water Resources Department drilled 355 wells. The purpose of the study is to collect the groundwater data of the Water Resource Department and to give a general picture of the groundwater condition in Ethiopia. (Knapp-USGS)
W72-14591

PALEOZOIC SANDSTONE AQUIFERS IN SAUDI ARABIA,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
For primary bibliographic entry see Field 02F.
W72-14593

GROUNDWATER RECHARGE BY DAMMED UP RIVERS,
H. W. Holz.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 72-79, 1972. 8 fig.

Descriptors: *Artificial recharge, *Bank storage, *Reservoirs, *Meanders, *Induced infiltration, Hydrogeology, Alluvial channels, Water management (Applied), Water levels, Water table.
Identifiers: Weser River (Germany).

Along the River Weser, Germany, several gate weirs were built to make the river navigable the whole year. By installing the barrages, the natural effluent groundwater river system was reversed into an influent one. A dense grid of observation wells was installed in order to monitor the predicted impairment of domestic and stock wells, as well as the wetting of agriculturally used land. About three observation wells per square kilometer were drilled. Measurement of the water level started one year before impounding the river. From then on, the depth of water table was measured regularly every other week for ten years. By damming a river, water from the river is bank stored and the groundwater table rises. Pumping this additonal available water is feasible especially if the river is meandering. Two locations are particularly suited for supply wells. The first one is the intersection between the axis of a meander above the dam and the interface between infiltrated river water and natural groundwater. The other promising place is within the meander below the dam. There, only infiltrated river water will be pumped even if there is no canal cutting off the meander. (Knapp-USGS)
W72-14595

ARTIFICIAL RECHARGE IN JAPAN,
Geological Survey of Japan, Kawasaki.
T. Konishi.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 80-87, 1972. 5 fig, 5 tab.

Descriptors: *Artificial recharge, *Water management (Applied), Water conservation, Reviews, Research and development, Injection wells.
Identifiers: *Japan.

Artificial recharge is a relatively recent development in Japan. The first official attempt of artificial recharge in Japan was made in 1951. At that time Amagasaki City drilled a well 500 mm in diameter and 70 m deep at the bed of Mukogawa River, and the river water was recharged underground. After this attempt, artificial recharge of water came to be recognized as a necessity, and there are many cases where industrial plants recharged water artificially in order to secure groundwater for their own use. Also injection of water is used for lowering sewerage costs and for prevention of land subsidence. (Knapp-USGS)
W72-14596

ESTIMATING THE TRANSMISSIVITY OF AQUIFERS FROM THE FORMATION CONDUCTANCE,
Ministry of Water and Power, Tehran (Iran). Div. of Groundwater.
A. M. Aiamouti.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 117-120, 1972. 4 fig, 2 tab, 9 ref.

Descriptors: *Aquifer testing, *Specific conductivity, *Transmissivity, *Drawdown, *Specific capacity, Water yield, Aquifer characteristics, Groundwater movement, Water levels.
Identifiers: *Iran, *Well efficiency.

The specific capacity of a well can be used for estimating the coefficient of transmissivity, assuming that the well is 100 percent efficient. In reality, however, this assumption is not valid as the head loss incurred by friction entering the well and traversing the pump assembly is never zero. The resulting specific capacity, as determined by water-level measurements in the well, is always less than its true value. In order to get the true value of specific capacity and make a better estimation of transmissivity, the result of step-drawdown tests can be used. By dividing the discharge of the well by the formation loss, an acceptable correlation can be obtained between formation conductance and transmissivity. This method has been successfully utilized in Iran as a rough means for controlling the result of interpretations of many pumping tests and in choosing between different values of transmissivity obtained from the application of drawdown and recovery tests. (Knapp-USGS)
W72-14597

GRAPHICAL METHOD FOR ESTIMATING THE TRANSMISSIBILITY AND STORATIVITY OF AQUIFERS FROM SPECIFIC CAPACITY OF WELLS,
Egyptian Desert Inst., Cairo.
For primary bibliographic entry see Field 02F.
W72-14603

A STUDY ON THE MECHANISM OF CONFINED GROUNDWATER RECHARGE,
Tokyo Univ. (Japan). Faculty of Engineering.
For primary bibliographic entry see Field 02F.
W72-14605

AN EVALUATION OF IRRIGATION POTENTIAL IN THE BONANZA VALLEY,
Minnesota Univ., Benson. Agricultural Extension Service.
For primary bibliographic entry see Field 03F.
W72-14611

GROUND-WATER RESOURCES OF ORANGE AND ULSTER COUNTIES, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-14726

GROUND WATER IN CENTRAL ST. CROIX, U.S. VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
T. R. Robinson.
Geological Survey Open-file Report, 1972. 18 p, 16 fig, 1 tab, 13 ref.

Descriptors: *Groundwater resources, *Water yield, *Water quality, *Water supply, *Virgin Islands, Reviews, Evaluation, Water demand, Water pollution sources, Salinity, Water wells, Pumping, Aquifer characteristics, Groundwater recharge, Saline water intrusion, Water treatment, Electrodialysis.
Identifiers: *St. Croix (V.I.).

The principal aquifer in central St. Croix, U.S. Virgin Islands, consists of the Kingshill Marl and associated alluvium. In one area, well yields of a few hundred gallons per minute are possible. In other places well yields are 5 to 40 gpm (gallons per minute) from the alluvium and 10 to 40 gpm from the marl. Groundwater recharge is approximately 3 percent of rainfall or about 1 3/4 mgd (million gallons per day). Pumpage is estimated to be less than 1 mgd. The water available at typical well depth is brackish and high in sodium chloride and sodium bicarbonate. The total water stored in the aquifer is estimated to be 130 billion gallons. About 35 billion gallons of this water could be recovered and desalted by electrodialysis. At projected levels of water use, this water of better quality would be exhausted in about 29 years. Replenishing the aquifer with treated sewage would extend the time to about 38 years. More water of poorer quality could be desalted by more expensive methods, such as distillation. (Woodard-USGS)
W72-14731

GROUND-WATER CONDITIONS IN THE EAST SHORE AREA, BOX ELDER, DAVIS, AND WEBER COUNTIES, UTAH-1960-69,
Geological Survey, Salt Lake City, Utah.
E. L. Bolke, and K. M. Waddell.
Utah Dept of Natural Resources, Salt Lake City, Technical Publication No 35, 1972. 59 p, 3 plate, 5 fig, 2 tab, 20 ref.

Descriptors: *Groundwater resources, *Hydrologic data, *Basic data collections, *Well data, Utah, Aquifers, Water yield, Groundwater recharge, Water quality, Water utilization, Water level fluctuations, Water supply, Water demand, Semiarid climates, Water importing, Surface waters.

Groundwater conditions (1960-69) are described for the East Shore area in north-central Utah between the east shore of Great Salt Lake and the Wasatch Range. Annual ground-water withdrawals for municipal and industrial supply increased from about 10,000 acre-feet in 1960 to about 21,000 acre-feet in 1969. Additional pumpage for irrigation and other purposes was about 5,500 acre-feet in 1969. Most of the water that is used for agriculture is supplied by surface-water sources. During 1960-69 water levels rose an average of 5 feet in the Bountiful and Brigham districts. There was an average decline of 10 feet in the Weber Delta district, chiefly as a result of withdrawals from wells. The rise of water levels in parts of the Bountiful district was due to

decreased withdrawal from wells brought about by importing water from the Weber River basin, and to additional recharge from use of imported water for lawn irrigation. The water quality has varied locally, but it has generally been a year-to-year fluctuation rather than a long-term trend. Most of the water is suitable for both domestic use and irrigation. (Woodard-USGS)
W72-14742

DECISION ANALYSIS IN WATER RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06B.
W72-14845

IF THE PUMPS RUN DRY...,
Washington State Water Research Center, Pullman.
D. C. Flaherty.
In: Washington State's Water, A State of Washington Water Research Center Report-1971, p 2-10, 3 fig, 1 map.

Descriptors: *Groundwater mining, *Hydrologic budget, *Water supply, *Wells, *Irrigation effects, *Irrigation systems, *Sprinkler irrigation, *Water levels, *Water table aquifers, *Irrigation engineering, Cost analysis, Recharge, Water table, Aquifers, Social aspects, Political aspects, Economics, Cost-benefit ratio, Washington, Hydrogeology, Crop production.

A synopsis of results from a Washington State University study team, assembled to investigate decreasing water tables in the central Washington region, is presented. Experiments by enterprising agriculturalists have revealed that deep wells, expensive pumps and massive sprinkler systems can produce twice the wheat of conventional dry farming methods. However, studies show that levels of aquifers have dropped more than 12 ft/yr under some farms. Much of the countryside around Lind and Odessa had to be closed to further drilling in 1968 until a management plan could be developed. Team economists warn that income returns are directly dependent on water table stability. Some of the difficult issues in ground-water management including user competition, legal problems, various crop alternatives, channelization, and socio-economic constraints are discussed. (See also W72-14618) (Black-Arizona)
W72-14865

ON THE DELIMITATION OF GROUNDWATER RECHARGE AREAS AROUND BERJESIYAH,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
S. B. Al-Jawad, W. I. Haddad, H. A. Hassan, and A. A. van der Sluijs.
Iraq Ministry of Higher Education, Council for Scientific Research Technical Report No 12, 1970. 33 p, 4 tab, 3 fig, 4 maps, 3 ref.

Descriptors: *Groundwater recharge, *Aquifers, *Hydrogeology, *Aquifer characteristics, *Areal hydrogeology, *Groundwater, *Sand aquifers, Geology, Geomorphology, Water table, Arid lands, Depression storage, Water storage, Water table aquifers, Zone of saturation, Water chemistry, Groundwater movement, Subsurface mapping, Infiltration, Water quality, Salinity.
Identifiers: I*raq.

A survey of groundwater flow was conducted for the Zubair and Berjesiyah areas of Iraq in September and October 1967, and February and March 1968, to study the possibility of local groundwater recharge of the Dibdibba sandstone aquifer. A map with water table contours was obtained by plotting the data collected on a 1:50,000 map of the Berjesiyah area. Conception of a lateral flow of groundwater towards the Berjesiyah depression, where it mixes with locally infiltrating rain water, seems to be confirmed by the tendency of the water quality to improve towards the depression. Prospection for groundwater with geoelectrical methods was conducted to determine the depth and extent of fresh water. Near Zubair, the Dibdibba sandstone contains a freshwater layer which floats on a salt water mass of great thickness. Farmers' wells tend to become brackish. The deeper aquifer shows a very high salt content, varying from that similar to sea water up to saturation point. Exploitation of the upper aquifer would constitute a serious risk. General aspects such as geology, geomorphology, water table data, and hydrochemical data of the Berjesiyah and Zubair areas are also included. (Black-Arizona)
W72-14870

HYDROLOGICAL AND SOIL PHYSICAL CONDITIONS IN A PILOT AREA IN THE GREATER MUSSAYEB PROJECT,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 02G.
W72-14871

PRELIMINARY STUDIES ON GROUNDWATER IN SAMARATIKRIT AREA,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
R. H. Haddad, S. B. Jawad, and W. I. Haddad.
Iraq Ministry of Higher Education, Council for Scientific Research, Technical Report No 13, 1970. 30 p, 2 fig, 2 tab, 3 ref.

Descriptors: *Arid lands, *Hydrogeology, *Base flow, *Salinity, *Groundwater recharge, *Aeral hydrogeology, *Groundwater resources, Aquifers, Artificial recharge, Groundwater, Geological mapping, Potential water supply, Irrigation effects.
Identifiers: *Iraq.

Purpose of the study, which began in 1969, is to make a hydrological survey of the Samara-Tikrit area in Iraq, located along the eastern bank of the Tigris river nearly 100 miles north of Baghdad, and to learn about its hydrological problems with regard to groundwater in order to make better use of this resource both domestically and agriculturally. Preliminary results indicate that most hydrological problems in the area stem mainly from high salinity and poor management. Groundwater in the study area was found to be generally unsuitable for human consumption and is used primarily for animal drinking and irrigation. Recommendations include investigations of artificial recharge possibilities, calculations of aquifer permeability, best methods of recharge, and water table fluctuations during and after recharge of main aquifer. Information is presented on geology, geomorphology, groundwater depth, and groundwater quality (chemical analysis) of the study area. (Black-Arizona)
W72-14872

ASPECTS OF AQUIFER MANAGEMENT,
Environmental Protection Agency, Ada, Okla. National Groundwater Research Program; and Environmental Protection Agency, Washington, D. C. Water Quality Office.
L. G. McMillion, and D. Olsson.
The Cross Section, Vol 18, No 3, March 1972. p 1-2, 4. 1 tab, 22 ref.

Descriptors: *Legal aspects, *Groundwater resources, *Water management (Applied), *Common law, *Prior appropriation, Humid areas, Arid lands, Reasonable use, Water rights, Regulations.

Legal aspects of aquifer management are outlined in response to current governmental involvement in the development and redistribution of water over large areas. Legal doctrines are divided into two major categories--Common Law Doctrine and Prior-Appropriation Doctrine. Common Law Doctrine, derived from England, is applied generally to humid and eastern states. Its expressed interest is protection of land-based property rights. Correlative rights, or California law, is a variation of the reasonable use concept. Prior-Appropriation Doctrine grants water rights to first users without regard to land ownership. It was developed in the western states, where aridity dictated that waster was of major importance and value. Applications of these doctrines are presented along with statewide regulatory programs. (Popkin-Arizona)
W72-14876

'SLATON CHANNEL' -- A BURIED VALLEY,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
D. D. Smith.
The Cross Section, Vol 18, No 3, March 1972. p 3. 2 fig.

Descriptors: *Geological surveys, *Geologic history, *Aquifer characteristics, *Erosion, *Topography, Great Plains, Aquifer systems, Texas, Groundwater.

Results are reported of the geologic investigation which located the areal and vertical extent of the Slaton Channel, an ancient river valley filled with rocks of the Ogallala formation in the Texas High Plains. Well logs form the basis of the report. Geologic history of the area includes the 60 million-year old Laramide revolution, followed by oceans of Cretaceous time withdrawing and subjecting the land surface to 50 million years of erosion. The Slaton Valley was one of the major drainage patterns developed. Renewed uplift in the Southern Rocky Mountains, and increased rainfall, caused decreasing stream gradients, and deposition of sands and gravels in the stream channels. The Ogallala top surface gives no sign of the buried topography. Instead of the usual 100-foot thickness, the Ogallala aquifer may extend to 300 over the Slaton Valley. (Popkin-Arizona)
W72-14877

WATER BROUGHT TO HIGHWAY REST AREA THE 'HARD' WAY.
Public Works, Vol. 103, No. 7, p 78-79, July 1972. 4 photo.

Descriptors: *Water supply, *Wells, *Economic feasibility, Salts, *Reverse osmosis, Water quality, Leaching, *Treatment facilities, Desalination.
Identifiers: *Sunset Point Rest Area (Ariz), Electro-dialysis.

Arizona's Sunset Point Rest Area on Interstate No. 17 between Phoenix and Flagstaff is discussed. The chief problem of this rest stop was a water supply for the traveller. A detailed study indicated that drilling a well would be the most feasible economic operation. A well was dug to 1.059 feet with a 500-foot artesian head. Samples of the water contained 1,837 mg/L of soluble salts against an allowable 500, and many other fluorides. A reverse osmosis system was used to purify the water. This water purification system operates on an electro-dialysis principle, which employs an electrical charge to pull salts through membrane filters, leaving potable water for consumption. In order to plant trees, holes were blasted. Since the soil had no leaching capability, a lagoon-type sewage facility was required. Water lines had to be below the frost line, in a rocky soil full of granite outcroppings. Power had to be brought in over a considerable distance, as did all construction materials. (Strachan-Chicago)
W72-14886

A CASE HISTORY IN GROUND WATER COLLECTION,
Public Utilities, Mankato, Minn.

W. V. Lacina.
Public Works, Vol. 103, No. 7, p 52-54, July 1972. 2 photo, 2 fig.

Descriptors: *Groundwater resources, *City planning, *Long-term planning, Water supply, Yield strength, Maintenance costs, Economic feasibility, Corrosion control, Clogging, Land use, Quality control, Pumping, *Minnesota.
Identifiers: *Mankato (Minn), *Metropolitan water resources management, Ranney horizontal collector well.

Planning for future requirements and experienece in ground water collection have permitted Mankato, Minnesota to keep relatively free of the municipal water problems that confront many large and small cities. The focus of Mankato's effort to upgrade its systems is the recent installation of a Ranney horizontal collector well which alone matches the output of six vertical wells which the City had previously used for water supply. The City has enough capability to handle its anticipated growth and demand for the next decade. The horizontal collector was selected on two criteria higher yield and negligible maintenance cost. Corrosion and clogging of screens, two factors which increase maintenance costs, are reduced in horizontal collector wells. Corrosion is reduced because the screens in a collector pipe are always submerged completely. Horizontal collector well systems establish a graduated natural filter around each screen pipe, permitting low-velocity entrance of the water into the pipe. Flushing of individual screen pipes is accomplished by closing off all but one of the control valves and temporarily lowering the water level in the caisson. The geophysical area of Mankato characterizes many of the favorable conditions for a horizontal collection system: (1) an aquifer or water-saturated strata holding large quantities of water, (2) unconsolidated materials in the aquifer which allow projection of horizontal collector pipes and provide a natural permeable filtration, and (3) a hydrological cycle that provides surface water infiltration. Some of the benefits include: good use of land, better quality control, and pumping economy. (Strachan-Chicago)
W72-14889

DEVELOPMENT AND MANAGEMENT OF GROUND WATER AND RELATED ENVIRONMENTAL FACTORS IN ARID ALLUVIAL AND CARBONATE BASINS IN SOUTHERN NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
R. L. Bateman, A. L. Mindling, R. L. Naff, and H. M. Joung.
Available from the National Technical Information Service as PB-212 382, $3.00 in paper copy, $0.95 in microfiche. Center for Water Resources Research, Desert Research Institute Project Report No 18, January 1972. 43 p, 16 fig, 7 tab, 8 ref, 5 append. OWRR C-2212 (No 3411) (1).

Descriptors: *Groundwater basins, *Competing uses, *Management, *Computer models, *Nevada, Arid lands, Environmental effects, Priorities, Warm springs, Aquifers.
Identifiers: *Desert pupfish (Cyprinodonts), *Amargosa Desert (Nev), Regional groundwater flow systems.

Groundwater resources of arid and semi-arid basins in the southwestern United States are generally developed within bounds imposed by physical, legal, and economic constraints. In Ash Meadows, a portion of the Amargosa Desert of south-western Nevada, groundwater development is subject to the additional constraint of preserving the rare desert pupfish (Cyprinodonts) which inhabit spring pools within the area. Continued withdrawal of groundwater for agricultural purposes will eventually decrease water levels to the extent that the natural habitats of the pupfish may be damaged. An unsteady state digital groundwater model is developed to assist in evaluation of these groundwater production problems. The model is verified by comparison of simulated and observed water level responses to the actual pumping history. Preliminary evaluation of alternative pumping locations (well sites) is made as regards their probable effect on water levels in critical areas. In addition, the suitability of available water and soils for agricultural purposes is evaluated and possible improvements discussed.
W72-14916

WELLS AND STREAMS: RELATIONSHIP AT LAW,
Missouri Univ., Columbia. Coll. of Law.
P. N. Davis.
Missouri Law Review, Vol. 37, No. 2, p 189-245, 1972. 7 tab, 151 ref, append.

Descriptors: *Groundwater, *Water utilization, *Water rights, *Watercourses (Legal aspects), *Missouri, Legal aspects, Water law, Common law, Judicial decisions, Hydrologic aspects, Stream flow, *Wells, Hydrologic cycle, Surface waters, Groundwater mining, Reasonable use, Diversion, Riparian rights, Water allocation (Policy).

Existing allocation rules concerning the hydrologic relationship between percolating groundwater and surface watercourses are evaluated. Two issues are discussed in great detail: first, when does a hydrologic connection exist.; second, will surface watercourses, percolating groundwater, or other rules be applied in various types of situations. Decisions from the United States, England, and Ireland are examined to determine if any trends have been established in spite of the absence of a clear doctrine in point. Eastern states should update their groundwater allocation rules to correspond with present day knowledge and the expense of hydrologic testing. Since groundwater movement can now be determined by routine methods, the contention that it is unknown can no longer justify the absolute ownership and reasonable use rules of groundwater. Two rules are set forth, one applying to high capacity wells and the other to small wells. Depending on the well size, a certain degree of knowledge about local groundwater movement will be imputed. This knowledge will determine liability for unreasonable injurious consequences. These rules correlate well with existing rules applicable to underground streams and remedy the illogic accepted by many eastern courts that percolating groundwater, diffused surface water and surface watercourses constitute independent classes of water. (Beardsley-Florida)
W72-14934

BIBLIOGRAPHY OF GROUND-WATER STUDIES IN NEW MEXICO.
New Mexico State Engineer, Santa Fe.
For primary bibliographic entry see Field 02F.
W72-14938

4C. Effects on Water of Man's Non-Water Activities

THE EFFECTS OF RAINFALL INTENSITY, PAVEMENT CROSS SLOPE, SURFACE TEXTURE, AND DRAINAGE LENGTH ON PAVEMENT WATER DEPTHS,
Texas Transportation Inst., College Station.
B. M. Gallaway, R. E. Schiller, Jr., and J. G. Rose.
Available from NTIS, Springfield, Va 22151, PB-206 497, Price $3.00 paper copy; $0.95 microfiche. Research Report 138-5, May 1971. 69 p, 19 fig, 13 tab, 32 ref.

Descriptors: *Rainfall, *Paving, *Highways, *Road construction, *Texas, Engineering structures, Water control, Materials testing, Testing procedures, Road design, Slopes, Drainage systems.

Determinations were made concerning the amount of water which can be expected to exist on various pavement types under normal ranges of pavement cross slopes, rainfall intensities, pavement textures, and drainage lengths. Equations were developed which relate these variables and their relative effects to water depth. Results are presented in both tabular and graphic form. Nine different types of surface were tested. The surfaces were placed on individual 28-foot long by 4-foot wide, double tee, prestressed concrete beams. Rainfall of uniform intensity was applied to the surface. Water depth measurements were taken at regularly spaced drainage lengths for various combinations of rainfall intensity and pavement cross slope. Multiple regression analyses were used to determine the best fit of the data. For a rainfall intensity of 1/5 in/hr, a surface texture of 0.03 in., and a drainage length of 24 ft., increasing the cross slope from 1/16 in/ft to 1/4 in/ft decreased water depths by 62 percent in the outside wheel path (Approximately 21 feet from the top of the drainage area). Correspondingly, increases in surface texture decreased water depths; whereas, increases in rainfall intensity and drainage length increased water depths. (Woodard-USGS)
W72-14360

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 06G.
W72-14548

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 06G.
W72-14564

THE INFLUENCE OF MAN ON THE HYDROLOGICAL CYCLE,
For primary bibliographic entry see Field 02A.
W72-14716

DESIGN ASPECTS AND PERFORMANCE CHARACTERISTICS OF RADIAL FLOW ENERGY DISSIPATORS,
Texas Univ., Austin. Center for Highway Research.
For primary bibliographic entry see Field 08B.
W72-14730

4D. Watershed Protection

SWEETWATER CREEK WATERSHED PROJECT, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-206 396-F. $3.00 in paper copy. November 1971. 28 p, 1 map, 1 tab.

Descriptors: *Tennessee, *Environmental effects, *Flood protection, *Channel improvement, Erosion control, Watersheds (Basins), Conservation, Land use, Flood control, Floods, Flood plains, Dams, Project benefits, Project purposes, Stream improvement, Multiple-purpose projects, Flooding, Aquatic environment, Agriculture, Area redevelopment, Water management (Applied), Flood damage, Dredging.
Identifiers: *Environmental impact statement, *Sweetwater Creek (Tenn), *Conservation land treatment measures.

The project consists of accelerated conservation land treatment measures and nine floodwater retarding structures supplemented with 42.3 miles of channel improvement for flood protection in the Sweetwater Creek Watershed, Tennessee. The land treatment measures will reduce runoff and erosion, increase the vegetative cover and improve the scenic quality of the landscape. The combined land treatment and structural measures will reduce urban property damage and crop and pasture damage due to floods in the flood plain. The reservoirs will create the potential for 132 acres of lake fishery and waterfowl resting area. The project will enhance the overall economic development of the area. Adverse effects include inundation of seven tenths mile of stream by the reservoirs, temporary disturbance of aquatic life during channel improvement installation, and periodic loss of some land to agriculture and wildlife use. Various alternative combinations of structural locations, structural measures, land treatment measures and non-structural measures such as flood plain zoning were considered as alternatives. Comments from interested agencies are included. (Brackins-Florida)
W72-14265

BIG CREEK AND TRIBUTARIES, LOWER WHITE RIVER BASIN, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W72-14267

HILLSDALE LAKE, BIG BULL CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-14275

METHOD OF CONTROLLING EROSION ON SEASHORES,
Z. Csiszar.
U. S. Patent No. 3,564,853, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 883, No 4, p 1390, February 23, 1971.

Descriptors: *Patents, *Beach erosion, Shore protection, Equipment, *Sand movement, *Erosion control, *Breakwaters, Coasts, Ocean waves, Littoral drift.

Two types of flexible curtains or screens are provided to control the movement of drifting sand. The first, a breakwater curtain consists of a continuous, perforated curtain made of strong and durable material, resistant to marine life. Its seaside end is weighted to the sea floor, the landside end is kept suspended at the required depth by a floater, anchored by a flexible cable in the sea floor. The second, a groyne-curtain consists of a flexible mesh with the bottom end weighted to the seafloor and the top end attached to a floater, holding the curtain suspended in a vertical position. This curtain oscillates with the waves. Positioning of this shore protection device depends upon an understanding of wind direction, longshore currents and sand movement. (Sinha-OEIS)
W72-14464

WINTERS CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-208 584-F, $3.00 in paper copy, $0.95 in microfiche. March 1972. 21 p, 2 map, 1 tab.

Descriptors: *Channel improvement, *Nebraska, *Soil conservation, *Environmental effects, Conservation, Protection, Project purposes, Erosion control, Sedimentation, Wildlife habitats, Flood protection, Riprap, Construction, Flooding, Flood frequency, Agricultural watersheds, Watersheds (Basins), Adoption of practices, Agricultural runoff, Agricultural engineering.
Identifiers: *Environmental Impact Statements, *Winters Creek Watershed (Neb).

The project involves conservation land treatment within the 89,710 acre Winters Creek Watershed, supplemented by construction of one floodwater retarding structure and 7.2 miles of channel enlargement. The project area is located along the North Platte River in Scotts Bluff and Sioux Counties of Nebraska. The area is predominantly farmland. The project will protect parts of the area from a 100-year storm and other parts from a 200-year storm. Favorable environmental effects include the following: reduced stream sedimentation, reduced sediment and floodwater damage in agricultural areas and urban areas, enhanced stream fisheries, expanded quality and quantity of wildlife habitats, and reduced mosquito production in urban areas. Adverse environmental impacts include temporarily increased sedimentation during construction, unsightly sediment and debris deposits in dry pool areas, and periodic inundation of 400 acres of grassland with resulting loss of wildlife habitat. The following possible project alternatives were considered: alternative floodwater retarding structure locations, further enlargement of Winters Creek Drain, diversion of Scottsbluff Drain, flood proofing of buildings, rezoning, and additional purchase of private lands. (Grant-Florida)
W72-14559

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-198 847-F, $3.00 in paper copy, $0.95 in microfiche. February 29, 1972. 81 p, 1 map, 8 photo, 2 tab.

Descriptors: *Oregon, *Levees, *Environmental effects, *Drainage districts, Flood protection, Levee districts, Drainage effects, Drainage practices, Drainage systems, Subsurface drainage, Wildlife habitats, Water table, Water storage, Columbia River, Pumping plants, Project purposes, Project benefits.
Identifiers: *Environmental Impact Statements, *Columbia River (Ore).

The proposed project involves modification of the existing levee and drainage system of Scappoose Drainage District on the lower Columbia River in Oregon. The purpose of the modifications is to increase the protection to the district from severe seepage and levee failure during unusually high water. Project features include the replacement of two existing pumping stations with stronger ones, construction of a new drainage canal and sublevee, and other modifications to the existing levee. About 170,000 cubic yards of material will be excavated. Environmental impacts include the following: more productive agricultural land use from improved drainage, occasional pasture flooding, loss of 7 acres of farmland, and associated land changes due to more intensive land use. Adverse impacts include temporary loss of valuable wildlife ground cover, loss of trees during construction, loss of 11 acres of grassland, and lowering of the water table which may encourage more undesirable urban uses. Alternative seepage control measures and water removal devices were considered as was the alternative of no action. (Grant-Florida)
W72-14560

EDEN WATERSHED, MISSISSIPPI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Jackson, Miss.

Available from the National Technical Information Service as PB-202 301F. $3.00 in paper copy, $0.95 in microfiche. March 1972. 33 p, 1 map, 1 tab.

Descriptors: *Mississippi, *Soil conservation, *Flood protection, *Environmental effects, Flooding, Flood damage, Flood control, Wildlife habitats, Conservation, Project purposes, Project benefits, Erosion control, Adoption of practices, Stream stabilization, Channel improvement, Structures, Water quality control, Sedimentation, Turbidity, Agricultural watersheds.
Identifiers: *Environmental Impact Statements, *Eden Watershed (Miss).

The project involves conservation land treatment of 10,817 acres in the Eden Watershed area of Yazoo County, Mississippi. Also included in the project is the construction of one floodwater retarding structure, three grade stabilization and sediment control structures, 25 miles of stream channel enlargement and 4 miles of new channel. The area is largely flat delta with some woods and a bluff area. The project is designed to protect against flooding and to abate erosion of agricultural land. Favorable environmental impacts of the project include: 20 per cent erosion and sediment reduction, 70 per cent reduction in flood plain sediment damage, reduction of floodwater damage, and creation of 14 acres of water surface for fishing and wildlife. Adverse impacts include: loss of agricultural use and wildlife habitat on 16 acres, loss of agricultural production of 50 acres of cropland, temporary turbidity and silting during construction, elimination of channel vegetative cover, and water quality impairment in the channel. Alternatives considered include: conservation land treatment alone, less intensive land use by retiring wetlands, no action, and varying structural alternatives. (Grant-Florida)
W72-14562

DUST ABATEMENT AT CANYON FERRY LAKE, CANYON FERRY UNIT, HELENA--GREAT FALLS DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Billings, Mont. Region 6.

Available from the National Technical Information Service as PB-203 097F. $3.00 in paper copy, $0.95 in microfiche. February 14, 1972. 48 p, 3 map.

Descriptors: *Environmental effects, *Montana, *Missouri River, *Wind erosion, *River basin development, *Dust storms, Flood control, Irrigation, Recreation, Fish conservation, Wildlife conservation, Dikes, Wildlife habitats, Aquatic habitats, Waterfowl, Lake basins, Turbidity, Erosion control.
Identifiers: *Missouri River basin, *Canyon Ferry Lake, *Environmental impact statements, *Helena-Great Falls (Mont).

Canyon Ferry Lake, formed by Canyon Ferry Dam on the Missouri River in Broadwater and Lewis and Clark Counties, Montana is at low elevations during the late winter and spring. Strong winds pick up dry soil and cause severe dust storms when there is little snow cover or when rainfall and beaches are exposed. The plan for dust abatement involves construction of dikes to form subimpoundments to cover exposed areas, dredging of fine material from the lakeside into the subimpoundments, and flooding the subimpoundments for development of wildlife habitat. Implementation of the plan will convert a section of the lake, which is wasteland and a source of dust when exposed, to an area of beneficial use. Excellent aquatic wildlife habitat will be developed at the im-

poundments. A major new migratory waterfowl production area will be developed. Construction may result in some temporary turbidity in the lake and reservoir storage capacity will be reduced by less than one percent. Alternatives considered were no development and stabilizing the reservoir operating level. In the absence of a solution to the dust problem, the quality of life in the area will continue at a significantly lower level than if the dust problem were abated. (Waldron-Florida)
W72-14565

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14571

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-14574

UTILIZATION OF AN INPUT-OUTPUT MODEL FOR PREDICTING WATER DEMAND ON A SMALL WATERSHED,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 06A.
W72-14644

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-199 637-F, $3.00 in paper copy, $0.95 in microfiche. September 22, 1971. 25 p, 1 map, 1 dwg, 4 tab.

Descriptors: *Lake Erie, *Environmental effects, *Beach erosion, *Erosion control, Pennsylvania, Recreation, Public benefits, Beaches, Sand, Recreation facilities, Shores, Project benefits, Project purposes, Shore protection, Coastal engineering, Recreation demand.
Identifiers: *Environmental Impact Statements, Presque Isle Peninsula (Pa).

The proposed project is a modification of a beach erosion control project on the south shore of Lake Erie at Erie, Pennsylvania. The purpose is to restore and improve 1500 linear feet of the public bathing beaches at a state park and to protect the lakeward perimeter of the peninsula from severe erosion. The proposed project modifications will only restore the beach to its condition at the time it was originally completed through sand replenishment. Therefore it should have no new impact on the local environment. The project will have no adverse environmental effects, except temporary restrictions on public use of the beach in the construction area. Alternatives include: utilization of continuation of the present method of beach replenishment using sand from the upland area, pumping sand from the area of natural accretion at the tip of the peninsula and recirculating it back to the beaches as needed, or abandoning the project entirely. Comments from interested agencies are included. (Brackins-Florida)
W72-14764

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

BARIUM AND STRONTIUM CONCENTRATIONS IN PACIFIC AND MEDITERRANEAN SEA WATER PROFILES BY DIRECT ISOTOPE DILUTION MASS SPECTROMETRY,
Institut de Physique du Globe, Paris (France).
M. Bernat, T. Church, and C. J. Allegre.
Earth and Planetary Science Letters, Vol 16, No 1, p 75-80, September 1972. 2 fig, 3 tab, 10 ref.

Descriptors: *Strontium, *Trace elements, *Sea water, *Mixing, Data collections, Water chemistry, Oceanography, Water analysis, Water circulation, Diffusion, Sampling, Distribution patterns.
Identifiers: *Barium, *Mediterranean Sea.

Determination of barium and strontium directly from sea water by isotope dilution mass spectrometry is an efficient, precise, and virtual blank-free procedure. Results for an eastern Pacific profile confirm a regularly increasing barium concentration from 5 to 23 micrograms/kg at 2500 m, but strontium concentrations appear to be nearly homogeneous below 50 m at 7.6 plus or minus 0.1 micrograms/kg with a single low value for the surface water. A western Mediterranean profile shows uniform concentrations for both barium and strontium, similar to the Atlantic. There appears to be a nearly conservative strontium-to-salinity ratio of 0.218 plus or minus 0.002 for sea waters below mixed surface zones. (Knapp-USGS)
W72-14222

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W72-14234

POTOMAC RIVER WATER QUALITY NETWORK: COMPILATION OF DATA.
Interstate Commission on the Potomac River Basin, Washington, D.C.

Report for Water Year 1971, 117 p, 2 fig.

Descriptors: *Potomac River, *Water quality, *Alkalinity, *Biochemical oxygen demand, *Chlorides, *Coliforms, Color, *Dissolved oxygen, Nitrites, *Nitrates, Nitrogen, Hydrogen ion concentration, *Phosphates, Flow rates, Pesticide residues, Water temperature, *Turbidity, Biota, Acidity, Sulfates, Manganese, Iron, Conductivity, Computer programs, Hydrologic data, Saturation, Suspended solids, Fish, Aquatic insects, Mullusks, Rivers, Bacteria, Data storage and retrieval.
Identifiers: *STORET, Shenandoah River, Anacosta River, Potomac River Basin, Dissolved solids, Rock Creek, Antietam Creek, Oxon Run.

The 1971 report on water quality of the Potomac River Basin is based on data obtained from samples taken at stream sampling points in the Basin. Ten selected parameters are recorded for each station but these vary from station to station. The data cover physical and chemical parameters as well as biota and coliform counts. The data reported were obtained from the STORET system, a multi-user computer system designed to manage water quality data in the most efficient and accurate way possible. Originally intended to handle only raw water quality data, STORET now handles municipal and industrial inventories, fish kill data, data plots, microfilming of data and other options. (Mortland-Battelle)
W72-14281

RESEARCH ON AND CULTURE OF CALCAREOUS GREEN ALGAE,
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 05C.
W72-14294

A SIMPLE MICROLAYER METHOD FOR SMALL SAMPLES,
Makapuu Oceanic Center, Waimanalo, Hawaii. Marine Ecology Div.
For primary bibliographic entry see Field 07B.
W72-14297

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES. A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-14298

TECHNIQUE FOR MEASURING C-1402 UPTAKE BY SOIL MICROORGANISMS IN SITU,
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. W. Smith, C. B. Fliermans, and T. D. Brock.
Applied Microbiology, Vol. 23, No. 3, p 595-600, March 1972. 3 fig, 1 tab, 12 ref.

Descriptors: *Soil microorganisms, *Absorption, *Carbon dioxide, *Radioactivity techniques, Soil algae, *Methodology, Measurement, Oxidation, Carbon radioisotopes, *On-site tests, Sulfur bacteria, Productivity, Radiochemical analysis, Thermophilic bacteria, Organic matter, Cultures, Soil bacteria.
Identifiers: Chemical interference, Scintillation counting, Cyanidium caldarium, Thiobacillus, Sulfolobus, Glucose, Uracil.

Uptake of C-1402 in soils due to algae or sulfur-oxidizing bacteria was examined by incubation of soil samples with gaseous C-1402 and subsequent chemical oxidation of the biologically fixed radioactive isotope to C-1402 for detection with a liquid scintillation counting system. The C-1402 was added to the soil in the gas phase so that no alteration of the moisture or ionic strength of the soil occurred. Wet oxidation of radioactive organic matter was carried out in sealed ampoules, and the C-1402 produced was transferred to a phenethylamine-liquid scintillation counting system with a simply constructed apparatus. The technique is inexpensive and efficient and does not require elaborate traps since several possible interfering factors were found to have no harmful effects. The efficiency of the technique in oxidizing various compounds was examined using varying concentrations of uniformly labeled glucose and uracil, and labeled Cyanidium caldarium cells. In all cases, the procedure was performed on samples containing 0.5 g of soil per ampoule to reproduce the treatment of natural samples as closely as possible. Sixty-one to eighty-seven percent of the added radioactivity was recovered during the oxidation of glucose and uracil, whereas 98 percent of the added radioactivity was recovered during the oxidation of C. caldarium. The recovery efficiency was independent of the amount of radioactivity present. Experiments in coal mine regions and in geothermal habitats have demonstrated the ecological applicability of this technique for measurement of CO2 fixation by sulfur oxidizing bacteria and soil algae. (Long-Battelle)
W72-14301

METHOD FOR STUDYING GEOCHEMISTRY OF SEDIMENT-WATER INTERFACE,
Stockholm Univ. (Sweden). Dept. of Geology.
F. A. Schippel, R. O. Hallberg, L. E. Bagander, and A. G. Engvall.
AMBIO, Vol. 1, No. 2, p 71-72, April 1972. 6 ref.

Descriptors: *On-site data collections, *Geochemistry, *Sediment-water interfaces, *Phosphates, *Hypolimnion, On-site investigations, Anaerobic conditions, Degradation (Decomposition), Methodology, Aerobic conditions, Organic matter, Water pollution sources, Sampling, Model studies, Nutrients, Physicochemical properties, Hydrogen sulfide, Methane, On-site tests, Hydrogen ion concentration, Oxidation-reduction potential, Water temperature, Nitrites, Nitrates, Ammonia, Sulfides, Sulfates.
Identifiers: *Baltic Sea, Accumulation.

Accumulation processes in the bottom water of the Baltic Sea were simulated in order to obtain experimental data for computer simulation and prediction of the increase of the phosphate content of the bottom water and to obtain similar data for other substances. The experiments were performed in situ with a closed system apparatus, a plexiglass box. Sampling and other procedures took place through self-sealing rubber membranes. The boxes were equipped with electrodes for obtaining measurements of hydrogen ion activity (pH), redox potential (Eh) and sulphide ion activity (Es). The measurements were recorded continuously at a floating laboratory. Fourteen systems were in operation to study the effect of different additions of sulfate and organic matter at different temperatures. Reducing conditions were attained within the first 15 days of the experiment with decreases in sulfate, nitrate, nitrite, pH, Eh, Es. After 14 days when all the oxygen consumed, the aerobic organisms will die, the anaerobic bacteria will dominate the conditions in the closed boxes, and hydrogen sulphide, ammonia, methane and carbon dioxide will be produced during the decomposition of organic matter and the reduction of sulphate. Experiments where light was not admitted into the box gave the same results as those where light was admitted. Since the anaerobic bacteria are heterotrophic, the flux of mineral nutrients will principally depend on the amount of decomposable organic matter available. The effect of organic matter on the deep oxygen-free bottoms of the Baltic, which consist of nearly the same type of sediment as those studied, can therefore be simulated in the type of experiments that were conducted. Moreover, oxygenated conditions can be studied in a similar way. (Long-Battelle)
W72-14302

IDENTIFICATION OF N,O-DIMETHYHYDROXYLAMINE AS A MICROBIAL DEGRADATION PRODUCT OF THE HERBICIDE, LINURON,
Technische Hochschule, Munich (West Germany); and Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, Munich (West Germany).
G. Engelhardt, P. R. Wallnofer, and R. Plapp.

Descriptors: *Herbicides, *Microbial degradation, Chlorinated hydrocarbon pesticides, *Pollutant identification, Pesticide removal, Halogenated pesticides, Gas chromatography, Water pollution effects, Separation techniques.
Identifiers: *Bacillus sphaericus, *N,O-Dimethylhydroxylamine, *Linuron, Thin layer chromatography, Flame ionization gas chromatography, Substrate utilization, Fate of pollutants, 2 4-dinitro-1-fluorobenzene, 3- (3 4-dichlorophenyl)-1-methoxy-1-methylurea, 3 4-dichloroaniline.

Bacillus sphaericus, grown in the presence of linuron, produced as degradation products 3,4-dichloroaniline, carbon dioxide, and an unidentified product described as N,O-dimethylhydroxylamine (MHA). Linuron, 50 micrograms in 1.5 ml of phosphate buffer (pH 7.5), was incubated with 0.5 ml of cell free extract for 20 hr at 37 degrees C, and 95 percent of the linuron was degraded. MHA was identified by thin-layer chromatography and flame ionization gas chromatography. (Long-Battelle)
W72-14304

MICROBIOLOGY-DETECTION AND OCCURRENCE OF VIRUSES,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W72-14305

ION-EXCHANGE, COORDINATION, AND ADSORPTION CHROMATOGRAPHIC SEPARATION OF HEAVY-END PETROLEUM DISTILLATES,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
D. M. Jewell, J. H. Weber, J. W. Bunger, H. Plancher, and D. R. Latham.
Analytical Chemistry, Vol. 44, No. 8, p 1391-1395, July 1972. 2 fig, 2 tab, 13 ref.

Descriptors: *Separation techniques, Acids, Chemical analysis, Organic compounds, Pollutant identification, Cation exchange, Anion exchange, Mass spectrometry, Alkalis (Bases), Methodology, Aromatic compounds, Inorganic compounds, Oil.
Identifiers: *Crude oil, *Petroleum distillates, *Waste characterization, Aromatic hydrocarbons, Saturated hydrocarbons, Adsorption chromatography, Petroleum fractions, Mass spectra, Ion exchange chromatography, Coordination chromatography, Sample preparation, Column chromatography, Complexation, Polar compounds, Recovery, Ion exchange resins.

A separation scheme is described that divides heavy end petroleum distillates into acid, base, neutral-nitrogen, saturated and aromatic fractions and allows the removal of 'polar' nonhydrocarbon compounds. The acid and base fractions are removed by anion-and cation-exchange chromatographic techniques while the neutral-N fraction is obtained by coordination-complex formation with FeC13 on Attapulgus clay (ferric chloride coordination chromatography). Non-polar hydrocarbons are separated into saturate and aromatic fractions by adsorption chromatography using silica gel. The chromatographic methods have been applied to Wilmington, Wasson, Gato Ridge, Red Wash, and Recluse crude oils with good reproducibility (plus or minus 4 percent) and recovery (96 percent weight or better). Data are also presented from mass spectral analysis of saturate and aromatic fractions. (Mackan-Battelle)
W72-14306

NUCLEAR MAGNETIC RESONANCE SPECTROMETRY OF PETROLEUM FRACTIONS. CARBON-13 AND PROTON NUCLEAR MAGNETIC RESONANCE CHARACTERIZATIONS IN TERMS OF AVERAGE MOLECULE PARAMETERS,
Gulf Research and Development Co., Pittsburgh, Pa.
D. R. Clutter, L. Petrakis, R. L. Stenger, Jr., and R. K. Jensen.
Analytical Chemistry, Vol. 44, No. 8, p 1395-1405, July 1972. 10 fig, 6 tab, 6 ref.

Descriptors: *Nuclear magnetic resonance, Oil, Spectrometers, Chemical analysis, Pollutant identification, Carbon radioisotopes, Organic compounds, Aromatic compounds.
Identifiers: *Petroleum fractions, *C-13, Aromatic hydrocarbons, Alkanes, Alkenes, Petroleum distillates, Oil characterization, Paraffins.

Compositional characterization of petroleum distillates has been achieved by use of a modified Varian HA-60IL spectrometer, which provides CW carbon-13 nuclear magnetic resonance analysis with proton noise decoupling in the internal lock mode. Characterization was made in terms of up to 15 'average molecule' parameters for petroleum fractions such as: n - the average number of C atoms/alkyl substituent; R sub A - average number of aromatic rings/average molecule; and R sub S - the average number of alkyl groups/average molecule. The technique has been applied to several FCC charge stocks but their applicability is much wider. The advantages are: (1) they provide direct and accurate values of 'aromaticity' of a fraction, and (2) they afford excellent characterization of complex, multicomponent fractions as based on 'average molecule' parameters. (Mackan-Battelle)
W72-14307

AN EVALUATION OF THE GASPAK SYSTEM IN THE CULTURE OF ANAEROBIC BACTERIA,
Edinburgh Univ. (Scotland). School of Medicine.
J. G. Collee, B. Watt, E. B. Fowler, and R. Brown.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 71-82, March 1972. 3 fig, 6 tab, 22 ref.

Descriptors: *Cultures, *Anaerobic bacteria, *Methodology, Evaluation, Laboratory tests, Efficiencies, Gases, Measurement, Water pollution, Pollutant identification, Aqueous solutions, Incubation, Manometers, Pressure, Hydrogen, Carbon dioxide, Catalysts, Gages, Clostridium.
Identifiers: *Gaspak anaerobic procedure, Recovery, Spread plate method, Anaerobic jar procedure, Clostridium histolyticum, Clostridium bifermentans, Clostridium butyricum, Clostridium septicum, Vacuum gauges, Clostridium novyi, Phase contrast microscopy, Clostridium pedematiens, Clostridium sporogenes, Clostridium tetani, Bacteroides fragilis, Clostridium chauvoei, Bacteroides necrophorus, Clostridium welchii, Clostridium perfringens.

The efficiency of the Gaspak-system in comparison with a standard anaerobic jar procedure was investigated. The Gaspak envelope was prepared and its contents placed into a jar for incubation. Commercial vacuum gauges, simple mercury manometers, and large manometers were used for measurement of pressures, and the evolution of gas was measured in separate water displacement studies. Total counts of bacteria were performed by phase contrast microscopy and viable counts with a spread plate method. Comparable results were obtained with the commercially available disposable system for the production of H2 and CO2 in an anaerobic jar (the Gaspak system) and with the standard anaerobic jar procedure. Both systems were used with the Baird and Tatlock anaerobic jar and a room temperature catalyst. The test organisms included strict anaerobes such as Clostridium oedematiens type D and Cl. tetani. Comparative tests were also made with Bacteroides species from laboratory stock cultures and with freshly isolated strains of Bacteroides. On occasion, higher recoveries were obtained with the standard system when relatively demanding models were set up but it has limitations, having been developed initially for research purposes. The Gaspak system probably gives more reliable and more reproducible results in a laboratory in which experience with strict anaerobes is limited or sporadic. (Byrd-Battelle)
W72-14308

AN APPARATUS FOR DOSING LABORATORY FERMENTERS WITH SUSPENSIONS,
West of Scotland Agricultural Coll., Auchincruive (Scotland). Dept. of Bacteriology.
J. D. Owens, and M. R. Evans.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 91-97, March 1972. 4 fig, 1 tab, 2 ref.

Descriptors: *Instrumentation, *Laboratory equipment, *Cultures, Design, Fermentation, Slurries, Automatic control, Dissolved oxygen, Microbiology, Suspended solids.
Identifiers: Culturing vessels, Performance evaluation, Culture media.

The construction and operation of an apparatus for dosing laboratory fermenters semicontinuously with suspensions is described. The

paratus periodically measures a volume of slurry and then injects it into the fermenter. A control unit determines how often the cycle of operations is performed. In order to determine the amount of variation in the concentration and volume of the aliquots of suspension delivered by the dosing unit, successive amounts were collected in flasks and the concentration of total solids was determined after drying at 105 degrees. To find out whether the volume delivered changed due to build up of material on the internal surfaces of the measure over a 24 h period, delivered volumes were collected on each of 2 successive days. The concentration of the suspension was measured at the start and the end of the trial to check that it had not changed. The results of the trial showed that the coefficient of variation for the concentrations of the delivered samples was 4.3 percent and that the mean concentration of the delivered suspension did not differ significantly from that ot the suspension in the reservoir. The coefficient of variation for the volumes of the aliquots was 3.3 percent and the mean volume delivered was similar on both days of the trial. (Snyder-Battelle)
W72-14309

A METHOD FOR THE RAPID ENUMERATION OF MYCOPLASMA SPECIES GROWING IN BROTH CULTURE,
East African Veterinary Research Organization, Kabete (Kenya).
R. S. Windsor, and C. D. H. Boarer.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 37-42, March 1972. 1 fig, 1 tab, 16 ref.

Descriptors: *Methodology, *Cultures, *Measurement, Microorganisms, Spectrophotometry, Pollutant identification, Freeze-thaw tests.
Identifiers: *Mycoplasma spp, *Enumeration, Culture medLactate dehydrogenase, Mycoplasma mycoides var mycoides.

The relationship of the mean lactate dehydrogenase (LDH) content of each organism to the number of viable organisms present proved to be a suitable method for the enumeration of Mycoplasma spp. in a growing culture. Newings tryptose broth and tryptose-serum agar were used for diluting organisms and for colony counts, respectively. The previously described method for determining LDH in cultures required spectrophotometric measurements of the decrease in absorption at 366 nm of NADH when it was oxidized by LDH in the presence of sodium pyruvate. Measurements of LDH were made on aliquots of the culture before and after disruption was only of value when cells were growing in the logarithmic phase. (Long-Battelle)
W72-14310

FLUORESCENT SPECTROPHOTOMETRY IN THE IDENTIFICATION OF BACTERIA,
Food and Drug Administration, Brooklyn, N.Y.
L. Ginell, and R. J. Feuchtbaum.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 9-36, March 1972. 7 fig, 7 ref.

Descriptors: *Pollutant identification, *Bacteria, Fluorescent dye, *Mapping, Fluorescence, Spectrophotometry, E. coli, Analytical techniques, Methodology, Salmonella, Enteric bacteria, Wavelengths, Chemical reactions.
Identifiers: *Fluorescence spectrophotometry, Detection, Sarcina lutea, Acridine orange, Proteus mirabilis, Salmonella binza.

A fluorescent spectrophotometric technique for identifying bacteria involves using emission wavelength, excitation wavelength, and intensity to produce a topographic map characteristic of the fluorescence of the chemical bonds. Bacteria that had been cultured, washed, centrifuged and resuspended in phosphate buffer were analyzed using a spectrophotofluorometer. The raw curves obtained were used to construct spectrofluorometric maps by recording successive scans of intensity versus emission wavelength for intervals of 10 nm in excitation wavelengths of 200-800 nm. Data obtained with Escherichia coli and Sarcina lutea showed the fluorescent portions of the bacteria to be inherently alike; however, upon dyeing with acridine orange, the differences (deviations in bonding) became apparent. This verifies the fact that dyes, such as acridine orange, can be used for enhancement of differences between species. Various improvements in the technique are presented. (Snyder-Battelle)
W72-14311

ON PRODUCTIVITY ESTIMATIONS OF RIVER WATER SAMPLES BY MEANS OF ALGAE TEST PROCEDURES,
Jena Univ. (East Germany). Biology Section.
For primary bibliographic entry see Field 05C.
W72-14314

THE IDENTIFICATION OF STREPTOCOCCI BY GAS-LIQUID CHROMATOGRAPHY,
Manchester University (England).
D. B. Drucker.
Microbios, Vol. 5, No. 18, p 109-112, March/April 1972. 1 tab, 20 ref.

Descriptors: *Streptococcus, *Pollutant identification, Gas chromatography, Separation techniques, Cultures, Esters, Isolation, Lipids, Organic compounds, Methodology, Aerobic bacteria.
Identifiers: *Gas liquid chromatography, *Waste characterization, Anteiso pentadecacanoate, Oleate, Stearate, Palmitoleate, Palmitate, Methylation (Chemical).

Ten strains of Streptococcus were identified by gas-liquid chromatographic (GLC) analysis which revealed patterns characteristic of fatty acid methyl esters produced by individual strains. Cells were grown on oxoid brain-heart infusion, with glucose as the carbon source. After growth, methyl esters of cells were produced by sealing 10 mg dry cells and 1 ml methylating reagent into ampoules under vacuum and heating to 100 degrees C for 3 hrs. Methyl esters were then extracted with 10 ml petroleum spirit (40-60 degrees C), and 3-microliter samples were analyzed by gas-liquid chromatography. (Long-Battelle)
W72-14316

PRODUCTIVITY OF THE BENTHIC MICROFLORA OF SHOAL ESTUARINE ENVIRONMENTS IN SOUTHERN NEW ENGLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W72-14317

ON THE DEPOSITION AND DISSOLUTION OF ZINC IN ALKALINE SOLUTIONS,
Pennsylvania Univ., Philadelphia. Electrochemistry Lab.
For primary bibliographic entry see Field 05B.
W72-14322

PHYSIOLOGICAL AND MORPHOLOGICAL EFFECTS OF PHENETHYL ALCOHOL UPON A GRAM-NEGATIVE MARINE PSEUDOMONAD,
Macdonald Coll., Sainte Anne de Bellevue (Quebec). Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-14323

A STUDY OF THERMOPHILIC AEROBIC SPOREFORMING BACTERIA ISOLATED FROM SOIL AND WATER,
Missouri Univ., Columbia. Dept. of Food Science and Nutrition.
For primary bibliographic entry see Field 05C.
W72-14324

APPARATUS FOR CONTINUOUS MEASUREMENT OF ACTIVE UPTAKE OF RADIOACTIVE SUBSTANCES,
Regensburg Univ. (West Germany).
E. Loos.
Analytical Biochemistry, Vol 47, No 1, p 90-101, May 1972. 6 fig, 1 tab, 8 ref.

Descriptors: *Laboratory equipment, *Radioisotopes, *Measurement, *Kinetics, *Absorption, Instrumentation, Radioactivity techniques, Carbon radioisotopes, Productivity, Metabolism, Fungi, Organic compounds, Chlorella, Tracers, Aquatic algae.
Identifiers: C-14, *Chlorella vulgaris, Neurospora crassa, Scintillation counting, Glucose, Membrane filters, Monosaccharides, Membrane filtration.

An apparatus consisting of a modified scintillation chamber, sample cell, and an end-on photomultiplier has been used to study the uptake kinetics of radioactive compounds (C-14-labelled 3-O-Methyl-D-glucose) by Chlorella vulgaris and conidia of Neurospora crassa. The apparatus is constructed so that the cells are held in a thin layer close to the scintillation crystal with the nutrient medium diffusing from above through a membrane filter. The medium is constantly stirred to minimize concentration gradients developed during uptake. Uptake rates are seen as an increase of measured radioactivity in the cells. For Chlorella a K sub m of 0.6 mM was found for the uptake. Parallel experiments with the membrane filter technique show good agreement and can be used to calibrate the apparatus. A diagram of the apparatus accompanies the description. (Mackan-Battelle)
W72-14326

ISOLATION AND CHARACTERIZATION OF ULTRAVIOLET LIGHT-SENSITIVE MUTANTS OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
Y. Asato.
Journal of Bacteriology, Vol 110, No 3, p 1058-1064, June 1972. 8 fig, 20 ref.

Descriptors: *Isolation, *Ultraviolet radiation, Separation techniques, Cyanophyta, Cultures, Antibiotics (Pesticides), Photoactivation, Aquatic algae, Environmental effects.
Identifiers: *Waste characterization, *Anacystis nidulans, *Mutants, *Sensitivity, Chloramphenicol, Recovery, Survival.

Three UV-sensitive mutants of the blue-green alga, Anacystis nidulans were isolated and characterized as to their ability to repair UV damage (photoreactivation). UV light-sensitive mutants, prepared by subjecting cells to UV radiation and replating the survivors, were isolated for study by treating exponential cultures with N-methyl-N'-nitro-N-nitrosoguanidine followed by centrifugation. The photoreactive ability of various A. nidulans mutants was determined under a variety of conditions which included exposing cells to chloramphenicol, caffeine, black and white fluorescent lights, and red lights. Strain uvs-1 was most sensitive to UV in the absence of photoreactivation. Pretreatment with caffeine suppressed the dark-survival curve of strain uvs-1, indicating the presence of excision enzymes involved in dark repair. Under 'black' and 'white' illumination, strain uvs-1 displayed photoreactivation properties nearly comparable to wild-type culture. Mutants uvs-35 and uvs-88 appeared to have partial photorecovery capacities. Upon pretreatment with chloramphenicol, photoreactivation properties of strains uvs-1 and uvs-88 were not evident although the partial photoreactivation characteristics of strain uvs-35 remained the same. Data indicate

that strains uvs-1, uvs-35, and uvs-88 are probably genetically distinct UV-sensitive mutants. (Long-Battelle)
W72-14327

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - I. PRESSURE,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 07B.
W72-14330

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - II. SPEED,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 07B.
W72-14331

THE CALIBRATION OF THERMISTORS OVER THE TEMPERATURE RANGE 0-30 DEGREES C,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 07B.
W72-14332

INTERACTIONS OF LIGHT AND INORGANIC NITROGEN IN CONTROLLING NITROGEN UPTAKE IN THE SEA,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W72-14333

INSTRUMENTATION FOR OCEANOGRAPHIC RESEARCH,
For primary bibliographic entry see Field 07B.
W72-14340

USE OF FIBER OPTICS IN THE STUDY OF CHEMILUMINESCENT REACTIONS,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
R. L. Brown.
The Review of Scientific Instruments, Vol 43, No 5, p 756-758, May 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Instrumentation, *Measurement, Chemical reactions, Calibrations, Light, Mathematics, Nitrogen, Methodology, Optical properties, On-site data collections, Attenuation.
Identifiers: *Fiber optics, *Chemiluminescence, Electron paramagnetic resonance spectroscopy, Detectors, Sensors.

The use of stationary light pipes and a stationary detector to measure light decay along a tube in a steady state flow system is described. This method exhibits a number of advantages over that of moving the detector. A means of calibrating the transmission of the light pipes in situ by using the properties of the yellow nitrogen afterglow is discussed. The high degree of spatial resolution achievable by this technique should make it especially suitable for studies of small flames and discharges. (Long-Battelle)
W72-14344

A HIGH PRESSURE OPTICAL CELL FOR STUDY OF BIOCHEMICAL SOLUTIONS,
Columbia Univ., New York. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02K.
W72-14345

SILICON, RADIUM, THORIUM, AND LEAD IN SEAWATER: IN-SITU EXTRACTION BY SYNTHETIC FIBRE,
Tata Inst. of Fundamental Research, Bombay (India).
For primary bibliographic entry see Field 02K.
W72-14353

SHIPBOARD ANALYSIS OF STRONTIUM-90 IN SEAWATER ON GEOSECS II,
W. J. Major, K. D. Lee, and R. A. Wessman.
Earth and Planetary Science Letters, Vol 16, No 1, p 138-140, September 1972. 1 tab, 4 ref.

Descriptors: *Water analysis, *Strontium radioisotopes, *On-site laboratories, Data collections, Sampling, Oceanography, Water chemistry, Radiochemistry, Tracers, Laboratory tests, Pollutant identification.

Strontium-90 in seawater samples was analyzed aboard the USS Knorr by direct extraction of the Y-90 daughter. The extraction was made in two 17-gallon heavy-walled glass bottles. Yttrium carrier was added and the Y-90 was extracted with HDEHP in toluene, back-extracted with HCl, and purified with a second HDEHP extraction. The Y was mounted as the oxalate and counted in a methane end window system. Check analyses were performed in a shore-based laboratory equipped with low background beta counters. The results of the sea and shore analyses were consistent within the limits of error. The test demonstrates that Sr-90 analyses can be performed satisfactorily at sea, and that a better equipped laboratory and counting facility would improve the performance considerably. (Knapp-USGS)
W72-14356

INDUSTRIAL WASTEWATER DISCHARGES.
New York State Dept. of Health, Albany. Div. of Pure Water.

June 1969. 60 p, 4 fig, 11 tab.

Descriptors: *Water sampling, *Water quality control, *New York, *Industrial wastes, *Water pollution, *Waste water disposal, Water quality standards, Analytical techniques, Water pollution control, Waste water (Pollution), Waste disposal wells.

Along with industry's right ot clean water comes their responsibility to return waste water in a condition that allows its continued use. This publication serves as a guide for local health departments and industries in New York State to set up and implement a program for measuring and reporting the extent of the pollution caused by their waste water discharges. Included are sections on selected analyses for surface water discharge and groundwater discharge, analytical procedures, New York laws on water pollution, and water quality standards. (Poertner)
W72-14444

THE ANALYSIS OF AROMATIC COMPOUNDS IN WATER USING FLUORESCENCE AND PHOSPHORESCENCE,
New Hampshire Univ., Durham. Water Resources Research Center.
D. W. Ellis.
Available from National Technical Information Service as PB-212 268, $3.00 in paper copy, $0.95 in microfiche. Completion Report, New Hampshire Water Resource Research Center, Durham, June 1972. 73 p, 12 fig, 21 tab. OWRR A-009-NH (4).

Descriptors: *Aeromatic compounds, *Fluorescence, Analytical techniques, Air pollution, Extraction, Separation techniques, Gas chromatography, Mass spectrophotometry.
Identifiers: *Polynuclear aromatic hydrocarbons, *Phosphorescence.

The presence of small amounts of polynuclear aromatic hydrocarbons (PNA) in many areas of the environment has focused attention on the development of improved analytical measurements for their determination. Much of this interest can be attributed to the fact that a substantial number of PNA have been shown to be highly carcinogenic. The major source of PNA in the environment is the incomplete combustion of coal and other fuels. As such PNA compose a significant percentage of chimney soot and coaltar pitch. Trace amounts of PNA have been found in association with a wide variety of other substances throughout the environment. Although most of these sources, such as airborne particulate matter or cigarette smoke, can be traced directly or indirectly to incomplete combustion, there is sufficient evidence to demonstrate that trace amounts of PNA are synthesized by naturally occurring organisms. The presence of PNA in air particulates has been firmly established and it is reasonable to assume that some are transported into the natural water system.
W72-14541

CHEMICAL STUDIES ON TOXINS FROM GYMNODINIUM BREVE AND APHANIZOMENON FLOS-AQUAE,
New Hampshire Univ., Durham. Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.
W72-14542

THE FRAUNHOFER LINE DISCRIMINATOR: AN AIRBORNE FLUOROMETER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14613

LOSS OF MERCURY FROM WATER DURING STORAGE,
Environmental Health Lab., McClellan AFB Calif.
R. V. Coyne, and J. A. Collins.
Analytical Chemistry, Vol 44, No 6, p 1093-1096 May 1972. 19 ref.

Descriptors: *Mercury, *Laboratory tests *Sampling, *Water analysis, Water pollution.
Identifiers: *Mercury losses, *Sample storage *Sample preservation, Polyethylene sample containers, Data interpretation, Nitric acid preservation.

There is no doubt that reported sensitivities fo mercury in the parts per billion range are possibl from a strictly analytical standpoint. However, a early as 1941, reference was made to adsorption o mercuric ions from dilute solutions onto glass su faces, but no data were presented to support th statement. Data are presented on the stability o dilute solutions of mercury stored in polyethyler bottles and the rate of loss under routine cond tions of sample handling is described. The loss of mercury can be severe, possibly leading to se ous misinterpretations of the actual condition Since error in this case is always on the low side, would seem appropriate to recommend extren caution in the interpretation of results from water sample over seven days old unless the sar ple handling conditions are accurately known. (the preservatives studied, nitric acid to a final p of 1 (about 10 ml/l of sample) seems to be the on one that is effective to any significant degre (Oleszkiewicz-Vanderbilt)
W72-14620

LEVELS OF ANTIMONY, CADMIU CHROMIUM, COBALT, MANGANESE, A ZINC IN INSTITUTIONAL TOTAL DIETS,
Food and Drug Administration. Cincinnati, Ohio
G. K. Murthy, U. Rhea, and J. T. Peeler.
Environmental Science and Technology, Vol No 5, p 436-442, May 1971. 1 fig, 6 tab, 35 ref.

Descriptors: *Foods, *Heavy metals, *Cadmium, *Chromium, *Cobalt, *Manganese, *Zinc, *Diets, Trace elements, Sampling.
Identifiers: *Institutional total diet, *Antimony, *Body burden, Atomic absorption spectroscopy, Food consumption.

The average trace element content in the diets of children, aged 9 to 12, from different institutions, expressed as mg/kg of food, varied. Values were: antimony, 0.209 to 0.693; cadmium, 0.027 to 0.062; chromium, 0.175 to 0.472; cobalt, 0.252 to 0.693; manganese, 0.535 to 1.639; and zinc, 2.67 to 6.36. Similarly, the consumption of food varied from 1.18 to 2.55 kg/day and the milk content of diet varied from 9.5 to 63.8%. Statistical analyses of the data (mg/day) showed significant seasonal and geographical variations among the 28 U.S. cities sampled. The samples from Palmer, Alas., and Salt Lake City, Utah, had the lowest trace element concentrations, whereas the concentrations in those from Tampa, Fla., and Jackson, Miss., were consistently high. Monthly averages for all elements showed that cadmium was constant throughout the year and the other elements tended to peak in late spring or summer. The institutions ranged from well-to-do boarding schools to orphanages with severe economic limitations. (Oleszkiewicz-Vanderbilt)
W72-14622

DETERMINATION BY GAS LIQUID CHROMATOGRAPHY OF PHYSIOLOGICAL LEVELS OF CHROMIUM IN BIOLOGICAL TISSUES,
Vanderbilt Univ., Nashville, Tenn. School of Medicine.
G. H. Booth, and W. J. Darby.
Analytical Chemistry, Vol 43, No 7, p 831-834, June 1971. 3 fig, 2 tab.

Descriptors: *Chromium, *Gas chromatography, *Analytical techniques, Laboratory tests, *Pollutant identification.
Identifiers: *Laboratory procedures, *Biological tissues, Liver, Extraction procedures, Chromium recovery, Chromium concentration.

A gas-liquid chromatographic method for the analysis of chromium in complex biological tissues such as liver is presented. Following wet digestion of tissue, chromium is chelated with trifluoroacetylacetone and this complex analyzed in a gas-liquid chromatograph equipped with electron capture detectors. Minimal detectable concentration of Cr in liver is less than 20 ng Cr/g tissue. Recovery of added inorganic chromium or Cr51 from liver averaged 95%. This analytical method is applicable to a variety of tissues and permits determination of Cr in tissuesat levels encountered in physiological and deficiency states. (Oleszkiewicz-Vanderbilt)
W72-14624

TRACE METAL CHARACTERIZATION BY ANODIC STRIPPING VOLTAMMETRY,
Michigan Univ., Ann Arbor. School of Public Health.
F. H. Mancy.
Paper presented 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-, 1972. Paper No 7, Section A, Session 13, June , 1972. 10 p, 4 fig, 14 ref.

Descriptors: *Metals, *Analytical techniques, Electrochemistry, *Trace elements, Laboratory tests, Heavy metals, Aquatic environment, *Pollutant identification.
Identifiers: *Anodic stripping voltammetry, Trace metals, *Differential techniques, *Electroanalytical techniques, ASV titration techniques, Metals interactions, Voltammogram, Labile metal complexes, Nonlabile complexes.

Among the various methods of metals analysis, electroanalytical procedures offer both advantages of in situ measurement and species characterization. In addition, they offer: (a) high sensitivity required for trace analysis, e.g. Anodic Stripping Voltammetry (ASV), (b) suitability for field operation and, (c) suitability for automation. Analytical feasibility of ASV for trace metal characterization in the aquatic environment is illustrated. The arbitrary classification of metal, into 'free', 'labile complexes' and 'nonlabile complexes' cannot be considered as a true metal specification. Yet it can be used to advantage to give an insight into whether the metals of interest are present in free or complex form and what are the rates and magnitudes of metal complex formation. This is particularly useful in estimating the rates and amounts of metal binding by certain organics in natural and waste waters and the competitive interactions between metals for organic complex formation. The use of differential ASV techniques with four-electrode systems makes the techniques more adaptable for environment measurement. The ability to measure in the presence of dissolved oxygen and background current compensation extend the use of ASV techniques to in situ analysis and continuous monitoring applications. (Oleszkiewicz-Vanderbilt)
W72-14626

A METHOD FOR ENVIRONMENTAL MERCURY POLLUTION CONTROL IN DEVELOPING AREAS,
Aarhus Univ. (Denmark). Inst. of Hygiene.
J. C. Hansen.
Presented at 6th International Water Pollution Research Conference, Jerusalen, Israel, June 18-23, 1972. Paper No 11, Session 6, Section C, June 20, 1972. 7 p, 1 fig, 4 tab, 29 ref.

Descriptors: *Mercury, *Laboratory tests, *Bioassay, Water pollution sources, Foods, Mortality, *Pollutant identification.
Identifiers: *Microbiological bioassay, *Antibacterial effect, *Dose-mortality curve, Methylmercury, Spectroscopy, Dilution technique, Dithizone extraction.

Highly technical or expensive methods for Hg analysis, such as neutron-activation-analysis or flameless atomic absorption are available to only a few laboratories. A method based upon microbiological testing permits analyses in the nanogram area with sufficient precision to serve as a screening test for mercury. Primary control can be decentralized and the tests can be carried out by laboratories which possess general bacteriological equipment. The principles of the method, based on maximum mortality effect on a Pseudomonas strain in varying dilutions are explained. The sample is wet ashed, extracted with dithizone then with KI into the water phase, diluted, inoculated with bacterial cells, and cultivated on Simon's citrate agar. The microbiological method permits the use of 10 g of organic material or 1 liter of water for the determination of 12.5 ng/g or 0.125 ng/ml mercury, and is thus suitable for foods, with a tolerance level of 50 ng/g as stated by FAO/WHO, and for environmental investigations. The method is compared with neutron-activation-analysis and spectrophotometric methods. Data on analysis of flour, kale powder, human hair and tissue of fish from different pollutional zones are presented. (Oleszkiewicz-Vanderbilt)
W72-14627

THE ENRICHMENT OF HEAVY METALS IN SUBMERGED PLANTS,
Ruhrverband, Essen (West Germany).
For primary bibliographic entry see Field 05C.
W72-14629

IMPROVEMENTS IN THE DETERMINATION METHOD OF METHYL MERCURY IN FISH TISSUES AND THE RATIO OF METHYL MERCURY TO TOTAL MERCURY IN FISH TISSUES,
Kanagawa Prefectural Environmental Control Center, Yokohama (Japan).
S. Fukui, K. Tanaka, S. Kanno, and T. Ukita.
Presented at 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-23, 1972. Paper No 27, Section C, Session 13, June 22, 1972. 9 p, 4 fig, 4 tab, 1 ref.

Descriptors: *Mercury, *Analytical techniques, *Laboratory equipment, Fish, Water pollution effects, Separation techniques, Pollutant identification.
Identifiers: *Methylmercury, *Total mercury, Laboratory procedures, *Fish tissue analysis, Atomic absorption, Automatic extraction apparatus, *Spearfish, *Albacore.

The experimental conditions necessary to obtain the correct results on the determination of the ratio of methylmercury to total mercury in fish tissues were found. Using papaine digestion, an automatic extraction procedure and the internal standard method, reproducibility can always be obtained in each step of the determination procedure. The step by step laboratory procedure for the new method has been presented, followed by a comparison between the FDA method and the modified method. In the FDA method, the recovery of mercury seems to be changed with each sample. The cause might be the emulsion formed in directly treating fish tissues with benzene. The modified method overcomes these difficulties. The recovery of mercury added to the fish tissue is almost always 90 plus or minus 2%. The ratio of methylmercury to total mercury in one sample of the spearfish was 80.3% and in albacore, 66.6%. (Oleszkiewicz-Vanderbilt)
W72-14630

MERCURY: ITS HISTORICAL PRESENCE IN NEW YORK STATE FISHES,
New York State Dept. of Environmental Conservation, Rome. Rome Pollution Lab.
For primary bibliographic entry see Field 05C.
W72-14632

ROTATING RING-DISK STUDY OF THE REDUCTION OF OXIDIZED PLATINUM BY MERCUROUS MERCURY AND ITS ADSORPTION ON REDUCED PLATINUM,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-14634

CHEMICAL METHYLATION OF INORGANIC MERCURY WITH METHYLCOBALAMIN, A VITAMIN B12 ANALOG,
Tokyo Univ. (Japan). Faculty of Pharmaceutical Sciences.
For primary bibliographic entry see Field 05B.
W72-14635

GAS CHROMATOGRAPHIC DETERMINATION OF ORGANIC MERCURY COMPOUNDS BY EMISSION SPECTROMETRY IN A HELIUM PLASMA,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
C. A. Bache, and D. J. Lisk.
Analytical Chemistry, Vol 43, No 7, p 950-952, June 1971. 1 fig, 3 tab, 38 ref.

Descriptors: *Gas chromatography, *Mercury, Spectroscopy, Fish, Analytical techniques, Laboratory tests, *Pollutant identification.
Identifiers: *Methylmercury, Helium plasma.

The gas chromatographic detection of organic compounds containing sulfur, phosphorus, and halogens by emission spectrometry in a

microwave powered inert gas plasma was devised by McCormack et al. The technique was extended here for the determination of organic mercury compounds. Gas chromatographic operating parameters are listed in a table. Preliminary testing for total mercury was done with atomic emission spectrometry. Analysis of methylmercury on Lake Erie Coho salmon is made. The percentage recoveries agree with those of Westoo who found approximately a 30 percent loss of methylmercuric salts in this procedure due to unfavorable partition coefficients. The estimated sensitivity of the method for methylmercuric chloride in fish is about 0.05 to 0.1 ppm depending on the control value. (Upadhyaya-Vanderbilt)
W72-14636

MERCURY POLLUTION: THE MAKING OF AN ENVIRONMENTAL CRISIS,
Massachusetts Inst. of Tech., Cambridge. Lab. of Nuclear Science.
For primary bibliographic entry see Field 05C.
W72-14637

THEORY AND USE OF ION-SPECIFIC ELECTRODES (IONENSPEZIFISCHE ELEKTRODEN--THEORIE UND ANWENDUNG),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
H. Baumung.
In: Methodik der Untersuchung von Abwasser und Vorfluter, Munchen und Wien, p 271-283, 1971. 4 fig, 1 tab, 37 ref.

Descriptors: *Analytical techniques, *Measurement, *Equipment, *Electrodes, *Ions, Theoretical analysis, Application equipment, *Pollutant identification, Mineralogy, Sulfides, Magnesium.
Identifiers: Glass electrodes, Sulfide electrodes, Calcium electrodes.

Analytical measuring techniques have received new impetus due to the development of ion-specific electrodes. Regardless of this substantial increase, the development of these electrodes is still in the stage of infancy. New ion-specific electrode materials have been discovered and researched which will further the increase in the future. Experiments are underway to develop specific electrodes for analytically unique types of ions. The theory and application of ion-specific electrodes are discussed, including: glass electrodes for analysis of wastewater, receiving waters, minerals in estuaries, boiler plants and power stations; sulfide electrodes for sulfide and hydrogen sulfide determination in sediments; and calcium electrodes for determination of magnesium in seawater and for recording water hardness. (Brown-PAI)
W72-14667

ASPECTS TO BE CONSIDERED IN THE DETERMINATION OF TOTAL RADIOACTIVITY, ITS MEASURING AND SPECIAL BETA--SPECTROMETRIC PROCESS, (GESICHTSPUNKTE BEI DER PROBENAHME ZUR ERMITTLUNG DER GESAMT-RADIOAKTIVITAT, DEREN MESSUNG UND SPEZIELLE BETA--SPEKTROMETRISCHE VERFAHREN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
K. Hubel.
In: Methodik der Untersuchung von Abwasser und Vorfluter, Munchen und Wien, p 201-221, 1971. 12 fig, 1 tab, 15 ref.

Descriptors: *Radioactivity, *Spectrography, *Water quality, Hydrobiology, Metabolism, Absorption, Mud, Fish, Plant pathology, Pollutant identification.
Identifiers: alpha-radiation, beta-radiation, gamma-radiation, *beta-spectrometric process.

Methods to determine the total radioactivity of water samples using beta-spectrometric methods are discussed. Studies of surface water systems showed that water tests alone are not sufficient and a study of hydrobiological materials is imperative. Due to the metabolism and absorption of active nuclides that takes place, investigation of mud, fishes and water plants is necessary. Naturally as well as artificially induced radioactive isotopes, alpha, beta and gamma radiation are discussed. Cosmic radiation and nuclear reaction are not mentioned. Various techniques and equipment are described. (Brown-PAI)
W72-14668

INVESTIGATIONS INTO THE DISTRIBUTION OF INORGANIC NITROGEN COMPOUNDS IN RELATION TO THE INCREASING DETERIORATION OF THE WATER IN THE BALTIC SEA (UNTERSUCHUNGEN UBER DIE VERTEILUNG DER ANORGANISCHEN STICKSTOFFVERBINDUNGEN I M HINBLICK AUF DIE ZUNEHMENDE WASSERVERSCHLECHTERUNG IN DER OSTSEE),
Deutsche Akademie der Wissenschaften zu Berlin, Rostock (East Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 05B.
W72-14674

PETROLEUM: TAR QUANTITIES FLOATING IN THE NORTHWESTERN ATLANTIC TAKEN WITH A NEW QUANTITATIVE NEUSTON NET,
Dalhousie Univ., Halifax (Nova Scotia).
B. F. Morris.
Science , Vol 173, p 430-432, 30 July 1971. 2 fig, 2 tab, 8 ref.

Descriptors: *Oil pollution, Water pollution, Analytical techniques, Oily water, Oil spills, *Oil wastes, *Atlantic Ocean, *Pollutant identification.
Identifiers: *Tar, *Neuston net, Oil tar lamps.

The neuston net has been modified to obtain quantitative samples of surface zooplankton. Petroleum lumps are commonly taken with these nets, and quantities of tar up to almost 1.0 gm (wet weight) per cubic meter of filtered surface water have been taken in the northwestern Atlantic Ocean. This information is used to estimate the quantity of tar lumps present in the North Atlantic and to indicate the probable limits of the degree of existing oil pollution in this region. It is suggested that previous estimates of ocean oil pollution may be too low. (Svensson-Washington)
W72-14693

TISSUE CULTURE BIOASSAY METHOD FOR WATER POLLUTION WITH SPECIAL REFERENCE TO MERCURIC CHLORIDE,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
M. F. Li, and G. S. Traxler.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 501-505, 1972. 5 fig, 1 tab, 13 ref.

Descriptors: *Mercury, Water pollution, *Bioindicators, *Bioassay, Water quality, *Monitoring, Methodology, Public health, Aquatic environment, Aquatic life, Industrial wastes, Respiration, Cytological studies, *Pollutant identification, Industrial wastes, Municipal wastes.
Identifiers: *Mercuric chloride, Cell multiplication, Cell physiology.

The effect of HgC12 on multiplication and respiration of mouse cells (L-cells, clone 929) cultivated in suspension was studied. The nutritional history, growth phase and initial density of the cells, as well as the concentration of the serum supplement used in the test medium had significant effects on the sensitivity of the bioassay system. It was concluded that the cells used for the test should be i the stationary phase at an initial cell density of ap proximately 200,000/ml, and the test mediu should be free of fetal calf serum. Under these ex perimental conditions mercuric chloride at a cor centration of 10 micrograms/liter or less inhibite the cellular multiplication significantly; the result indicated that this assay procedure could b adequate for monitoring water quality. The cellu lar respiration method, however, was less sens tive, but simple and rapid with results availabl within a few hours. Therefore, they are useful fo screening or preliminary testing of heavily po luted samples. (Svensson-Washington)
W72-14700

WATER POLLUTION SURVEYS AS A GUID TO INDUSTRIAL POLLUTION CONTROL,
Canadian Industries, Ltd., Montreal (Quebec). En gineering Dept.
N. E. Cooke.
Water and Pollution Control, p 20-23, 50, Ma 1971. 4 fig, 6 ref.

Descriptors: *Bioindicators, *Pollutant identifica tion, *Benthic fauna, *Monitoring, Analytic techniques, *Water quality control, Invertebrate Aquatic animals, Baseline studies, Water pollu tion, Mathematical studies, Graphical method Least squares method, Oligochaetes, Mollusk Control systems.
Identifiers: Control charts, *Industrial pollutio monitoring, Analysis of variance, Chironomid Fly larvae.

Biological surveys based on the numbers of var ous types of invertebrate animals living in o square foot of the bottom sediments can be used indicate if some harmful material has entered th water. The general concept is that of the contr chart. Two types of charts have been develope One is for use in unpolluted water. The other is f use in rivers where upstream pollution is preser The mathematics involved in determining the co trol limits in both these cases is discusse (Svensson-Washington)
W72-14707

MONITORING OF ORGANO-CHLORI RESIDUES IN FISH FROM AROUND ENGLA AND WALES, WITH SPECIAL REFERENCE POLYCHLORINATED BIPHENYLS (PCBS),
Ministry of Agriculture, Fisheries and Foo Burhham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W72-14711

THE LEVELS OF CERTAIN METALS IN FI FROM COASTAL WATERS AROUND E GLAND AND WALES,
Ministry of Agriculture, Fisheries and Foo Burhham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05C.
W72-14712

BIOLOGICAL MONITORING OF THE I FLUENT FROM A LARGE CHEMICAL WOR IN A RIVER WHICH HAS SOURCES OF PO LUTION UPSTREAM,
Canadian Industries, Ltd. Montreal (Quebec). I gineering Dept.
N. E. Cooke, R. M. Cooper, and T. W. Beak.
Presented at Proceedings, 5th International Wa Pollution Research Conference July-August 19 p I-28/1 - I-28/6, Published in 1971. 2 fig, 4 ref.

Descriptors: *Bioindicators, *Pollutant identif tion, Water quality, *Benthic fauna, *Monitor Methodology, Analytical techniques, In tebrates, Aquatic animals, Water pollu sources, Graphical methods, Oligochaetes, M lusks, Control systems, Gastropods, Indus wastes, Effluents.

dentifiers: *Industrial pollution monitoring, Control charts, Chironomids, Fly larvae, St. Clair River.

An effluent from a new plant was being discharged nto the St. Clair River where there was already considerable pollution. To complicate the development of a system to monitor the effluent from the new plant, the existing pollution in the river was of a random nature indicating that there were intermittent discharges or spills of pollutants from upstream industries. To detect and recognize a meaningful signal in the presence of a large amount of static noise is a difficult task. That is what is accomplished by the method reported. The method of basing control charts on the differences n the number of animals found at stations upstream and downstream from the outfall being monitored permits one to detect a significant change caused by material discharge d through the outfall in spite of fluctuations in the number of animals caused by random discharges of polluting material discharged upstream. The method also clearly indicates those times where the changes in he number of animals have not been caused by discharges through the outfall being monitored but are only caused by other discharges upstream. (Svensson-Washington)
W72-14713

MONITORING MERCURY VAPOR NEAR POLLUTION SITES.
Environmental Measurements, Inc., San Francisco, Calif.

Copy available from GPO Sup Doc, $0.70; microfiche from NTIS as PB-212 370, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, May 1971. 66 p, 30 fig, 8 tab, 17 ref. EPA Program 16020 GLY 05/71.

Descriptors: Water pollution sources, *Mercury, Pollutant identification, *Analytical techniques, Surveys, Remote sensing, Prototype tests, *Air pollution, Distribution patterns, Measurement, California, Path of pollutants.
Identifiers: *Barringer Airborne Mercury Spectometer.

Field and laboratory measurements were made to demonstrate that mercury vapor in the air near Mercury-polluted water or sediment can be detected using an extremely sensitive detector, the Barringer Airborne Mercury Spectrometer. Areas were visited where the presence of mercury was known from fish, water, or sediment analyses; anomalous mercury levels ranging from 50 to more than 20,000 nanograms per cubic meter (ng/M3) were detected. Ambient air contained from 0 to 50 ng/M3. Anomalous concentrations of atomic mercury vapor in air may be classified as natural or man-made. The largest anomaly detected was natural, emanating from a steam vent at the Geysers, California. The second largest was man-made, and was measured downwind from a large chemical plant. Laboratory studies demonstrated that the mercury spectrometer is sensitive only to atomic mercury. By means of pyrolysis or combustion, organic compounds could be converted to metallic form and detected. To detect mercury pollution in water, pyrolysis appears necessary to convert combined mercury to the atomic state for measurement by rapid spectrophotometric techniques. (Eagle-Vanderbilt)
W72-14714

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
W. H. Funk, and D. C. Flaherty.
Photographic Applications in Science, Technology and Medicine, Vol 7, No 5, p 20-22, September 1972. 7 fig, 1 ref.

Descriptors: Surveys, *Aerial photography, Water pollution effects, Eutrophication, *Lakes, Algae, Infrared radiation, *Remote sensing, *Pollutant identification, Aquatic weeds, *Washington, *Chlorophyll, Water temperature, Alkalinity, Dissolved oxygen, Conductivity, Hydrogen ion concentration.
Identifiers: *Snake River (Wash).

The first step in aerial photographic studies of lakes has been to make an aerial photographic survey of the particular lake or reservoir which has been scheduled for investigation. This helps to give the investigators a comprehensive picture of the lake environment in terms of its drainage basin, surface outlets, aquatic growth, possible nutrient sources and size in relation to other hydrographic features of the area. This initial aerial survey is followed by or conducted simultaneously with infrared photography of the lake and its environs. One of the characteristics of this material is that the chlorophyl of living algae and aquatic weeds is captured on the film in vivid pinkish red hues, whereas dead algae or vegetation exhibit a whitish or yellowish orange appearance. Aerial reconnaissance has made it possible to survey eight to ten lakes in a two-state area in a single day. On sampling trips, light penetration, water temperature, dissolved oxygen, pH, alkalinity, and conductivity tests are made at various depths. Two-liter water samples are also collected for plankton and chemical analysis. A current project involving water quality surveillance is a study of 150 miles of the Lower Snake River drainage area located in southeastern Washington. Aerial photography shows that this stretch of the river is subjected to excessive runoff of topsoil shortly after the snow melts in the spring, and also during periods of high rainfall. (Knapp-USGS)
W72-14728

BEHAVIOR OF BERYLLIUM SULFATE IN HARD AND SOFT WATER,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05B.
W72-14744

NUTRIENT SURVEY OF SURFACE WATERS IN SOUTHERN FLORIDA DURING A WET AND A DRY SEASON, SEPTEMBER 1970 AND MARCH 1971,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14750

AN IMPROVED SEPARATION AND DETERMINATION OF URANIUM IN SEAWATER,
Hawaii Univ., Honolulu. Dept. of Chemistry; and Hawaii Inst. of Geophysics, Honolulu.
Gregory Leung, Young. S. Kim, and Harry Zeitlin.
Analytica Chimica Acta, Vol. 60, p. 229-232, 1972.

Descriptors: Separation techniques, *Sea water, Fluorescence, Surfactants, Fluorescent dye, Spectrophotometry, Anions, Trace elements, Analytical techniques.
Identifiers: *Uranium, Thorium-hydroxide.

Whether the use of thorium hydroxide coupled with the measurement of fluorescence intensity of the uranium-Rhodamine B complex would lead to improvement in recovery and increase in sensitivity of the determination of uranium in seawater was investigated. Fluorescence intensity was measured with a Beckman DU spectrophotometer with a fluorescence attachment. Flotation procedure separated the uranium; thorium nitrate solution was added to samples of filtered seawater containing uranium. The pH, around 5.7, was adjusted with 1 M hydrochloric acid and the sample was transferred to the flotation cell. Maximal recovery had been obtained at this pH in a comparable study. The sodium dodecyl sulfate surfactant failed to float the colloidal thorium hydroxide to the surface. A clean separation and stable froth were achieved by substitution of sodium dodecanoate as the surfactant. By use of sodium dodecanoate and thorium hydroxide the recovery of uranium from seawater based on that added was improved to about 91%. The absorption and fluorescence spectra are shown and the sensitivity of the two methods was compared; results indicate that fluorescence intensity gives better sensitivity. This study confirms a previous communication that adsorbing colloid flotation may be of general applicability for separation of many trace metallic ions through selection of the proper surfactant-collector from seawater. (Jones-Wisconsin)
W72-14798

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF POLYCHLORINATED BIPHENYLS,
National Institute of Environmental Health Sciences, Research Triangle Park, N.C.
For primary bibliographic entry see Field 05C.
W72-14804

THE VELOCITY DEPENDENCE OF THE TOTAL CROSS SECTION FOR ALKALI--WATER SCATTERING,
Connecticut Univ., Storrs. Inst. of Water Resources.
E. Pollack, and T. I. Moran.
Available from the National Technical Information Service as PB-212 362, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 3 p, 1 tab, 2 ref. OWRR A-023-CONN (2).

Descriptors: *Molecular structure, *Attenuation, *Ionization, *Potassium, *Cesium, Velocity, Deflection, Alkalinity, Alkaline water.
Identifiers: *Alkali water systems, *Atomic beam scattering, Beam velocity, Potential energy, Internuclear separation, *Rubidium.

The long range interactions between K, Cs, Rb atoms and water molecules were studied using atomic beam scattering techniques. The alkali beam was thermally generated, subsequently velocity filtered, and directed upon target water molecules. The ensuing collisions between the incident alkali atoms and water molecules result in a diminution of alkali beam intensity at the beam detector. Measurements of the amount of alkali beam attenuation resulting from collision (and deflection) of the alkali beam as a function of the beam velocity provides the experimental information from which is obtained the power of r in the expression for the interaction potential V (r)-c-/r to the s power. Results are reported for each of the alkali-water systems. The values of s are 6.00, 5.88 and 6.13 for K, Rb, and Cs respectively.
W72-14838

A CHEMICAL ANALYSIS OF THE EARTHY--MUSTY ODOR IN WATER,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. P. Collins.
Available from the National Technical Information Service as PB-212 365, $3.00 in paper copy, $0.95 in microfiche. Completion Report, July 1972. 3 p, 4 ref. OWRR A-032-CONN (1).

Descriptors: *Acetinomycetes, *Odor, *Gas chromatography, *Spectrophotometry, Microorganisms, Water quality, Chemical analysis.
Identifiers: *Streptomyces odorifer, 2-exo-hydroxy-2-methylbornane, Trans-1, 10-dimethyl-trans-decalol, Cadin-4-ene-l-ol, *Earthy-musty odor, Thames River salmon, Aroma-inducing constituents.

The earthy-musty odor complex induced by Streptomyces odorifer has been studied. The major aroma inducing constituents have been

identified as 2-exo-hydroxy-2-methylbornane, trans-1, 10-dimethyl-trans-decalol, and cadin-4-ene-1-ol. The identifications were based on gas chromatographic and thin-layer chromatographic procedures as well as infrared and mass spectrometry.
W72-14841

SOLUBILIZING EFFECTS OF AMIDE-WATER MIXTURES,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. E. Lindstrom.
Available from the National Technical Information Service as PB-212 367, $3.00 in paper copy, $0.95 in microfiche. Completion Report June 1972. 9 p, 1 tab, 4 fig. OWRR-A-049-CONN (1).

Descriptors: *Amino acids, *Aqueous solutions, *Peptides, *Solubility, Pesticides.
Identifiers: *Amides, *Amide-water mixtures, *Apparent molar volumes, *Methyl parahydroxybenzoate, *Dilatometry, Parabens, Dimerization, Solubility of nonelectrolytes.

The solubility of methyl paraben in various amide-water mixtures was measured at 25.0 degrees Centigrade. The paraben solubility increases exponentially above an amide concentration corresponding to the point at which the amide apparent molar volume passes through a minimum. A model for the observed phenomena was proposed on the basis of data from solvent systems which included sixteen amides and various of their aqueous mixtures. The model proposes the formation of amide aggregates which (i) increase in size and complexity with the amide concentration; and (ii) lead to a greatly enhanced solubilizing power for the binary amide-water co-solvent system.
W72-14843

POLLUTION INSTRUMENTATION TECHNIQUES,
Union Carbide Corp., South Charleston, W. Va.
L. G. Cochran, J. P. Gay, H. N. Hill, Jr., and R. C. Lawrence.
Chemical Engineering Progress, Vol 68, No 8, p 76-79, August 1972. 4 fig, 2 ref.

Descriptors: *Pollution abatement, *Industrial wastes, *Pollutant identification, Chemical oxygen demand, Water pollution control, *Monitoring, *Instrumentation, Costs, Chromatography, Spectrophotometry.
Identifiers: *Carbon analyzer.

The result of a river cleanup program began in 1958 along the Kanawha River has been the development of several pollution instrumentation techniques. Union Carbide employs in-plant monitoring of waste effluent by using chromatographs, carbon analysis, chemical oxygen demand apparatus and a Perkin Elmer atomic absorption spectrometer. These systems permit instant warning of harmful spills in the plant. In addition to improving their relationship with the community and reducing pollution hazard, the Union Carbide program and techniques have paid for themselves by reducing the loss of expensive products and/or raw materials. (Smith-Texas)
W72-14855

METHYLATION OF MERCURY BY MICROORGANISMS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
L. W. Parks, and E. M. S. MacDonald.
Available from the National Technical Information Service as PB-212 386, $3.00 in paper copy, $0.95 in microfiche. Technical Research Project Termination Report, 1972. 22 p, 2 fig, 5 tab, 18 ref. OWRR A-015-ORE (1).

Descriptors: *Mercury, *Analytical techniques, *Separation techniques, Chelation, Resins, Inorganic compounds, Organic compounds.
Identifiers: Dithizone method.

Both organic and inorganic forms of mercury are analyzed by a modification of the classical dithizone method in the range 0-50 microgram. The separation of mercury from the bulk of interfering ions such as Cu++, Fe+++, Bi+++, Mg++, Ca++ and Na+ can be accomplished simply by use of chelating resins. No satisfactory method of separating inorganic mercury compounds from organomercurial compounds by differential elution was found. Mercury is not appreciably volatile in hot oxidizing acidic solution and the elaborate refluxing systems of the standard dithizone method are unnecessary.
W72-14921

AN ANALYSIS OF THE CONCENTRATIONS OF HEAVY METALS IN MONTEREY HARBOR UTILIZING THE METHODS OF ATOMIC ABSORPTION SPECTROPHOTOMETRY AND POLAROGRAPHY,
Naval Postgraduate School, Monterey, Calif.
J. W. Tanner.
Available from the National Technical Information Service as AD-738 889, $3.00 in paper copy, $0.95 in microfiche. M Sc Thesis, Naval Postgraduate School, December 1971. 41 p, 6 fig, 3 tab, 15 ref.

Descriptors: *Chemical analysis, *Heavy metals, *Sea water, *Coasts, *California, Analytical techniques, Harbors, Spectrophotometry, Polarographic analysis, Evaluation, Methodology, Breakwaters, Environmental effects, Ecology, Sampling, Cobalt, Copper, Iron, Lead, Nickel.
Identifiers: Pre-construction study.

In 1972 or 1973 construction may begin on a breakwater to be located off of Del Monte Beach north and east of the present Municipal Wharf No. 2 in Monterey, California. Faculty and students of the Naval Postgraduate School have undertaken to describe the ecology of this area before construction begins. Ecological base lines in the undisturbed area will be established so that environmental changes brought about by harbour construction can be evaluated. As part of this study, water samples were taken at selected stations and analyzed for the heavy metals cobalt, copper, iron, lead, and nickel by atomic absorption spectroscopy and by polarography. The results obtained by these two methods are compared and discussed. The heavy metals in the sea water were concentrated and removed using the ammonium pyrrolidine dithiocarbamate (APDC) -- methyl isobutyl ketone (MIBK) solvent extraction method. The concentrations of the metals were determined using atomic absorption spectrophotometry. The APDC-MIBK solvent extraction method was not adequate for analysis by polarography. (Woodard-USGS)
W72-14964

USE OF X-RAY FLUORESCENCE TO DETERMINE TRACE METALS IN WATER RESOURCES,
Dayton Univ., Ohio. Dept. of Physics.
M. B. Blasius, S. J. Kerkhoff, R. S. Wright, and C. R. Cothern.
Water Resources Bulletin, Vol 8, No 4, p 704-714, August 1972. 11 fig, 1 tab, 38 ref.

Descriptors: *Trace elements, *Water analysis, *X-ray fluorescence, X-ray analysis, Fluorescence, Sampling, Water chemistry, Ion exchange, Water quality, Pollutant identification.
Identifiers: Ion exchange filter paper.

The X-ray fluorescence method may be used to analyze trace metals collected in particulate form on filter papers and from the ionic state by ion exchange filter papers. The samples are prepared by allowing water to pass through these filter papers. The procedures necessary for using the X-ray fluorescence method are described. A number of samples were taken from the Great Miami River in Dayton, Ohio over one year, showing the presence of Ca, Ti, Cr, Fe, Cu, Zn, Sr, and Cd. Elements in the periodic table between Ti and Cs were detectable to a sensitivity limit of the order of 30 ppb for metals in the particulate form and 0.4 ppm for metals in the ionic form. (Knapp-USGS)
W72-14965

5B. Sources of Pollution

BERYLLIUM-7 AND FISSION PRODUCTS IN THE GEOSECS II WATER COLUMN AND APPLICATIONS OF THEIR OCEANIC DISTRIBUTIONS,
W. B. Silker.
Earth and Planetary Science Letters, Vol 16, No 1, p 131-137, September 1972. 4 fig, 1 tab, 19 ref.

Descriptors: *Tracers, *Water circulation, *Atlantic Ocean, *Trace elements, *Radioisotopes, Fallout, Oceanography, Ocean currents, Distribution patterns, Data collections, Beryllium, Zinc, Cesium, Thermocline, Sampling, Water analysis.

Vertical concentration gradients of Be-7 and ZrNb-95 in the Atlantic Geosecs II water column showed the vertical eddy diffusion coefficient to be 1.2-1.35% cm/sec through the top sixty meters of the thermocline. Lower values of the diffusion coefficient calculated from the longer-lived nuclides Ru-106 and Ce-144 suggests horizontal transport of the deeper water from areas of lower fallout levels. Temporal and spatial oceanic distributions of Be-7 were analyzed with respect to their application for use in predicting deposition of other radionuclides which are present in the atmosphere. The ratios of air concentrations of radioactive tracers, together with known variations of Be-7 in the ocean can be applied in the development and proof of a dynamic model of oceanic circulation and transport. (Knapp-USGS)
W72-14220

TRITIUM PROFILE AT THE ATLANTIC 197 GEOSECS TEST CRUISE STATION,
Heidelberg Univ. (West Germany). Institut fue Angewandte Physik.
W. Roether, and K. O. Munnich.
Earth and Planetary Science Letters, Vol 16, No 1 p 127-130, September 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Sea water, *Atlantic Ocean, *Tritium, *Water chemistry, Water analysis, Radiochemistry, Geochemistry, Oceanography, Data collections, Sampling, Provenance, Mixing, Tracers, Trace elements, Water circulation, Ocean currents.

Tritium concentrations at the Atlantic Geosec station are reported. The tritium concentration 8.5 TU at the surface, and it drops marked between 600 and 100 m depth to below 1 TU. Tritium concentrations significantly exceed zero dow to about 200 m depth. The tritium profile reflec the hydrographic structure at the station. Loc vertical mixing can be excluded as the source the tritium found below 1000 m depth. (Knap USGS)
W72-14221

BARIUM AT GEOSECS III IN TH SOUTHWEST PACIFIC,
Massachusetts Inst. of Tech., Cambridge. Dept. Earth and Planetary Sciences.
For primary bibliographic entry see Field 02K.
W72-14223

STRONTIUM DISTRIBUTION IN SEA WATER PROFILES FROM THE GEOSECS I (PACIFIC) AND GEOSECS II (ATLANTIC) TEST STATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
G. W. Brass, and K. K. Turekian.
Earth and Planetary Science Letters, Vol 16, No 1, p 117-121, September 1972. 1 fig, 2 tab, 3 ref.

Descriptors: *Strontium, *Trace elements, *Sea water, *Pacific Ocean, *Atlantic Ocean, Spectrophotometry, Mass spectrometry, Salinity, Water chemistry, Analytical techniques, Water analysis, Sampling, Oceanography, Distribution patterns.
Identifiers: *Mass spectrometric isotope dilution analysis.

Strontium was determined at Geosecs I and II test station profiles in the Pacific and Atlantic, respectively, by mass spectrometric isotope dilution (MSID) analysis and atomic adsorption spectrophotometry. The Geosecs I profile shows a range in salinity from 218 to 223 micrograms/gram by MSID; Long Island Sound water yields a value of 2.4. A maximum was found at Geosecs I at a depth of about 500 meters by the atomic adsorption data. Comparison of atomic adsorption data for the Atlantic and Pacific test stations by MSID indicates that the deep Atlantic is about 1.5% lower in Sr/salinity than the deep Pacific. The differences are about as large as the coefficient of variation. (Knapp-USGS)
W72-14224

STUDY OF PH AND EH CHANGES OF WATER-LOGGED SOIL AND IN PURE SYSTEMS,
National Commission on Agriculture, New Delhi (India).
For primary bibliographic entry see Field 02G.
W72-14269

POTOMAC RIVER WATER QUALITY NETWORK: COMPILATION OF DATA.
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 05A.
W72-14281

CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES--INDIANA-MICHIGAN-NEW YORK-OHIO-PENNSYLVANIA: VOLUMES 1 AND 2.
Federal Water Quality Administration, Washington, D.C.

Held in Detroit, Michigan, June 3 and 4 1970, 740 p. 21 fig, 25 tab, 18 append.

Descriptors: *Water pollution, *Lake Erie, *Mercury, *Municipal wastes, *Industrial wastes, Water pollution control, Water pollution sources, Tributaries, Freshwater fish, Yellow perch, Sewage effluents, Oil spills, Thermal pollution, Nutrients, Bioassay, *Water quality, Algae, Pesticides, Heavy metals, Wastewater treatment, Smelts, Michigan, Ohio, New York, Pennsylvania, Toxicity, Discharge (Water), Phenols, Electric powerplants, Nuclear wastes, Phosphorus, Dissolved oxygen, Cladophora, Acids, Organic wastes, Biochemical oxygen demand, Salmon, Carp, White bass, Channel catfish, Suckers, Bullheads, Buffalo fish, Pike, Sulfate, Chloride, Sodium, Potassium, Calcium, Drums, Sauger, Walleye, Water quality standards, Water analysis.
Identifiers: Maumee River, St. Clair River, Lake St. Clair, Detroit River, Black River, Pine River, Clinton River, Huron River, Bell River, Salt River, Microcystis, Aphanizomenon, Cyanides, Coho salmon, Sheepshead, Chubs, Northern pike, Gizzard shad.

A verbatim transcript of the proceedings of a conference concerned with the water pollution problems of Lake Erie and its tributaries and summaries of the various reports presented have been compiled into a two-volume report. Statements of compliance with the Lake Erie Enforcement Conference Abatement Schedules for municipalities and industries and detailed discussions on the sources of pollution on the lakes, including industrial wastes from major cities such as Detroit and Cleveland, and mercury standards, sources, and levels are also included. Participants in the conference were from water pollution control agencies of the states of Michigan, Indiana, Ohio, Pennsylvania and New York, and of the U. S. Department of the Interior. (Mortland-Battelle)
W72-14282

LYSIMETER STUDIES ON THE SHORT TERM EFFECT OF COMPOSITION OF IRRIGATION WATER ON THE BORON ACCUMULATION IN SOIL,
Udaipur Univ. (India). Coll. of Agriculture.
B. L. Jain, and S. N. Saxena.
J Indian Soc Soil Sci. 19 (2): 171-174. 1971.
Identifiers: *Boron, *Irrigation water, *Lysimeter studies, *Soils.

Boron concentration (B) in available form and water soluble form (saturation extract) increased in the profile up to 150 cm depth. Maximum accumulation of the available form of B occurred at the depth 30-60 cm and in water soluble form at the depth 0-30 cm. Accumulation of B in soil profile increased with the increase in concentration of B in irrigation water. Increase in Na absorption ratio of irrigation water decreased the accumulation of available B and increased the water soluble B. Application of irrigation water having B concentration up to 1.0 ppm did not lead to accumulation of B to toxic concentrations in the short duration of 3 mo.--Copyright 1972, Biological Abstracts, Inc.
W72-14283

MICROBIAL UPTAKE OF LEAD,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-14291

EVIDENCE FOR THE RECOVERY OF THE WATERS OFF THE EAST COAST OF NOVA SCOTIA FROM THE EFFECTS OF A MAJOR OIL SPILL,
Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanography Lab.
For primary bibliographic entry see Field 05C.
W72-14292

REDUCTION OF THE 20-CARBONYL GROUP OF C-21 STEROIDS BY SPORES OF FUSARIUM SOLANI AND OTHER MICROORGANISMS. I. SIDE-CHAIN DEGRADATION, EPOXIDE CLEAVAGE, AND SUBSTRATE SPECIFICITY,
Montreal Univ. (Quebec). Faculte de Pharmacie.
For primary bibliographic entry see Field 05C.
W72-14300

HEAVY METALS POLLUTE NATURE, MAY REDUCE PRODUCTIVITY,
Lund Univ. (Sweden). Dept. of Ecological Botany.
For primary bibliographic entry see Field 05C.
W72-14303

IDENTIFICATION OF N,O-DIMETHYHYDROXYLAMINE AS A MICROBIAL DEGRADATION PRODUCT OF THE HERBICIDE, LINURON,
Technische Hochschule, Munich (West Germany); and Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, Munich (West Germany).
For primary bibliographic entry see Field 05A.
W72-14304

RELATIONSHIPS OF CHLOROPHYLL MAXIMA TO DENSITY STRUCTURE IN THE ATLANTIC OCEAN AND GULF OF MEXICO,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 05C.
W72-14313

ON THE DEPOSITION AND DISSOLUTION OF ZINC IN ALKALINE SOLUTIONS,
Pennsylvania Univ., Philadelphia. Electrochemistry Lab.
J. O'M. Bockris, Z. Nagy, and A. Damjanovic.
Journal of the Electrochemical Society, Vol 119, No 3, p 285-295, March 1972. 14 fig, 7 tab, 69 ref.

Descriptors: *Zinc, *Alkaline water, *Electrolysis, Ions, Chemical interference, Ion exchange, Aqueous solutions, Electrochemistry, Cathodes, Anodes, Electrolytes, Physiochemical properties, Methodology, Instrumentation, Electrical properties, Thiems equation, Equilibrium.
Identifiers: *Electrodeposition, Ion selective electrodes, Zinc electrodes, Potentiostat, Galvanostat.

The zinc/KOH-zincate electrode reaction was investigated at room temperature under high purity conditions with galvanostatic and potentiostatic transient techniques in the 0.1-3.0 M KOH and 0.0001-0.5 M zincate concentration range. The exchange current density was found to be between 8 and 370 mA/sq cm, with 40 mV/decade anodic and 120 mV/decade cathodic nominal Tafel slopes; an overpotential range of plus or minus 100 mV was covered. The cathodic reaction orders were 1 for zincate, and minus one for hydroxyl ions. A four-step mechanism, consistent with the kinetic data, is suggested. It consists of four consecutive dissociation reactions of the zincate complex, with two of them incorporating a single electron charge transfer. The mechanism of the anodic and cathodic reactions is the same. The transients indicate only double layer charging and charge transfer processes. No surface diffusion effects or intermediate build-up was observed (no pseudocapacitance). A rationalization is given for the mechanism. The effect of zinc surface preparation is discussed. (Snyder-Battelle)
W72-14322

DISTRIBUTION OF CLOSTRIDIUM BOTULINUM TYPE E IN THE GULF OF ST. LAWRENCE IN RELATION TO THE PHYSICAL ENVIRONMENT,
Fisheries Research Board of Canada, Halifax (nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05C.
W72-14325

HETEROTROPHIC NITRIFICATION BY ARTHROBACTER SP.,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 05C.
W72-14328

EFFECT OF AMINO ACIDS ON THE GROWTH OF ACETOBACTER SUBOXYDANS,
The Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-14329

THE ASSIMILATION OF MONOCARBON COMPOUNDS BY PSEUDOMONAS SP. 2,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W72-14335

BENTHIC FAUNAL RECOVERY IN A SWEDISH FJORD FOLLOWING THE CLOSURE OF A SULPHITE PULP MILL,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
For primary bibliographic entry see Field 05C.
W72-14337

THE ECOLOGY OF MORECAMBE BAY. II. INTERTIDAL INVERTEBRATES AND FACTORS AFFECTING THEIR DISTRIBUTION,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
For primary bibliographic entry see Field 05C.
W72-14338

THE ECOLOGY OF MORECAMBE BAY. IV. INVERTEBRATE DRIFT INTO AND FROM THE RIVER LEVEN,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 05C.
W72-14339

WATER SUPPLY AND WASTE DISPOSAL SERIES: VOLUME I. TERMINOLOGY STANDARDIZATION AND MICROBIOLOGY.
Federal Highway Administration, Washington, DC, Office of Research; and Federal Highway Administration, Washington, D.C. Office of Development.

Dept of Transportation-Federal Highway Administration Staff Report 72R-106S-1, November 1971. 51 p, 16 fig, 12 tab, 141 ref. append.

Descriptors: *Water supply, *Waste disposal, *Recreation wastes, *Microorganisms, *Water pollution sources, Reviews, Microbial degradation, Classification, Sewage, Soil properties, Groundwater movement, Outfall servers, Streams, Septic tanks, Fungi, Algae, Water pollution control.
Identifiers: *Roadside rest areas.

This is the first volume of a series of reports on water supply and waste disposal published by the Federal Highway Administration. This series emphasizes water supplies, water-carriage waste treatment, and solid waste disposal, particularly as they relate to roadside rest areas. Because definitions, classifications, and terminology concerning microorganisms and biological terms sometimes lack uniformity among the disciplines, this volume defines and standardizes the terminology that will be used in all volumes of the series. Information on diseases that might be transmitted at rest or recreation areas is presented. The capability of individual species of microorganisms to survive in the soil, on the soil, in water, and in other situations is indicated. A bibliography containing 14 references is included. (Woodard-USGS)
W72-14363

MAN-MADE ENVIRONMENT AS VIEWED FROM SPACE: WATER AND AIR POLLUTION,
Leningrad State Univ. (USSR).
B. V. Vinogradov.
Available from NTIS, Springfield, Va. 22151, as N72-12322, Price $3.00 paper copy; 95 cents microfiche. National Aeronautics and Space Administration Technical Translation Report (NASA TT F-14079), November 1971. 16 p, 4 fig, 20 ref. (Paper presented at 22nd International Astronautical Federation Congress, Brussels, Sept 1971).

Descriptors: *Water pollution sources, *Remote sensing, *Aerial photography, *Satellites (Artificial), *Pollutant identification, Air pollution, Reviews, Data collections, International commissions, Water pollution control, Planning.
Identifiers: Spacecraft.

A study of water pollution using space methods (aerial spectrometry and photography) is in the stage of aircraft and theoretical modeling. The water pollution in the inland and oceanic waters is detected by different remote indicators; (1) tone and color changes influenced by transportation of suspended, washed out, and sewage materials; (2) thermal anomalies due to admixture of the exhaust waters; (3) foam formed in mixing the warm chemical and cold natural waters; (4) changes in water vegetation under influence of thermal and chemical properties; (5) rising of exhaust matter to water surface; (6) affect of active films on surface waves and scattering functions of sea surface; and (7) affect of oil and other active films on the color and spectral reflectivity of sea surface. Also, atmospheric pollution must be inspected worldwide because of its international character. (Woodard-USGS)
W72-14373

SANITARY WASTE WATER TREATMENT AND DISPOSAL AS RELATED TO DEVELOPMENT--LAKE COUNTY, FLORIDA.
Florida Dept. of Community Affairs, Tallahassee. Technical Assistance Div.
For primary bibliographic entry see Field 05D.
W72-14383

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
A. O. Converse, and J. Tyler.
Prepared for: Vermont Natural Resources Council, Montpelier, (Project EPIC), February 1972. 66 p, append.

Descriptors: *Vermont, *Data processing, *Simulation, *Water quality control, *Watersheds (Basins), *Waste water (Pollution), *Water analysis, *Planning, *Computer models, New England, Runoff, Low flow, Flow rates, Gaging stations, Biochemical oxygen demand, Dissolved oxygen.
Identifiers: *Winooski Watershed, *Waste discharge, *Winooski River.

A water quality simulation program as applied to the Winooski Watershed in Vermont is presented, examining the economic feasibility of using computer data storage and processing as a planning tool in the control of waste water pollution. Sources of waste discharge are located and numbered beginning with the headwater of a branch and numbering sequentially down each branch. Runoff per unit land area during low flow conditions is computed from the 10-year, 7-day low flow at the nearest gaging station and corresponding land area drained. A water quality simulation plot of the main branch of the Watershed is included, showing clearly the effect of discharge of the stone works and organic wastes in the Montpelier-Barre area. The program and data are stored in Dartmouth's time-shared computing system and are available to anyone with telephone and teletype. Results show computer costs are reasonable. Since discharge data must be acquired and planning studies must be made anyway, most probably an available computer data storage and processing capability would reduce manpower requirements. Given the nature of watersheds in New England, a central time-shared facility would seem quite desirable. (Bell-Cornell)
W72-14392

THERMAL DISCHARGE: A MODEL-PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
P. D. Hindley, R. M. Miner, and R. F. Cayot.
Journal of the Power Division, Proceedings of ASCE, Vol 97, No PO4, Proc. Paper 8580, p 783-798, December 1971. 11 fig, 2 ref.

Descriptors: *Thermal pollution, *Model studies, *Remote sensing, Estuaries, Cooling water, Temperature, Water, Mixing, Dispersion, Powerplants, Tidal waters, Isotherms, *Thermal powerplants, Heated water.
Identifiers: Model-prototype study, *San Francisco Bay System, *Infrared temperature detection.

Infrared temperature sensing systems were used to compare the temperature fields resulting from a prototype power plant's condenser cooling water discharge with those obtained by simulating the discharge on a distorted hydraulic model. IR temperature measurement offers certain advantages over the more common thermocouple or thermistor temperature sensing and recording systems. The prototype plant is located in the upper reaches of San Francisco Bay, and was simulated on the San Francisco Bay-Delta model. The model is operated by the Corps of Engineers and has 1000:1 horizontal and 100:1 vertical length ratios. Photographic images of the temperature fields on both model and prototype are presented, along with best fit lines relating nondimensional surface temperature increase and the surface area enclosed by the increase. The general features of the prototype fields were satisfactorily reproduced by the model. The IR systems used are described. The prototype mixing process would be expected to be more random than that with the model since there are more variables with the prototype than with the model. (Oleszkiewicz-Vanderbilt)
W72-14393

SOME ENVIRONMENTAL FACTORS TO BE CONSIDERED IN THE DESIGN OF THERMAL POWER PLANTS IN THE NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 05G.
W72-14394

COMPUTER MODEL FOR A THERMAL PLUME,
Detroit Edison Co., Mich.
R. E. Barry, and D. P. Hoffman.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 117-132, June 1972. 7 fig, 2 tab, 3 ref.

Descriptors: *Computer models, *Heated water, *Velocity, *Temperature, Turbulent flow, Shallow water, Cooling water, Discharge measurement, Thermal powerplants, Jets, Model studies, Thermal pollution.
Identifiers: *Thermal plumes, Mixing zone, Eddy diffusivity.

A digital computer program is described for determination of the temperature and velocity profiles in a shallow body of water resulting from the discharge of condenser cooling water from a powerplant. The purpose of this computer model is to start with the applicable equations for mass momentum and energy transfer, include the effects of the lake bottom, the lake current, and the wind velocity, and to produce a scheme whereby existing data on thermal plumes may be extrapolated to other conditions. The assumptions made in the derivation of the equations imply the absence of waves and more importantly, neglect the contributions of the buoyant forces which may become dominant as the plume velocity decreases to that of the local current. Two mixing coefficients for the horizontal and vertical eddy diffusion of momentum require field data for verification. (Upadhyaya-Vanderbilt)
W72-14407

HEATED-EFFLUENT DISPERSION IN LARGE LAKES: STATE-OF-THE-ART OF ANALYTI

CAL MODELING. PART 1. CRITIQUE OF MODEL FORMULATIONS,
Agronne National Lab., Ill. Center for Environmental Studies.
A. J. Policastro, and J. V. Tokar.
Publication No. ANL/ES-11, Waste Heat Disposal, January 1971. 373 p, 151 fig, 17 tab, 25 ref, append.

Descriptors: *Heated water, *Heat transfer, *Mathematical models, *Jets, *Outlets, Buoyancy, Heat budget, Currents (Water), Discharge (Water), Winds, Wind pressure, Computer models, Computer programs, Dispersion, Lakes, Diffusion, Model studies, *Reviews.
Identifiers: *Waste heat disposal, Critical review, *Outfall modeling, Near-field issues, Far-field issues, Jet regime, Buoyant jets, Heated jet, Lake Monona, Great Lakes, Cayuga Lake model, Entrainment coefficient, Drag coefficient, Motz-Benedict model, Stolzenbach model, Harleman, Edinger-Polk model, Heat losses, Wind stress, Jet diffuser.

This is part of a three-part literature survey to delineate the state-of-the-art of available methods for predicting heated-effluent dispersion from powerplant condenser-cooling-water discharges into large lakes. This report, which will be periodically updated, concentrates solely on mathematical predictive methods. Two companion reports assess the state-of-the-art of hydraulic modeling which could possibly be used to validate predictive methods. Essentially 16 mathematical models have been critically reviewed concerning their formational development. Criticisms have been made discussing individual model treatment of geometric, kinematic, hydrodynamic, and thermodynamic variables. The models have been categorized according to their regime of applicability, and contrasting and congruous qualities between models within each category have been summarily presented. (Oleszkiewicz-Vanderbilt)
W72-14409

THERMAL-HYDRAULIC STUDY: ARKANSAS COOLING RESERVOIR,
Bechtel Corp., San Francisco, Calif.
H. S. Riesbol, J. B. Anderson, F. H. Wend, and H. T. Holmes.
Journal of the Power Division, Proceedings of ASCE, Vol. 97, No. P01, Proc. Paper 7811, p 93-113, January 1971. 17 fig, 9 ref.

Descriptors: *Cooling, *Model studies, *Temperature, *Powerplants, Thermodynamics, Reservoir operation, Heat transfer, Heated water, *Arkansas, Flow profiles, Jets, Environmental engineering, Water, Water quality, Thermal powerplants, Entrainment, *Thermal pollution.
Identifiers: *Thermal-hydraulic model, *Heat dissipation, *Arkansas Reservoir, Heat exchange coefficient, Isotherms.

An 850-Mw nuclear power plant to be built by Arkansas Power and Light Company on the Dardanelle Reservoir on the Arkansas River will utilize reservoir water for condenser cooling. Analysis of expected thermal effects due to the cooling water discharge was required to establish that water quality criteria will be met. A review of reservoir heat dissipation principles is presented. An analytical solution with a heat balance based on flow patterns developed by jet momentum-entrainment theory is described. A thermal-hydraulic laboratory study using a large distorted scale model with controlled atmospheric conditions was undertaken to corroborate the analytical results. Water temperatures were recorded on a three-dimensional pattern utilizing over 300 thermocouples and an automatic digital recorder. Flow patterns were observed and recorded. Model operation, and analysis and interpretation of data are given. Based on the results of the analytical and thermal-hydraulic model investigations, it was known that the plant heat load of 137.5 x 10 to the 9th power Btu per day can be dissipated in Dardanelle Reservoir under the prescribed criteria and limitations. The thermal hydraulic model is a useful tool for the solution of complicated thermal power plant heat dissipation problems. (Oleszkiewicz-Vanderbilt)
W72-14414

VELOCITY AND TEMPERATURE IN BUOYANT SURFACE JET,
Tahal Consulting Engineers Ltd., Tel Aviv (Israel).
R. Dornhelm, M. Nouel, and R. L. Wiegel.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 29-47, June 1972. 15 fig, 3 tab, 21 ref.

Descriptors: *Jets, *Mixing, *Velocity, *Temperature, *Turbulence, Surface tension, Cooling water, Froude number, Eddies, Density, Saline water, Laboratory tests, *Thermal pollution.
Identifiers: Buoyant jets, Hot film anemometers.

Laboratory studies of turbulence in surface buoyant jets were made using hot film anemometers. Results showed considerable turbulence was generated in the jets. Comparisons are presented for temperature and velocity fluctuations in surface jets for a range of Reynolds numbers and densimetric Froude numbers. Difficulties in using hot film anemometers in salt water are described, together with methods to minimize some of the difficulties. Large scale surface eddies resulting from the interaction of the sidewalls of the tank with the surface spreading jet tended to confine the jet to a narrow stream along the center line. Experimental results showed that surface tension was not a significant variable in the jet mixing. (Eagle-Vanderbilt)
W72-14416

DDT IN WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-212 262, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center, Report WRSIC 71-211, October 1971. 278 p.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Bibliographies, *Abstracts, Information retrieval, Water pollution sources, Path of pollutants, Pollutant identification.

This bibliography contains 196 abstracts with full bibliographic details for selected reports, journal articles, and various documents published mostly since 1967. Produced from a computerized information base containing 32,719 abstracts at the time of search, the bibliography is representative of the information on DDT in water contained in the journal 'Selected Water Resources Abstracts' through October 15, 1971 (Volume 4, Number 20). A significant descriptor index is given of representative weighted terms that best describe the information content of the abstracted items. A comprehensive index is also given that represents all descriptors and identifiers used to index the various papers and documents represented by the abstracts in the bibliography. Abstract items are arranged in ascending WRSIC Accession Number sequence.
W72-14431

POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO,
New Mexico State Univ., University Park. Water Resources Research Inst.
P. D. Bigbee, and R. G. Taylor.
Available from the National Technical Information Service as PB-212 264, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 005, Partial Completion Report, August 1972. 30 p, 8 fig, 15 ref.

Descriptors: *Coliforms, Water pollution sources, Recharge, *New Mexico, Seasonal, *Bacteria, Groundwater, Aquifer characteristics.
Identifiers: *Ogallala aquifer, *Portales (N Mex), Coliform organisms, Fecal pollution.

Preliminary examination of the aquifer in the vicinity of Portales, New Mexico, indicated the presence of coliform bacteria within a two mile radius of the town of Portales. Coliform organisms are used as bacterial indicators of fecal pollution. The presence of these bacterial organisms in the water table at Portales is indicative of recharge to the aquifer. This study will examine both chemical and bacterial parameters of the aquifer and extend the results to eluciwhich little or no nitrogenous fertilizers were used demonstrated low aquifer nitrate concentrations regardless of water usage. (See also W72-14434 and W72-14436) (Creel-New Mexico State)
W72-14434

FLUCTUATIONS IN NITRATE CONCENTRATIONS UTILIZED AS AN ASSESSMENT OF AGRICULTURAL CONTAMINATION TO AN AQUIFER OF A SEMIARID CLIMATIC REGION,
New Mexico State Univ., University Park. Water Resources Research Inst.
R. G. Taylor, and P. D. Bigbee.
Available from the National Technical Information Service as PB-212 265, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report 006, Partial Completion Report, August 1972. 12 p, 1 fig, 4 tab, 9 ref. OWRR A-034-NMEX (3).

Descriptors: Water pollution sources, Aquifer characteristics, *New Mexico, Irrigation, *Fertilizers, Nitrates, Arid lands.
Identifiers: *Nitrate contamination, *Agricultural contamination, Semiarid climatic region.

Aquifer water has become contaminated in regions that have been developed for agriculture. Nitrate contamination has been shown to be permeable to the aquifer and harmful to human health. An assessment of agricultural practices and their roles in contamination of aquifers has been undertaken with difficulty in the past. Nitrate concentrations have been utilized in this study to demonstrate their applicability to examining agriculture practices which contaminate aquifer water. Areas treated with nitrogenous fertilizers and subsequently irrigated were found to contain aquifer fluctuations in nitrate content directly in proportion to irrigation seasons. Agricultural industries with high animal densities per land area, and high water consumption for maintenance, were found to have high, but non-fluctuating, nitrate concentrations. Areas with high animal density per land area with low water usage for maintenance; areas with low animal density per land area; and agricultural practices for which little or not nitrogenous fertilizers were used demonstrated low aquifer nitrate concentrations regardless of water usage. (See also W72-14434 and W72-14436) (Creel-New Mexico)
W72-14435

UNDERGROUND WASTE MANAGEMENT AND ENVIRONMENTAL IMPLICATIONS - A SYMPOSIUM.
American Association of Petroleum Geologists, Inc., Midland, Tex.
For primary bibliographic entry see Field 05G.
W72-14480

WELL CONSTRUCTION AND WATER QUALITY,
Department of Agriculture, Beltsville, Md.
E. E. Jones, Jr.
Presented at 1971 Winter Meeting of American Society of Agricultural Engineers, Chicago, Illinois, Paper No. 71-703, 15 p, December, 1971. 2 tab, 15 fig, 3 ref.

Descriptors: *Coliforms, *Ground water recharge, Grouting, Pesticides, Turbidity, *Monitoring, Water quality control, Water pollution sources.
Identifiers: *Sanitary defects, Chlordane.

Wells lacking adequate sanitary protection serve as unauthorized uncontrolled ground water recharge points. Common, easily detected sanitary defects are described. A detailed investigation of a contaminated well, apparently having adequate sanitary protection, was made. Design recommendations are not included. (Campbell-NWWA)
W72-14494

ENVIRONMENTAL FRAMEWORK OF GROUND-WATER CONTAMINATION,
Geological Survey, Washington, D.C.
H. E. LeGrand.
Ground Water, Vol 3, No 2, p 11-15, April, 1965. 5 ref.

Descriptors: *Pollutants, *Groundwater recharge, Encroachment, Saline water intrusion, Saline water - freshwater interfaces, Porosity, Permeability, Recharge wells, Radioactive wastes, Water pollution sources, *Dispersion, *Path of pollutants.
Identifiers: Mineralized water, Sorptive capacity.

The volume of useable ground water is shrinking in many places because of dispersion of contaminated water. Ways of contamination and pertinent parts of the physical environment include: waste-disposal practices (at or near land surface and in deep formations), artificial recharge (at land surface and in aquifers), accidents, and salt-water contamination of aquifers. Evaluation of waste-disposal problems calls for appreciation of two opposing tendencies - the tendency of wastes to move with ground water and the tendency to be attenuated near disposal sites by decay or inherent decrease in potency, by chemical and physical sorption, and by dilution through dispersion of ground water. (Campbell-NWWA)
W72-14502

BACTERIOLOGICAL AND CHEMICAL FACTORS IN INDUCED INFILTRATION,
For primary bibliographic entry see Field 05G.
W72-14504

HYDROGEOLOGIC FACTORS IN PROBLEMS OF CONTAMINATION IN ARID LANDS,
Nevada Univ., Las Vegas. Desert Research Inst.
G. B. Maxey, and R. N. Farvolden.
Ground Water, Vol 3, No 4, p 29-32, October, 1965. 3 fig, 4 ref.

Descriptors: *Nevada, *Arid lands, Basins, *Waste water disposal, Hydraulic gradient, *Groundwater recharge, Alluvial aquifers, Great Basin.
Identifiers: *Discharge areas, *Hydrologic analysis, Carbonate aquifers.

The ideal hydrologic system in arid lands includes a recharge area in mountains and a discharge area in lowlands, a system modified in nature by geologic and physiographic factors. Population and agricultural activity concentrates in valleys, usually in zones of ground-water discharge. Most water-supply, contamination and disposal problems arise from this combination of features. The suitability of hydrogeologic units for any function of operations involving water supply or waste disposal depends primarily on their position within the hydrologic system and secondarily on physical properties. For example, at the Nevada Test Site the ground-water flow system is used to good advantage, whereas at Las Vegas, 70 miles away, the methods of disposal practiced are in direct conflict with the system. (Campbell-NWWA)
W72-14508

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-14544

DDT AND PCB IN FISH,
For primary bibliographic entry see Field 05C.
W72-14583

PROCEDURE AND RESULTS OF GROUNDWATER POLLUTION STUDIES IN TEHERAN AREA, IRAN,
Ministry of Water and Power, Teheran (Iran). Research Div.
F. Esfandiari.
In: International Association of Hydrogeologists Memoires, Vol 9, Proceedings of Asian Regional Conference, August 18-27, 1971, Tokyo: Japanese National Committee of the International Association of Hydrogeologists, Tokyo, p 3-7, 1972. 3 tab, 4 ref.

Descriptors: Water pollution sources, *Path of pollutants, *Waste disposal wells, *Artificial recharge, Sewage disposal, Bacteria, Nitrates, Hydrogeology, Water supply, Groundwater movement, Groundwater, Malenclaves.
Identifiers: *Iran, *Groundwater pollution.

Research on groundwater pollution has been carried out in the Teheran Region, Iran, since 1968. The project area covers 1,064 sq. km. Water samples were taken from about 210 wells and subjected to chemical and bacteriological analysis. The chemical quality of the groundwater in the area is generally good and the water quality zones are well defined. Despite recharge to the aquifer by untreated sewage in the city area, the mass of water in the aquifer is not significantly polluted. There is, however, bacteriological evidence of slight contamination by filtered sewage recharge. The water is suitable for public supply after treatment under close control by super-chlorination and dechlorination only, no filtration being needed. (Knapp-USGS)
W72-14590

WATER QUALITY PROBLEM IN EASTERN OSAKA, JAPAN,
Osaka City Univ. (Japan).
For primary bibliographic entry see Field 02F.
W72-14606

DISPERSION OF GROUNDWATER FLOW,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 02F.
W72-14608

THE FRAUNHOFER LINE DISCRIMINATOR: AN AIRBORNE FLUOROMETER,
Geological Survey, Washington, D.C.
G. E. Stoertz.
Available from NTIS, Springfield, Va 22151 as N72-18448 (NASA-CR-125643)-Price $3.00 paper copy; $0.95 microfiche. Geological Survey-National Aeronautics and Space Administration Interagency Report NASA-157, 1969. 30 p, 6 fig, 2 tab, 20 ref.

Descriptors: Water pollution sources, *Remote sensing, *Tracking techniques, *Instrumentation, Fluorescence, Analytical techniques, *Path of pollutants, Solar radiation, Reflectance, Analog computers.
Identifiers: Photomultiplier.

Applications of the Fraunhofer Line Discriminator (FLD) include remote sensing of fluorescent dyes used in studies of current dynamics. The basic technique is applicable to detection of oil spills, monitoring of pollutants, and sensing over land areas. The FLD can differentiate and measure solar-stimulated luminescence when viewed against a background of reflected light. Key elements are two extremely sensitive photomultipliers, two glass-spaced Fabry-Perot filters having a bandwidth less than 1 angstrom, and an analog computer. As in conventional fluorometers, concentration of a fluorescent substance is measured by comparison with standards. Quantitative use is probably accurate only at low altitudes but detection of luminescent substances should be possible from any altitude. (Woodard USGS)
W72-14613

MERCURY STIRS MORE POLLUTION CONCERN.

Chemical and Engineering News, June 22, 1970. p, 1 fig.

Descriptors: *Mercury, *Great Lakes Region, *Fish, *Industrial wastes, Freshwater fish, Water pollution, Water pollution effects, Bottom sediments, Dredging, Toxicity.
Identifiers: *Mercury discharges, *Industrial sources, Chlor-alkali plants, Electrical apparatus, Mercury consumption, Mercury levels, Fish tissue contents, Toxicity levels, FDA standards.

Due to the recent (1969/1970) bans on fishing caused by finding mercury in the fish tissue and industrial discharges to the Great Lakes watershed the United States and Canadian businesses are claiming losses of more than one billion dollars in commercial and sport fishing. A mercury concentration and accumulation pattern is indicated. Two aspects of the problem are mentioned. The problem of mercury loss (over 6 million pounds in 1969) from industries such as mercury cell chlor-alkali plants can be solved. Another concern what to do with the mercury already lying on the river or lake bottoms. Dredging could release more mercury over a larger area and could in effect be detrimental. Mercury has not escaped into water in sufficient quantities to endanger drinking water supplies to the cities in the Lake Erie watershed. The only measurable concentration found in water was in Detroit River and was 0.05 mg/l. (Oleskiewicz-Vanderbilt)
W72-14619

TOXIC EFFECTS OF CADMIUM: A REVIEW,
Food and Drug Administration, Rockville, M Bureau of Drugs.
For primary bibliographic entry see Field 05C.
W72-14621

PRELIMINARY STUDY OF MERCUR RESIDUES IN SOILS WHERE MERCURY SEE TREATMENTS HAVE BEEN USED,
Agricultural Research Service. Hyattsville, Md.
P. F. Sand, G. B. Wiersma, H. Tai, and L. J. Stevens.
Pesticides Monitoring Journal, Vol 5, No 1, p 33, June 1971. 1 tab, 3 ref.

Descriptors: *Mercury, *Soil contamination, *S management, *Seed treatment, *Agricultu chemicals, Neutron activation analysis, Statisti methods, Great Plains.
Identifiers: *Mercury residues, *Mercury treat seed, *Soil samples, Soil monitoring program.

Ninety-three soil samples collected in 1968 from the small-grain producing areas of the North Central United States were analyzed for mercury residues by neutron activation analysis. Half the samples were from areas where mercury-treated seed had been used in 1968 and the other half were from areas of no use. Mercury was found in almost all soil samples. A significant difference was found in mean levels between areas of use and no use, with the higher residues occurring in areas where mercury had not been used in 1968. The significance of the results is considered questionable because there is no record of whether or not mercury was used prior to 1968 and there was considerable variation resulting from analytical techniques. There is a need for more extensive soil sampling for mercury residues. (Oleszkiewicz-Vanderbilt)
W72-14623

TRACE METAL CHARACTERIZATION BY ANODIC STRIPPING VOLTAMMETRY,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 05A.
W72-14626

A METHOD FOR ENVIRONMENTAL MERCURY POLLUTION CONTROL IN DEVELOPING AREAS,
Aarhus Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 05A.
W72-14627

THE TRANSITIONAL CONDITION OF MINAMATA BAY AND THE NEIGHBORING SEA POLLUTED BY FACTORY WASTE WATER CONTAINING MERCURY,
Kumamoto Univ. (Japan). Dept. of Hygiene; and Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 05C.
W72-14628

FISH AND MERCURY.
For primary bibliographic entry see Field 05C.
W72-14633

ROTATING RING-DISK STUDY OF THE REDUCTION OF OXIDIZED PLATINUM BY MERCUROUS MERCURY AND ITS ADSORPTION ON REDUCED PLATINUM,
State Univ. of New York, Buffalo. Dept. of Chemistry.
S. Bruckenstein, and M. Z. Hassan.
Analytical Chemistry, Vol 43, No 7, p 928-932, June 1971. 5 fig, 12 ref. AFSOR 70-1832.

Descriptors: *Electrodes, *Adsorption, *Mercury, Reduction, Oxidation, Graphical analysis.
Identifiers: *Platinum disk electrode, Current-potential curve, Rotator.

A potential-time study at a rotating platinum disk electrode showed that Hg (I) in 1.04M HC104, reduces an oxidized platinum surface. Using a rotating platinum ring-disk electrode, the time-dependent ring collection curves demonstrated that the amount of Hg (II) produced was less than the amount of Hg (I) consumed during the reduction of the oxidized platinum surface. The quantity of Hg (II) produced agreed with the electrical charge required to reduce the oxidized platinum surface. The difference between the amount of Hg (I) consumed and Hg (II) produced (357 plus or minus 47) microC/sq cm corresponds to the amount of Hg (I) adsorbed on a reduced Pt surface. The quantity of adsorbed Hg (I) was independently established by determining the charge (1) required for reduction to Hg (O) on the disk; (2) required for oxidation to Hg (II) on the disk before and after reducing the disk; and (3) corresponding to the amount of Hg (II) produced in (2) using the ring electrode. (Uadhyaya-Vanderbilt)
W72-14634

CHEMICAL METHYLATION OF INORGANIC MERCURY WITH METHYLCOBALAMIN, A VITAMIN B12 ANALOG,
Tokyo Univ. (Japan). Faculty of Pharmaceutical Sciences.
N. Imura, E. Sukegawa, S-K. Pan, K. Nagao, and J-Y. Kim.
Science, Vol 172, p 1248-1249, June 11, 1971. 1 fig, 1 tab, 9 ref.

Descriptors: *Mercury, *Chemical reactions, Water pollution sources, Chromatography, Analytical techniques, Kinetics, Laboratory tests, Reduction, Sediments.
Identifiers: *Methylation, Methylcobalamin, Methylmercury.

The kinetics of chemical transmethylation from methylcobalamin (a known methyl donor in biological systems) to inorganic mercury under various conditions are reported. The transmethylation proceeded at an unexpectedly high rate after the methylcobalamin was mixed with inorganic mercury in neutral aqueous solution in the absence of reducing agents. Silica gel thin-layer chromatography with the use of three solvent systems revealed that the reaction products dimethylmercury and methyl mercuric chloride, were formed in different ratios, depending on the molar ratio of the reactants and the reaction times. The results indicate that mercuric chloride was essential for the liberation of the methyl group from methylcobalamin. Methylcobalamin is isolable not only from microorganisms but also from mammalian sources such as calf liver and human blood plasma. It is therefore believed to be widely distributed in nature. (Upadhyaya-Vanderbilt)
W72-14635

A WATER QUALITY MODEL FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
California State Water Resources Control Board, Sacramento.
G. S. Nicolson.
(1972), 36 p, 5 fig, 13 tab, 33 equa.

Descriptors: *North Carolina, *Natural streams, *Dissolved oxygen, Evaluation, Water quality, Organic wastes, Organic loading, Biochemical oxygen demand, River basins, Runoff, Hydraulics, Evaluation, Mathematical models, Systems analysis, Streamflow.
Identifiers: *Piedmont, *Haw River, *Cape Fear River basin, *Yadkin River basin, *Waste assimilative capacity, *Linear functions, *Sensitivity analysis, *Streeter-Phelps equation, River stretches, Dilution water, Buffalo Creek, Reedy Fork.

A water quality model is used to evaluate dissolved oxygen levels in natural streams. DO is chosen as water quality parameter because of its vital contribution to the balance of stream life and because of its response to organic pollution. The model is formulated so that the deficits at the end of river stretches are linear functions of upstream loading conditions. Given the loading conditions and the transfer coefficients, which relate the loading to downstream deficits, the dissolved oxygen profile and the waste assimilative capacity of the stream can be determined. Dealt with first are the derivation of the model, the necessary conditions for use of the model and the sensitivity of the model to changes in the parameters: The Streeter-Phelps equation for relating DO response to organic pollution is the fundamental equation used in the model. Next, a detailed application of the model to the Buffalo Creek--Reedy Fork subregion of the Haw River is presented, listing the data required and giving the resulting dissolved oxygen profiles. Results of the model are confirmed by comparing them to field tests made by the Federal Water Pollution Control Administration and indicate the importance of waste treatment alternatives versus low flow augumentation. (See W72-14638) (Bell-Cornell)
W72-14641

DISPERSION OF POLLUTANTS IN THE COASTAL WATERS OF THE SOUTHEASTERN UNITED STATES,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom.
In: Colloque International sur L'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 12 p, 3 fig, 10 ref.

Descriptors: *Southeast US, Coasts, *Littoral, Water pollution control, Industries, Wastes, *Mercury, *Dispersion, Physical control, *Biocontrol, *Chemcontrol, Estuaries, Marshes, *Waste disposal, Environmental effects, South Carolina, Florida, Path of pollutants.

The environmental characteristics of the littoral zone of the southeastern United States are described. Physical, chemical and biological processes all determine the dispersion patterns of pollutants. The physical processes transport the pollutants southward and landward into salt marshes and estuaries. The chemical and biological processes often convert pollutants from one form to another, sometimes resulting in trapping the pollutants in esturaies and marshes. To avoid environmental degradation it is suggested that wastes be discharged at approximately 10 kms offshore. (Ensign-PAI)
W72-14651

CURRENT VELOCITIES IN THE VICINITY OF THE GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT'S IONA ISLAND OUTFALL - 1968,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
S. Tabata, L. F. Giovando, and D. Devlin.

Descriptors: *Outlets, *Outfall sewers, *Canada, Sewage treatment, Treatment facilities, Population, Wastes, *Domestic wastes, Currents (Water), Ocean currents, *Current meters, Velocity, Flow measurement, *Circulation, Tracking techniques, *Tracers, Aerial photography, Effluents, Public health, Waste disposal.
Identifiers: Iona Island, Georgia Straits.

The Greater Vancouver Sewerage and Drainage District maintains a major sewage primary treatment plant on Iona Island. The treated effluent is released to the Strait of Georgia through an open channel running roughly westward, almost to the edge of Sturgeon Bank. The Iona Jetty flanks the channel to the North as a supposed barrier against northward movement of effluent across Sturgeon Bank. The rapidly increasing load on the existing facility with the accompanying medical and esthetic problems prompted an investigation on current velocities to provide information necessary to determine the district's future plans for sewage disposal in the area. Both surface and subsurface circulation were studied in 1968. Current-metering, free floating surface current followers and visual/aerial photographic tracking containing 'tracers' were employed. (Ensign-PAI)
W72-14657

STUDIES ON THE EFFECTS OF A STEAM ELECTRIC GENERATING PLANT ON THE MARINE ENVIRONMENT AT NORTHPORT, NEW YORK,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05C.
W72-14659

RISKS OF RADIOACTIVE POLLUTION OF THE OCEANS,
California Univ. Medical Center, San Francisco. Radioactivity Research Center.
For primary bibliographic entry see Field 05G.
W72-14661

WATER POLLUTION BY SEWAGE FROM WATER CRAFT,
Washington, Univ., Seattle. Coll. of Engineering.
R. W. Seabloom.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 13 p, 4 fig, 10 ref.

Descriptors: *Ships, *Boats, *Sewage disposal, Water pollution treatment, *Bacteria, *Ecology, Water pollution control, Legislation, Technology, Disinfection, Incineration, Washington, California.
Identifiers: Recirculating, flush toilets, Holding tanks, *Meydenbauer Bay, *Wollochet Bay, *San Diego Bay.

The pollution by water craft waste discharges in Meydenbauer Bay, an inlet on Lake Washington, Wollochet Bay, a harbor on Puget Sound and San Diego Bay was investigated. Bacterial counts were taken and the ecology of the areas studied. Pollution control devices macerator-disinfectors, self contained recirculating flush toilets, incinerators, and holding tanks are some of the possibilities considered to aid in abatement of this pollution problem. International legislation and additional research to improve the technology for handling vessel wastes are suggested for improvement of the present minimally adequate systems. (Ensign-PAI)
W72-14663

RESOURCES, ENVIRONMENTAL PROBLEMS AND TECHNOLOGICAL SOLUTIONS IN CHESAPEAKE BAY,
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 05C.
W72-14664

SOME ECOLOGICAL POINTS REGARDING WATER POLLUTION, (EINIGE OKOLOGISCHE GESICHTSPUNKTE BEIM GEWASSERSCHUTZ),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
W. Stumm.
In: Eidgenossische Technische Hochschule, Eidgenossische Anstalt fur Wasserversorgung, Abwasserreinigung und Gewasserschutz, Dubendorf-Zurich, Schweiz, Separatum Nor. 392, p 15-36, 1971. 8 fig, 2 tab, 13 ref.

Descriptors: Water pollution effects, *Ecology, *Energy, Pollutants, *Ecological effects, *Balance of nature, Life cycles, Selectivity, Succession, Carbon dioxide, Smoke, Oil, Chemicals, Fertilizers, Heavy metals, Pollution abatement.

Pollution of the environment is unquestionably connected with the increasing use of energy reserves as our civilization develops. Smoke, carbon dioxide, oil, petrochemical and other synthetic chemicals together with fertilizers and heavy metals eventually find their way into the environment, disturbing the balance of nature and natural selections by influencing biological counteractions and hydrochemical cycles. Unstable environmental systems produce extreme reactions to outside influences. An understanding of ecological law and counteractions between the world of organisms and an abiotical world are necessary as a basis for control and abatement of pollution. (Brown-PAI)
W72-14669

WATER POLLUTION BY OIL. THE PROBLEM OF PERSISTENT CHEMICALS PRESENT IN THE ENVIRONMENT, (VERUNREINIGUNG DER GEWASSER DURCH OL. ZUM PROBLEM DER PERSISTENTEN CHEMIKALIEN IN DER UMWELT),
Woods Hole Oceanographic Institution, Mass.
M. Blumer.
In: Eidgenossische Technische Hochschulen, Eidgenossische Anstalt fur Wasserversorgung, Abwasserreinigung und Gewasserschutz, Dubendorf - Zurich, Schweiz, Seperatum No. 398, p 1-21, 1971. 21 fig.

Descriptors: *Oil pollution, *Oil spills, *Oil wastes, Ships, *Accidents, *Disasters, *Chemical wastes, Aquatic animals, Mussels, Oysters, Absorption, Massachusetts, *Path of pollutants, Water pollution effects.
Identifiers: *Buzzards Bay (Mass).

The last few years public awareness of the problems of oil pollution has increased partly due to accidents like the 'Torrey Canyon' and the Santa Barbara disaster. Investigations of the oil tanker accident in Buzzards Bay near West Falmouth, Massachusetts in which 600 tons of diesel oil was spilled is discussed. Since the oil was relatively light weight it disappeared quickly from the surface, thus classing it as a 'minimal' spill. Biologists from Woods Hole had researched the area for years and were able to follow the oil effects and compare to pre-spill times. Two research stations were set up. Pollution appeared immediately in samples at the site nearest the accident but not until about 4 months later at the more distant site. Mussels and oysters, among other species absorbed the oil and even after long periods of time in fresh water still showed the effects of oil. (Brown-PAI)
W72-14670

RESEARCH ON THE DISTRIBUTION OF RADIOACTIVE FALL-OUT IN THE REGION OF THE NORTH SEA, SKAGERRAK AND THE WESTERN BALTIC SEA, (UNTER SUCHUNGEN UBER DIE VERTEILUNG DES RADIOAKTIVEN FALLOUT IM BEREICH DER NORDSEE, DE S SKAGERRAKS UND DER WESTLICHEN OSTSEE),
Deutsches Hydrographisches Institut, Hamburg (West Germany).
H. Kautsky.
Deutsche Hydrographische Zeitschrift, Vol 24, No 6, p 262-267, 1971. 3 fig, 2 tab.

Descriptors: *Radioactivity, *Fallout, Sampling, Distribution, Strontium, Cesium, *Nuclear explosions, Explosions, Nuclear wastes, Water pollution sources.
Identifiers: *North Sea, *Skagerrak, *Baltic Sea, *Strontium 90, *Cesium 137, Vertical distribution, Horizontal distribution.

Investigations on the distribution of radioactive fall-out were conducted by sampling water at 29 stations in the North Sea, the Skagerrak and the Western Baltic Sea. From 50-200 liter samples were studied in November 1967 for Strontium 90 and Cesium 137 concentrations. An overall view of the horizontal and vertical distribution of the artificial radio-active materials originating predominantly from atomic explosions is presented. (Ensign-PAI)
W72-14671

DISCOLORATION OF ALGAL BLOOMS AND SEAWEEDS (VEGETATIONSFARBUNGEN UND WASSERBLUTEN),
Oesterreichische Gesellschaft fuer Meteorologie, Vienna (Austria).
For primary bibliographic entry see Field 05C.
W72-14673

INVESTIGATIONS INTO THE DISTRIBUTION OF INORGANIC NITROGEN COMPOUNDS IN RELATION TO THE INCREASING DETERIORATION OF THE WATER IN THE BALTIC SEA (UNTERSUCHUNGEN UBER DIE VERTEILUNG DER ANORGANISCHEN STICKSTOFFVERBINDUNGEN I M HINBLICK AUF DIE ZUNEHMENDE WASSERVERSCHLECHTERUNG IN DER OSTSEE),
Deutsche Akademie der Wissenschaften zu Berlin, Rostock (East Germany). Institut fuer Meereskunde.
D. Nehring.
Beitrage zur Meereskunde, Berlin, Germany, No 28, p 57-74, 1971. 7 fig, 28 ref.

Descriptors: *Indicators, *Organic matter, *Mineralogy, *Nitrification, Ammonia, Nitrogen fixation, Organic loading, Inorganic compounds, *Path of pollutants, *Pollutant identification.
Identifiers: *Baltic Sea, *Lubecker Bight.

Investigations in the Baltic Sea showed that under certain conditions large amounts of ammonia and nitrogen appeared indicating an incomplete nitrification and that the previous organic load in these waters was not yet overcome. These pollution indicators proved that the groundwater flowing into the western and middle Baltic Sea in 1969 was heavily loaded with organic matter. The mineralization and nitrification of the materials stopped east of Bornholm. By the end of November of 1969 a strong organic load was observed in the Lubecker Bight indicative of deterioration of these waters. (Brown-PAI)
W72-14674

PETROLEUM HYDROCARBONS: UPTAKE AND DISCHARGE BY THE MARINE MUSSEL MYTILUS EDULIS,
Scripps Institution of Oceanography La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W72-14683

PHENOXY HERBICIDE RESIDUES AND THEIR PERSISTENCE,
Midwest Research Inst., Kansas City, Mo.
W. B. House, L. H. Goodman, H. M. Gadberry, and K. W. Dockter.
Available from the National Technical Information Service as AD-726 367, $3.00 in paper copy, $0.95 in microfiche. December 1967. 18 p, 46 ref. DAHC 15-68-C-0119.

Descriptors: *Pesticide residues, *Herbicides, *2-4-5-T, *2-4-D, *Environment, *Chemcontrol, Pesticides, Pesticide kinetics, Soil treatment, Agricultural chemicals, Food chains, Diquat, Paraquat, Post-emergents, Pre-emergents, Phenolic pesticides, Public health, Aquatic environment, Water pollution sources, Water pollution effects, Degradation (Decomposition), Plant physiology.
Identifiers: *Phenoxy herbicide residues, MCPA, 4CPA, 2,4-DCP, Silvex, Amitrole.

Decomposition rates of various phenoxy herbicide residues, such as 2,4-d; 2,4,5-T; MCPA; 4 CPA 2,4-DCP; and their esters, paraquat, diquat, silvex, and amitrole in soil, vegetation and water are discussed. Uses of the herbicides in agriculture forestry, range, and water management and ensuing accumulation problems such as injury to sensitive crops that are grown in rotation, bioaccumulation, and leaching into the aquatic environment are considered. (Svensson-Washington)
W72-14687

TRANSFER OF MERCURY FROM FISHES TO SARCOSAPRO-PHAGOUS FLIES,
Helsinki Univ. (Finland).
P. Nuorteva, and E. Hasanen.
Annals of Zoology Fennici, Vol 9, p 23-27, 1972. fig, 4 tab, 22 ref.

Descriptors: *Path of pollutants, *Mercury, *Larvae, Food chains, Water pollution effects, Fish, Public health.
Identifiers: *Bioaccumulation, *Flies (Sarcosaprophagous), Methyl mercury, Lucilia spp.

Sarcosaprophagous flies were reared from eggs to adults on fish containing 0.14, 0.17, 0.47 and 1.90 mg/kg of mercury. The transfer of mercury from the food to the larvae was followed by activation analysis. When fed on fish of the two lowest ('-natural') levels of mercury, the fly larvae had the same mercury content as their food. With a mercury content of 0.47 mg/kg in the fish the full grown fly larvae had 0.62 mg/kg, while with a mercury content of 1.90 mg/kg in the fish the full grown larvae contained 6.90 mg/kg, which is a clear indication of bioaccumulation. It is suggested that fly larvae are capable of inhibiting the bioaccumulation of mercury only if it is present in the food in 'normal' concentrations. When the larvae were given mercury contaminated (9.07 - 10.62 mg/kg) adult flies as their food for a short period, their mercury content rose from low level to 11.40 mg/kg. Because of the weight loss caused by evaporation and respiration during the pupal stage, the mercury content of the adult flies was about 1 1/2 times as high as that of the full grown larvae. Free living fly population in general had low mercury contents (0.02 - 0.06 mg/kg), except for one sample (0.50 mg/kg) collected on the shore of a mercury polluted lake at a place where fish are regularly cleaned. (Svensson-Washington)
W72-14701

ABSENCE OF POLYCHLORINATED BIPHENYLS IN HUMAN MILK AND SERUM FROM TEXAS AND HUMAN MILK FROM NEW GUINEA,
William Beaumont General Hospital, El Paso, Tex.
P. G. Dyment, L. M. Hebertson, E. D. Gomes, J. S. Wiseman, and R. W. Hornabrook.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 6, p 532-534, 1971. 6 ref. PH 86-65-73.

Descriptors: *Pesticide residues, *Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, *Public health, Path of pollutants, Pesticides, DDT, DDE, Insecticides, Gas chromatography, Bioassay, *Texas.
Identifiers: *Human contamination, Milk (Human), Serum (Human), *New Guinea, Industrial pollutants.

The degree of human contamination by PCB's was investigated by assaying human milk and serum from an industrialized society (Texas) and human milk from a, until recently, stone age culture (New Guinea natives). Despite the detection of chlorinated hydrocarbon insecticides in all of the Texas samples, no PCB's were detected in either the milk or the serum. Neither were any detected in the milk from New Guinea natives, although DDT and DDE were detected in all but one of them. The lack of other insecticides in these latter samples can be attributed to the exclusive use of DDT in malaria eradication programs. Because PCB's are lipid soluble, it could be assumed that if they were present in the human body in detectable amounts, they could be recovered from lipid-containing tissue such as milk or serum. Their total absence from these samples would suggest that although PCB's are widespread industrial pollutants, they are not yet significantly contaminating humans. (Svensson-Washington
W72-14708

MONITORING OF ORGANO-CHLORINE RESIDUES IN FISH FROM AROUND ENGLAND AND WALES, WITH SPECIAL REFERENCE TO POLYCHLORINATED BIPHENYLS (PCBS),
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
International Council for the Exploration of the Sea, Fisheries Improvement Committee, C. M. 1970/E:9, 1970. 5 p, 2 tab, 9 ref.

Descriptors: *Marine fish, *Shellfish, *Assay, *Monitoring, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, Herring, Pesticide toxicity, Pesticide residues, Coasts, Mussels, Aquatic environment, Water pollution effects, Aroclors, DDE, DDT, DDD, Aldrin, Dieldrin, Endrin, Heptachlor.
Identifiers: Cod, Whiting, Plaice, BHC, Clophen.

An on-going routine monitoring program is described, involving sampling cod, whiting, plaice and herring landed at nine fishing ports around England and Wales on a twice-yearly basis. Similarly, the sampling of shellfish, particularly mussels, is also being done. Residues of the following organochlorine pesticides: alpha and gamma BHC, DDT, TDE, DDE, aldrin, dieldrin, endrin and heptachlor epoxide are monitored. Concentrations of PCB's in the material obtained for organo-chlorine analysis are also estimated. The main objectives of this program are to establish the levels of these residues in fish and shellfish, the possible differences in concentrations with area or type of fish, and whether the levels have been decreasing or increasing. In addition it was hoped that in conjunction with toxicity tests it would be possible to assess the danger posed to fish by these residues. Results of assays and toxicity tests are presented in tabular form. (Svensson-Washington)
W72-14711

BIOLOGICAL MONITORING OF THE EFFLUENT FROM A LARGE CHEMICAL WORKS IN A RIVER WHICH HAS SOURCES OF POLLUTION UPSTREAM,
Canadian Industries, Ltd. Montreal (Quebec). Engineering Dept.
For primary bibliographic entry see Field 05A.
W72-14713

MONITORING MERCURY VAPOR NEAR POLLUTION SITES.
Environmental Measurements, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05A.
W72-14714

GROUND-WATER RESOURCES OF ORANGE AND ULSTER COUNTIES, NEW YORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-14726

CHRONOLOGY OF THE BLACK SEA OVER THE LAST 25,000 YEARS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-14732

MOLYBDENUM, ARSENIC, AND OTHER ELEMENTS IN STREAM SEDIMENTS, TOMAH MOUNTAIN, TOPSFIELD, MAINE,
Geological Survey, Washington, D.C.
G. A. Nowlan, and T. D. Hessin.
Geological Survey Open-file Report, 1972. 18 p, 4 fig, 2 tab, 4 ref.

Descriptors: *Bottom sediments, *Trace elements, *Molybdenum, *Arsenic compounds, *Maine, Streambeds, Water chemistry, Streams, Geology, Rocks, Sampling, Chemical analysis, Analytical techniques, Data collections, Water pollution sources.
Identifiers: *Washington County (Maine).

The molybdenum and arsenic content of stream sediments is usually high in streams draining the general area of contact between the Devonian Bottle Lake Quartz Monzonite and Silurian metasedimentary rocks near eastern Tomah Mountain, Washington County, Maine. Anomalous values of molybdenum are commonly, but not exclusively, found in stream sediments containing hydrous manganese-iron oxides. High values of arsenic are found in stream-sediment samples containing hydrous manganese-iron oxides but all of the samples containing the oxides do not contain high amounts of arsenic. The anomaly is probably not due solely to the element-scavenging properties of the hydrous manganese-iron oxides. Very sparse molybdenite was found in an outcrop of igneous rock within the drainage basin of an anomalous stream. (Woodard-USGS)
W72-14733

BEHAVIOR OF BERYLLIUM SULFATE IN HARD AND SOFT WATER,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
A. R. Slonim.
Available from NTIS- Springfield, Va. 22151, as AD-739 888, Price $3.00 Paper copy; $0.95 in microfiche. Aerospace Medical Research Laboratory Technical Report 71-100, December 1971. 22 p, 3 fig, 9 tab, 18 ref.

Descriptors: Water pollution sources, *Beryllium, *Sulfates, *Analytical techniques, Hydrogen ion concentration, Water chemistry, Water properties, *Chemical reactions, Laboratory tests, *Chemical analysis, Turbidity, Dissolved oxygen.
Identifiers: *Hard water, *Soft water, Buffering.

The interaction of beryllium with hard and soft water represents the first phase of a study of beryllium effects on water and fish. The pH of BeSO4 in soft water is significantly lower than in hard water in the concentration range of beryllium from 0.01 to 100 mg/liter. An insoluble complex forms only in hard water within a limited beryllium concentration range (1.50 mg/liter). Water hardness is a significant determinant of the pH of beryllium solutions. The amount of NaHCO3 needed to buffer varying amounts of concentrated (acidic) beryllium solutions is compared on a molar basis between soft and hard water. Beryllium has no effect on the hardness or dissolved oxygen content of either test water, but shows greater changes in conductivity of soft water than hard water. The absence of any appreciable beryllium effect on seven characteristics of soft or hard water over a 96-hour period supports the feasibility of running a static bioassay on beryllium in the laboratory. (Woodard-USGS)
W72-14744

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 14,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02K.
W72-14746

NUTRIENT SURVEY OF SURFACE WATERS IN SOUTHERN FLORIDA DURING A WET AND A DRY SEASON, SEPTEMBER 1970 AND MARCH 1971,
Geological Survey, Washington, D.C.
H. J. Freiberger.
Geological Survey Open-file Report 72008, 1972. 29 p, 5 fig, 8 ref.

Descriptors: *Chemical analysis, *Nutrients, *Surface waters, *Florida, Surveys, Phosphates, Ammonium compounds, Nitrites, Nitrates, Wet seasons, Dry seasons, Water pollution sources, Data collections, Water quality, Analytical techniques, Pollutant identification.
Identifiers: *Southern Florida.

A mass nutrient survey of southern Florida surface waters was made in September 1970, during a period of high water, and again in March 1971, during a period of low water. Water samples were analyzed by automated chemical techniques for total ortho plus acid-hydrolyzable phosphorus (P-PO4) ammonia nitrogen (NH3-N), nitrite nitrogen

(NO2-N), and nitrate nitrogen (NO3-N). Phosphorus concentration averaged about 0.50 mg/liter during the wet season; the average concentration was slightly higher during the dry season. At one site in Broward County near a point of sewage outfall, the concentration was 45 mg/liter during the dry season. Ammonia was the most prevalent form of nitrogen detected. Concentrations of NH3-N ranged from less than 0.01 to 25 mg/liter in the dry season. Nitrite and nitrate concentrations were generally low in both wet and dry seasons. Nitrite ranged from less than 0.01 to 0.70 mg/liter during the wet season and slightly lower in the dry season. Most nitrate concentrations were below 0.20 mg/liter during the wet and dry seasons. (Woodard-USGS)
W72-14750

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage (England).
A. L. H. Gameson, D. Munro, and E. B. Pike.
Presented to Institute of Water Pollution Control Symposium on Water Pollution Control in Coastal Areas, Bournemouth, May 1970. 20 p, 13 fig, 2 tab, 10 ref. Water Pollution Research Laboratory Reprint No. 587.

Descriptors: *Mathematical models, *Correlation analysis, *Coliforms, *Coasts, *Water pollution sources, Tidal effects, Winds, Seasonal, Sewage effluents, Bacteria, Path of pollutants, Model studies.
Identifiers: Sea state.

In an attempt to develop a predictive model for estimating the pollutional effects of a sewer emptying into the sea, measurements of coliform bacteria were taken periodically over a period of two years. Sampling stations were located along the shingle, sand and gravel beach for a distance of 1.2 kilometers in one direction and 1.7 kilometers in the other. Results indicate that general estimates can be made based on tidal state, wind, sea state, season, sewage strength and distance from the outfall. The influence of the above factors varies between measurement stations. The Fickian dispersion model was used with numerical values assigned based on the most relevant data. Further observations resulted in changes in these values which provide a model that is only approximate. Attempts to relate discrepancies between observed and calculated values to the pollutional effects of three rivers in the area were inconclusive. Nevertheless, the predictions were not entirely unsuccessful and the discussions illustrate the difficulties in predictive methods. (Goessling-Texas)
W72-14817

BOD DETERMINATIONS ON FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14819

FACTORS AFFECTING OXYGEN TRANSFER IN THE ELECTROLYSIS BOD SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14820

A THIRD YEAR OF OBSERVATIONS ON THE CONTRIBUTION OF NUTRIENT SALTS OF SOME WATERCOURSES FLOWING INTO THE ADRIATIC,
Bologna Univ. (Italy). Instituto di Zoologia; and Laboratorio di Biologica Marine e Pesca, Fano (Italy).
M. V. Olmo, and M. P. Molinas.
Note Lab Biol Mar Pesca-Fano. Vol 3, No 8, p 177-221. 1970. Illus. Map. English summary.
Identifiers: *Adriatic Sea, Fano (Italy), Nutrients, *Chemical properties, Phosphates, Nitrates, Nitrites, Nitrogen compounds.

Data are presented on the quantitative analysis of soluble phosphates, ammonia salts, nitrates and nitrites flowing into the Adriatic Sea near Fano, Italy, obtained from 1967-1969. The areas studied are in the vicinity of the Metauro and Arzilla water courses.--Copyright 1972, Biological Abstracts, Inc.
W72-14822

RELATIVE POLLUTION STRENGTHS OF UNDILUTED WASTE MATERIALS DISCHARGED IN HOUSEHOLDS AND THE DILUTION WATERS USED FOR EACH,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. Laak.
Available from the National Technical Information Service as PB-212 363, $3.00 in paper copy, $0.95 in microfiche. Completion Report 1972. 15 p, 9 tab, 11 ref. OWRR A-025-CONN (1).

Descriptors: *Domestic wastes, *Pollutant identification, *Waste water (Pollution), *Detergents, *Plumbing, Recycling, Ammonia, Nitrogen, Biochemical oxygen demand, Chemical oxygen demand, Water utilization, Sanitary engineering, Inorganic compounds, Phosphates.
Identifiers: *Pollutional load budget, *Recycle system design, Consumer products.

By keeping records, weighing the quantities of consumer products used in 5 households and measuring the water used for each plumbing fixture a detailed pollutant budget was obtained. Laboratory analysis for consumer brands used and actual samples of the wastewater for BOD, COD, ammonia, Kjeldahl and nitrate nitrogen, and inorganic phosphates are presented in table form for design of recycle systems, estimating pollution loads and for calculating the impact of consumer brands changes. Consumer products contributed less than 50% of the total pollution load. About half of the waste flow, 90% of the nitrogen, 60% of COD and 50% of phosphates were contributed by toilet wastes. Effective environmental protective measures appear to be reduction or elimination of water carried toilet systems and partial recycling of water between bathing and laundry.
W72-14839

A CHEMICAL ANALYSIS OF THE EARTHY--MUSTY ODOR IN WATER,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05A.
W72-14841

A PRE-IMPOUNDMENT STUDY OF THE NORTH ANNA RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
M. Simmons, Jr.
Available from the National Technical Information Service as PB-212 380, $3.00 in paper copy, $0.95 in microfiche. Virginia Water Resources Research Center Bulletin 55, August 1972. 76 p, 20 fig, 7 tab, 11 append. OWRRA-031-VA (3).

Descriptors: *Water quality, *Acid mine water, Benthic fauna, Aquatic animals, Water pollution sources, *Virginia.
Identifiers: Aquatic ecology, *North Anna River (Va).

Virginia Electric and Power Company has completed a nuclear powered electrical generating facility on the North Anna River in Louisa County, Virginia, with a 14,500 acre reservoir serving as a coolant. Pre-impoundment studies have been completed on the evaluation of the existing macrobenthic community and water quality conditions in the impoundment basin. Analyses of the diversity index and structure of the macrobenthic community show that while the river was severely affected by acid mine drainage from a major tributary, Contrary Creek, the polluted zone is in a recovery phase. Chronic siltation from Contrary Creek is presented as the primary factor restricting complete recovery. A project supported by the power company revealed that the point of biological recovery was at the confluence of the North Anna and South Anna rivers, approximately 40 miles from Contrary Creek and 19 miles from the dam site.
W72-14846

POLLUTION INSTRUMENTATION TECHNIQUES,
Union Carbide Corp., South Charleston, W. Va.
For primary bibliographic entry see Field 05A.
W72-14855

LEAD-DEADWOOD SANITARY DISTRICT NUMBER 1, SOUTH DAKOTA (FINAL ENVIRONMENTAL STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 05D.
W72-14924

TEST TO DETERMINE THE COMBINED EFFECTS OF WAVES AND CURRENTS ON BARRIER MOTIONS AND OIL RETENTION EFFICIENCY IN ROUGH WATER. POINT CONCEPTION, CAL. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-14937

DYE DISPERSION PATTERNS FOR THREE OUTFALL LOCATIONS FOR THE WARWICK RIVER SEWAGE TREATMENT PLANT HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb, and N. J. Brogdon, Jr.
Available from NTIS, Springfield, Va. 22151 as AD-738 802 - Price $3.00 in paper copy; $0.95 cent microfiche. Miscellaneous Paper No 2-951 December 1967. 20 p, 88 plate, 1 tab.

Descriptors: *Water pollution sources, *Sewage effluents, *Estuaries, *Model studies, *Virginia, Dye releases, Sampling, Path of pollutant Tracers, Fluorescent dye, Tracking technique Data collections.
Identifiers: *James River estuary (Va).

A fixed-bed model of the James River estuary ar its tributaries, which reproduced tides, current and salinities, was used to determine the dispe sion characteristics and areas of influence sewage effluent from three proposed locations f a sub-aqueous outfall for the Warwick River trea ment plant. The outfall locations tested were 3,8 ft, 8,000 ft, and 12,000 ft from shore, and efflue discharge rates equivalent to 5 million gallons p day (mgd) and 15 mgd were tested at each outf location. Two fluorescent dyes, adjusted to an i tial concentration of 1,000,000 parts per billio were injected at the proper rate to simulate eit the low or the high effluent discharge rate. Wa samples were collected from surface and bott depths at times of local tidal high- and low-wat Both the dispersion rate and the area of influer increased when the outfall location was shif from 3,800 ft to 8,000 ft from shore. Shifting outfall an additional 4,000 ft to a point 12,00 from shore had very little further effect. The m imum concentration was in the Warwick Ri

with a 15 mgd discharge rate from the outfall located 3,800 ft from shore. (Woodard-USGS)
W72-14951

PRELIMINARY STUDIES IN THE TERRESTRIAL DISPOSITION OF SILVER FROM CLOUD SEEDING,
Colorado State Univ., Fort Collins. Dept. Watershed Science.
H. L. Teller, and D. R. Cameron.
Water Resources Bulletin, Vol 8, No 4, p 715-723, August 1972. 4 fig, 3 tab, 12 ref.

Descriptors: *Path of pollutants, *Silver iodide, *Cloud seeding, *Environmental effects, *Colorado, Weather modification, Trace elements, Sampling, Chemical analysis, Distribution patterns, Monitoring.

Silver levels in soil, plant and litter material are being monitored twice a year on a mountainous area in southwestern Colorado, to determine whether annual accretion from cloud seeding can be measured with current techniques and whether significant changes in silver concentration take place in grass, aspen, and spruce communities. One AgI generator site is also being monitored. No measurable increase was found after the first winter's seeding. On an ash basis, spruce foliage and litter contain about four times as much silver as soil. On a dry weight basis, soil from all three plant communities contains about six times as much silver as foliage. Consistent increases in silver concentration were found in soil and pine foliage within 200 meters of one generator site. (Knapp-USGS)
W72-14953

FEASIBILITY STUDY OF CHEMICAL SEALING OF SOILS,
Diamond Alkali Co., Painesville, Ohio.
W. T. Gooding, Jr., A. D. Bergmann, and C. G. Vinson.
Available from the National Technical Information Service as PB-206 018, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 266, June 1967. 31 p, 7 fig, 3 tab, 12 ref, 3 append. Contract 14-01-0001-649.

Descriptors: *Brine disposal, *Soil treatment, *Evaporation, *Ponds, *Permeability, Soil chemical properties, Saline water, *Sealants.
Identifiers: *Soil mixes, Permeability cell tests, Soil sealants, Solar ponds.

Chemically sealing of soils was evaluated in the laboratory to determine the rate of permeation of various soils and chemicals. Permeability tests showed that several formations of Roswell, New Mexico soil have casagrande permeabilities of 0.1 foot per year or less. The cheapest of the formulations studied contained 0.3 weight percent sodium silicate. Sodium silicate mixes were considered to be ready for field testing. Measurements were conducted by moistening and compacting mixtures of the Roswell soil and the chemical sealant to a depth of 2.5 inches in permeability cells. Rates of brine permeation through the cells were measured under pressure differential of about 10 psi. (OSW abstract)
W72-15000

5C. Effects of Pollution

THE ECOLOGY OF THE SILVERJAW MINNOW, ERICYMBA BUCCATA COPE,
Eastern Michigan Univ., Ypsilanti. Dept. of Biology.
D. C. Wallace.
Am Midl Nat. Vol 87, No 1, p 172-190. 1972. Illus.
Identifiers: Behavior, Ecology, *Ericymba buccata, Minnow, *Pimephales notatus, *Silverjaw minnow, *Otter Creek (Ind), Indiana, Turbidity, *Mine wastes.

A study of the ecology of E. buccata Cope, in Otter Creek, Vigo Co., Indiana, was based on random samples taken over a period of 1 yr. This method enabled analysis of temporal and spatial changes in the occurrence of this species with respect to the environmental factors measured. Comparisons between the ecology of E. buccata and Pimephales notatus (Rafinesque) were drawn. Ericymba was the most abundant species in this relatively small, soft-bottomed stream. It usually occurred in non-wooded areas, over sand or sand-and-fine-gravel bottoms, in situations between 6 in. and 2.5 ft deep, and 16 to 40 ft wide with current speeds less than 1.5 fps (ft/sec). Certain aspects of its physiology and behavior are adaptive to these conditions. Although commonly associated with P. notatus, the next most abundant species, the occurrence of the silverjaw minnow was less narrowly defined with regard to depth and flow. Pimephales occurred at significantly higher densities in 'slow flow-deep' areas than in 'moderate flow-shallow' areas. In contrast, the silverjaw minnow occurred at essentially the same densities in both of these situations and at much higher densities than the bluntnose minnow in the 'moderate flow-shallow' areas. Although Erycimba has a high tolerance to turbidity and mine wastes, its numbers are reduced where turbidity and mine wastes have deposited silt layers over otherwise habitable stream bottoms. This species apparently moves into somewhat deeper water in the winter and remains there during early spring. Based on densities of occurrence it appears that young-of-the-year tend to move downstream in the autumn and remain there as yearlings until sometime the following autumn when they move upstream.--Copyright 1972, Biological Abstracts, Inc.
W72-14206

WATER RELATIONS IN LIVING, DEAD, AND CELLULOSE MODELS OF THE LICHEN UMBILICARIA PAPULOSA,
Ohio State Univ. Hospitals, Columbus.
R. E. Showman, and E. D. Rudolph.
Bryologist, 74 (4): 444-450, Illus, 1971.
Identifiers: Algal layer, *Cellulose models, *Lichens, Staining, *Umbilicaria-Papulosa, Water.

Water relations of living lichens, dead lichens, and cellulose model lichens were studied at different relative humidities. An air flow system allowed instantaneous weight measurement while water uptake or loss was occurring. In all cases, living lichens had the greatest uptake rates, followed by dead lichens and cellulose models. Nonaqueous staining techniques showed that in living, but not in dead lichens, most of the water is held in the algal layer. The processes of water vapor uptake and water loss are apparently physical, and the differences in rates can be explained by differences in the physical properties of the test materials.--Copyright 1972, Biological Abstracts, Inc.
W72-14247

TRUMBULL LAKE, PEQUONNOCK RIVER, TRUMBULL, CONNECTICUT (UPDATED FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-14278

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14279

LIMNOLOGICAL EFFECTS OF SIMULATED PUMPED-STORAGE OPERATION AT YARDS CREEK,
Delaware River Basin Commission, Trenton, N.J.
C. F. Baren.
December 1971. 158 p, 36 fig, 31 tab, 103 ref.

Descriptors: *Water level fluctuations, *Pumped storage, Physicochemical properties, *Plankton, *Aquatic plants, *Aquatic animals, *Model studies, Limnology, Biological properties, Mineralogy, Fish, Fish behavior, Chemical analysis, Sampling, Volumetric analysis, Algae, Reservoir storage, Impoundments, Dissolved oxygen, Chlorides, Invertebrates, Hardness (Water), Turbidity, Alkalinity, Carbon dioxide, Phosphorus, Nitrogen, Silica, Copper, Sulfates, Iron, Manganese, Spawning, Fish reproduction, Life history studies, Phytoplankton, Standing crop, Biomass, Sport fish, Zooplankton, Water temperature, Air temperature, Juvenile fishes, Fry, Plankton nets, Nets, Sunfishes, Bass, Rock bass, Diatoms, Chrysophyta, Bullheads, Shiners, Yellow perch, Walleye, Minnows, Protozoa, Rotifers, Brook trout, Rainbow trout, Pikes, Striped bass, Chlorophyta, Euglenophyta, Phrrophyta, Euglena, Cyanophyta, Crustaceans, Copepods, Nesting, Brown trout, Scenedesmus, Dinoflagellates, Larvae, Daphnia, Midges, Caddisflies, Gastropods, Pondweeds, New Jersey, Delaware River, Nutrients, Primary productivity, Secondary productivity.
Identifiers: Macroinvertebrates, *Tocks Island Reservoir (NJ), American shad, Ekman dredge, Pumpkinseed, Black crappie, Chain pickerel, Tendipes tentans, Trichoptera, Limnephilus, Glossosoma, Physa gyrina, Kemmerer sampler, Secchi *Yards Creek (NJ), Relative condition factor.

A pumped-storage power generating systems which would alter water levels has been proposed for inclusion in the Tocks Island Reservoir project at Blairstown, New Jersey. Results are reported of a two-year study to determine what effects changing water levels might have on aquatic biota. Four t disc,est ponds were constructed in the vicinity of the planned project to investigate: (1) the effects of diurnally fluctuating water levels on the life history of selected, native nest-building and non-nest-building fish; (2) the physical and chemical characteristics of variously fluctuated test ponds; (3) the resulting effects of fluctuating water levels on macroinvertebrates, plankton, and aquatic plants; and (4) the consequent combined effects of physicochemical characteristics and changing water levels on the behavior of the selected fishes. It was found that (1) fish adapted to the uniform regime of water level fluctuations and were successful in spawning and hatching eggs and (2) the measurable effects observed in plankton and macroinvertebrate productivity, plant colonization, relative condition factors of fish, and the physical and chemical properties of the test pond had no marked effect on the fish populations. The results of the physiochemical analyses and profiles, the plants and animals studied, and sampling procedures utilized in the study are included in figures, tables and appendices. (Holoman-Battelle)
W72-14280

CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES--INDIANA-MICHIGAN-NEW YORK-OHIO-PENNSYLVANIA: VOLUMES 1 AND 2.
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14282

HISTOLOGICAL CHANGES IN LOBSTERS (HOMARUS AMERICANUS) EXPOSED TO YELLOW PHOSPHORUS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. E. Aiken, and E. H. Byard.

Science, Vol 176, No 4042, p 1434-1435, June 30, 1972. 1 fig, 8 ref.

Descriptors: *Phosphorus, *Toxicity, *Lobsters, Industrial wastes, Water pollution effects, Fishkill, Canada, Cytological studies, Sea water, Microscopy.
Identifiers: *Yellow phosphorus, Homarus americanus, Histology, Hepatopancreas, Antennal gland, Tissue, Arthropods, Macroinvertebrates, Biological samples, Sample preparation,Sample preservation.

An analysis of tissue samples from lobsters killed by phosphorus reveals pronounced histological changes in the hepatopancreas. Variable destruction of parts of the antennal gland was also evident. Tissues were taken from 18 phosphorus contaminated lobsters and from two control lobsters that were asphyxiated in oxygen-free seawater. The tissues were fixed in Bouin's fluid and stored in 70 percent ethyl alcohol. The tissue was stained with Delafield's hematoxylin and one percent aqueous eosin. Tissue from a second control group of 18 lobsters was stained and mounted without storage. Antennal gland degeneration was evident to some degree in all but one of the exposed lobsters and in none of the controls. The phosphorus caused degeneration in all four cell types in the hepatopancreas. A characteristic way of dying was also observed in the lobsters exposed to lethal doses of yellow phosphorus. (Mortland-Battelle)
W72-14284

CHLORINATION OF POWER PLANTS: IMPACT ON PHYTOPLANKTON PRODUCTIVITY,
Minnesota Univ. Minneapolis. Dept. of Ecology and Behavioral Biology.
A. J. Brook, and A. L. Baker.
Science, Vol 176, p 1414-1415, June 30, 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Phytoplankton, *Chlorination, *Respiration, Water pollution effects, *Primary productivity, Powerplants, Rivers, *Photosynthesis, *Thermal pollution, Water temperature, Sewage treatment, Chlorine, Incubation, Dissolved oxygen, Volumetric analysis, *Minnesota, Environmental effects.
Identifiers: Light and dark bottle technique, *St. Croix River (Minn).

Photosynthesis and respiration rates were measured to determine the effects on river phytoplankton productivity of passage through a power plant. Three hundred-ml samples were taken in the St. Croix River near the Allen S. King power plant in Minneapolis. The photosynthesis and respiration rates were determined by the light-dark bottle incubation technique and changes in the amounts of dissolved oxygen were measured by Winkler titration. The studies indicated that chlorination depresses photosynthesis and respiration to a much greater extent than does heating of the water. (Mortland-Battelle)
W72-14285

EFFICACY, TOXICITY, AND RESIDUES OF NIFURPIRINOL IN SALMONIDS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
D. F. Amend.
Technical Paper No 62, April 1972. p 3-13, 4 fig, 3 tab, 13 ref.

Descriptors: *Toxicity, *Fish diseases, *Animal pathology, *Salmonids, Pathogenic bacteria, Water temperature, Hardness (Water), Mortality, Lethal limit, Freshwater fish, Antibiotics (Pesticides), Bactericides, Pesticide residues, Chinook salmon, Rainbow trout, Carp, Bullheads, Sunfishes, Bioassay, Water pollution effects, Physicochemical properties.
Identifiers: *Nifurpirinol, Drugs, Sample preparation, Tissue, Biological samples, Chondrococcus columnaris, Furunculosis, Aeromonas salmonicida, Coho salmon, Oncorhynchus kisutch, Myxobacteriosis, Cytophaga psychrophila, Oncorhynchus tschawytcha, Virbrio anguillarum, Muscle, Blood, Skin, Kidneys, Liver, Salmo gairdneri.

Nifurpirinol (NFP) was tested for control of furunculosis, myxobacterioses, and vibriosis, and for effects on rainbow trout, coho, and chinook salmon under various conditions. The elimination of NFP from various tissues of coho salmon at 45C and 70C was measured. Furunculosis in coho salmon was partially controlled with 2 daily 1-hour baths at 8 or 10 ppm NFP; it was not controlled by feeding the drug because the fish refused to eat the medicated food. Excellent control of myxobacterioses (columnaris, cold-water disease, myxobacterial gill disease, followed 1 or 2 daily 1-hour treatments at 1 ppm NFP. Preliminary tests indicated that loss of chinook salmon due to vibrosis could be reduced with NFP fed at 50 to 75 mg/kg per day for 14 days. The reason chinook salmon ate the medicated food and coho salmon did not is not known. The toxicity of NFP to cohos varied directly with dosage level, treatment frequency, and water temperature. Single 1-hour exposures were not toxic at levels up to 10 ppm, but repeated exposures to 6 ppm or higher at 24-hour intervals resulted in increased mortality. Toxicity was greater at higher water temperatures. Results were similar with chinook salmon and rainbow trout. NFP was eliminated from all tissues of cohos within 9 days following 3 daily 1-hour exposures at 2 ppm at both 45 and 70C. The highest levels occurred in the liver and kidney, and it expecially accumulated in these tissues at 45C. Muscle, serum, and skin drug levels were highest immediately following treatment, but were undetectable after 48 hours. It was concluded that NFP administered as a 1-hour bath to cohos at 1 ppm on 1 to 3 consecutive days will effectively control myxobacterial diseases. It is of low toxicity and poses no residue problems 9 days after the last treatment. (Mortland-Battelle)
W72-14286

MORPHOLOGY AND ENZYME HISTOCHEMISTRY IN THE LIVER OF LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
Louisville Univ., Ky. Dept. of Anatomy.
D. E. Hinton, R. L. Snipes, and M. W. Kendall.
Journal Fisheries Research Board of Canada, Vol 29, No 5, p 531-534, May 1972. 10 fig, 16 ref.

Descriptors: *Enzymes, Bass, Microscopy, Electron microscopy, Fish diseases, Fish physiology, Sampling, Freshwater fish.
Identifiers: *Histochemistry, *Liver, *Largemouth bass, *Morphology, Glucose-6-phosphatase, Micropterus salmoides, Tissue, Biological samples, Sample preparation, Alkaline phosphatase, Histology.

A description is given of the morphology and enzyme histochemistry of the liver of the largemouth bass (Micropterus salmoides). Twenty-seven bass were collected from streams and an impoundment in Kentucky by electroshocking. Rapid streamside dissections were performed and the livers were placed in appropriate solutions for subsequent examinations: light and electron microscopy and enzyme histochemistry. The connective tissue framework of the liver was primarily collagen and reticulum. Elastic lamellae were seen in hepatic arteries. Hepatic parenchyma was arranged in dual-plated muralia. Hepatocytes contained glycogen, endoplasmic reticulum, mitochondria, and a homogeneous nucleus with one prominent nucleolus. Pancreatic acini were observed in walls and perivascular connective tissue of portal veins. No distinct lobular pattern of parenchyma was observed. The enzyme glucose-6-phosphatase was abundant in cytoplasm of hepatocytes usually forming a perinuclear cuff. Alkaline phosphatase was determined in the sinusoidal border of hepatocytes and in walls of central veins. Differentiation of portal veins from central veins was made on the basis of proximity to the hepatic artery and bile duct. (Byrd-Battelle)
W72-14288

DISTRIBUTION OF HERRING (CLUPEA HARENGUS) LARVAE ALONG THE SOUTHERN COAST OF NOVA SCOTIA WITH OBSERVATIONS ON THEIR GROWTH AND CONDITION FACTOR,
Bedford Institute, Dartmouth (Nova Scotia).
D. D. Sameoto.
Journal Fisheries Research Board of Canada, Vol 29, No 5, p 507-515, May 1972. 8 fig, 2 tab, 17 ref.

Descriptors: *Growth rates, *Spatial distribution, *Fish physiology, *Larval growth stage, *Ecological distribution, Water pollution effects, Herrings, Copepods, Water quality, Zooplankton, Mortality, Biomass, Sea water, Fish populations, Sampling, Marine fish, Equipment, Coasts, Statistical methods, Bioindicators, Maine, Atlantic Ocean, Water pollution, Pollutant identification, Reproduction, Spawning.
Identifiers: *Clupea harengus, *Nova Scotia, Condition factor, Sample preservation, Sample preparation, St. Margaret's Bay, North Sea, Baltic Sea, Clyde Sea.

The distribution of herring (Clupea harengus) larvae along the southern coast of Nova Scotia was studied in relation to their growth and condition factor. Herring larvae and zooplankton samples were collected and the condition factors calculated to be used as indicators of high or low potential of larval mortality. During the fall and winter, the condition factor and growth rate of herring larvae were studied and compared to that of herring larvae from the coast of Maine, and from parts of the North, Baltic and Clyde Seas to determine if the environment on the coast of Nova Scotia was as favorable to the larvae as those mentioned above. The distribution and abundance of herring larvae on the southern coast of Nova Scotia suggested the presence of a fall spawning population. Larvae were found in St. Margaret's Bay from late September to June. They showed a slower growth rate than larvae from the Clyde Sea, Scotland, and weighed less at a particular length than did larvae from the Clyde Sea and Boothbay, Maine. The larvae had a lower condition factor at 25 mm length than larvae from the North and Baltic Seas. No larvae were found on the Scotian Shelf during late May and early June, 1969, but were abundant during September and October. Herring spawning beds were reported from areas along the entire coast of Nova Scotia from Canso to Cape Sable. (Byrd-Battelle)
W72-14289

EFFECT OF THERMAL STRESS ON PREDATOR AVOIDANCE IN SOCKEYE SALMON,
Washington Univ., Seattle. Coll. of Fisheries.
J. R. Sylvester.
Journal Fisheries Research Board of Canada, Vo 29, No 5, p 601-603, May 1972. 1 fig, 10 ref.

Descriptors: *Thermal stress, *Prey fish, *Predation, *Sockeye salmon, *Environmental effects Mortality, Fishkill, Heated water, *Thermal pollution, Water temperature, Aquaria, Fish behavior Water pollution effects, Laboratory tests, Salmon Fry, Freshwater fish.
Identifiers: Oncorhynchus kisutch, Oncorhynchu nerka, Coho salmon, Survival.

Experiments were performed to examine the effect of moderate and severe thermal doses of shor duration on the ability of sockeye salmon fry, Oncorhynchus nerka, to avoid predation by yearlin coho salmon, Oncorhynchus kisutch, in laborator

aquaria. Predators and prey were divided into three groups; each group was acclimated in holding tanks to water temperatures of 7, 12, or 17 C for at least 2 weeks before tests. All fish were held under a constant photoperiod. Tests were conducted in insulated tanks containing dechlorinated water at an acclimation temperature of plus or minus 0.5 C. Dissolved oxygen was maintained at 80-90 percent of air saturation values. Eight prey and two predators acclimated to the same temperature were randomly selected from the holding tanks for each test. A control series and two experimental series of tests were conducted at each acclimation temperature to study the effect of thermal doses of short duration on the prey. Tests in each series were replicated eight times. Under laboratory conditions, predation rates of yearling coho salmon on sockeye salmon fry increased with increasing acclimation temperature. Elevated temperature doses significantly decreased survival of sockeye salmon fry. The results suggest that under natural conditions, sudden increases in water temperature could alter predator-prey interactions of some fish by increasing predation mortalities. (Byrd-Battelle)
W72-14290

MICROBIAL UPTAKE OF LEAD,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
T. G. Tornabene, and H. W. Edwards.
Science, Vol 176, No 4041, p 1334-1335, June 23, 1972. 2 tab, 15 ref.

Descriptors: *Cytological studies, *Lead, *Bacteria, *Absorption, Bromides, Chlorides, Iodides, Salts, Cultures, Spectrophotometry, Turbidity, Centrifugation, Proteins, Lipids, Spectrometers, Incubation, Membranes, Food chains, Absorption, Path of pollutants.
Identifiers: *Lead compounds, *Biological magnification, Lead bromide, Lead iodide, Lead bromochloride, Azotobacter, Micrococcus luteus, RNA, Hexosamine, Atomic absorption spectrophotometry.

A study was made of the immobilization of inorganic lead by microbial cells and the fraction of immobilized lead that passes through the cell envelope into the cytoplasm. This immobilization may be important to transfer through the food chain. Azotobacter sp. and Micrococcus luteus were grown in broth in the presence of lead bromide, lead iodide, and lead bromochloride. Culture turbidity was measured spectrophotometrically and a viable cell count was taken. These measurements indicated that the three lead salts in concentrations approaching the solubility limits had no appreciable effect on overall growth rates and cell viability. Cellular subfractions were analyzed for lead by dissolution in concentrated nitric acid followed by atomic absorption spectrometric analysis. It was concluded from this study that these microbial systems are capable of immobilizing large quantities of inorganic lead and that the lead is largely associated with cell membranes (99.3 and 99.1 percent, respectively, for Micrococcus luteus and Azotobacter sp.). The remaining lead is associated with cytoplasmic fractions. (Mortland-Battelle)
W72-14291

EVIDENCE FOR THE RECOVERY OF THE WATERS OFF THE EAST COAST OF NOVA SCOTIA FROM THE EFFECTS OF A MAJOR OIL SPILL,
Bedord Inst., Dartmouth (Nova Scotia). Atlantic Oceanography Lab.
E. M. Levy.
Water, Air, and Soil Pollution, Vol 1, No 2, p 144-148, April 1972. 1 fig, 3 tab, 5 ref.

Descriptors: *Sea water, Water pollution effects, Oil spills, Separation techniques, Fluorometry, Sampling, Water pollution sources, Solvent extractions, Persistence, Oil pollution, Biodegradation, Environmental effects, Path of pollutants.
Identifiers: *Fate of pollutants, *Bunker C oil, *Recovery, *Nova Scotia, Oil residues, Membrane filters, Membrane filtration, Sample preparation, Fuel oil, Chedabucto Bay, Particulate matter, Petroleum products.

The amount of oil residues in Chedabucto Bay, Nova Scotia and the surrounding areas was determined in order to evaluate environmental recovery from the effects of the one-year old Bunker C fuel oil spill from the tanker ARROW which was wrecked in 1970. The area examined for oil was extended beyond that of a previous investigation. Analysis for particulate oil involved filtering sea water through 0.45-micron pretreated Millipore filters. The filtrate was extracted with chloroform and examined fluorometrically. The results showed residual oil in the Halifax section decreased over an 8 month period from 6.0 - 1.9 micrograms/l at a depth of 2 m, and from 6.5 - 1.6 micrograms/l at 10 m. Variations in data collected at different metering stations were attributed to weather, biodegradation, water movements, and other environmental factors. (Long-Battelle)
W72-14292

RESEARCH ON AND CULTURE OF CALCAREOUS GREEN ALGAE,
Ohio State Univ. Research Foundation, Columbus.
L. Hillis-Colinvaux.
Final Report, February 11, 1972. 30 p, 1 fig, 3 tab, 27 ref.

Descriptors: *Cultures, *Plant growth, *Chlorophyta, *Marine algae, *Bioassay, Reproduction, Sea water, Marine plants, Primary productivity, Coral, Reefs, Antibiotics (Pesticides), Chlorinated hydrocarbon pesticides, Pesticide toxicity, Plant populations, Aquaria, Laboratory equipment, Plant physiology.
Identifiers: Epiphytes, Culturing vessels, Penicillin, Lindane, Diadema antillarum, Aandomene, Siphonales, *Halimeda spp., Penicillus capitatus, Penicillus dumentosus, Rhipocephalus phoenix, Udotea flabellum, Bryopsis, Caulerpa, Acropora palmata, Penicillus lamourouxii.

Four genera of coral reef Siphonales, Halimeda, Penicillus, Rhipocephalus and Udotea were grown in laboratory aquaria under light intensities of 650, 200-375 and 125-200 ft-candles. The commercial preparation 'Instant Ocean' was tested for use with plants. Penicillin and lindane were tested for their effect on epiphytes and other nuisances. A 15 ppm solution of the invertebrate killer Lindane did not kill Halimedae which were immersed in it for 15 minutes. Penicillin at a concentration of 3000 units per ml was initially effective in controlling the weeds, but within 2 months they were abundant again and penicillin was thereafter ineffective. The growth and development of all 4 genera from tiny protuberances above the sand to white, dying and disintegrating individuals was followed. All produced new individuals from rhizoidal-like filaments that extended outwards through the sand from the holdfast of an older plant. It was demonstrated that vegetative reproduction might occur with partial burying of individuals by shifting sands in a reef, or from portions of plants broken off by grazing or other natural activities. Plants produced vegetatively are not initially epiphytized and so may be a source of clean plants for laboratory experiment. The first swarmer-producing Penicillus plants so far known were produced during this study. The rather undistinguished structures associated with them, the release of swarmers from Halimeda, and associated observations are described. Insight into the role of calcareous plants in a reef was obtained by a productivity study which combined a census of such plants in a reef and a laboratory measure of oxygen changes in an entire aquarium. Some Halimeda reef populations appeared to be grazed by the urchin Diadema. A conservative figure for the productivity of laboratory Halimeda plants is 2.5 mg C/plant/day (net) or 4.5 mg C/plant/day (gross). (Long-Battelle)
W72-14294

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES. A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
I. S. Pakkala, M. N. White, G. E. Burdick, E. J. Harris, and D. J. Lisk.
Pesticides Monitoring Journal, Vol. 5, No. 4, p 348-355, March 1972. 1 fig, 4 tab, 23 ref.

Descriptors: *Estuaries, *Lead, Wildlife, Water pollution effects, Pollutant identification, Heavy metals, Freshwater fish, Bioassay, Chemical analysis, Colorimetry, Striped bass, Walleye, Yellow perch, Pikes, Suckers, Lake trout, Rock bass, Bullheads, Catfishes, Brown trout, Rainbow trout, Drums, *New York, Data collections, Sampling, Toxicity, Sunfishes, Carp, Analytical techniques.
Identifiers: Bioaccumulation, Sample preparation, Sensitivity, *Cayuga Lake (NY), Ictalurus, Acipenser, Perca, Dry ashing, Goldfish, Coho salmon, Burbot, Gizzard shad, Sturgeon, Pomoxis nigromaculatus, Amia calva, Salvelinus fontinalis, Salmo trutta, Lota lota, Cyprinus carpio, Esox niger, Coregonus artedii, Oncorhynchus kisutch, Aplodinotus grunniens, Dorosoma cepedianum, Carassius auratus, Salvelinus namaycush, Coregonus clupeaformis, Micropterus salmoides, Esox masquinongy, Esox lucius, Salmo gairdneri, Amblopites rupestris, Micropterus dolomieui, Morone saxatilis, Stizonstedion vitreum vitreum, Roccus chrysops, Catostomus commersoni.

A survey was made of 419 fish in 49 New York State waters for total lead content and compared to data presented on a series of lake trout sampled in 1970 from Cayuga Lake in order to determine if lead were cumulative in these fish. Lead content was determined by dry ashing 10 gm of fish at 485 degrees C and examining the residue by a colorimetric procedure. The results showed that lead concentrations usually ranged from 0.3 to 1.5 ppm, and a few samples up to 3.0 ppm. Variations were found in lead content of fish taken from different lakes, but no correlation was observed between lead concentration and size, species, or sex. Lead did not appear to be cumulative in lake trout up to 12 years of age taken from Cayuga Lake. (Long-Battelle)
W72-14298

ANIMAL TOXICITY OF PHYTOPATHOGENIC FUNGI,
North Carolina State Univ., Raleigh. Dept. of Plant Pathology.
C. E. Main, and P. B. Hamilton.
Applied Microbiology, Vol 23, No 1, p 193-195, January 1972. 1 tab, 14 ref.

Descriptors: *Plant pathology, *Toxicity, *Pathogenic fungi, *Bioassay, *Animal pathology, Phytotoxicity, Cultures, Methodology, Data collections, Pollutant identification, Pollutants, Chlorella, Inhibition, Growth, Aquatic fungi.
Identifiers: *Chlorella pyrenoidosa, Alternaria citri, Alternaria solani, Alternaria tenuis, Ceratocystis fagacearum, Ceratocystis fimbriata, Ceratocystis ulmi, Endothia parasitica, Fusarium lateritium, Fusarium oxysporum f conglutinans, Fusarium oxysporum f lycopersici, Fusarium oxysporum f niveum, Fusarium roseum f cerealis, Fusarium tricinctum Helminthosporium sativum, Helminthosporium victoriae, Nectria cinnabarina, Penicellium funiculosum, Penicillium janthinellum, Periconia circinata, Phytophthora infestans, Phytophthora parasitica var nicotiana, Rhizoctonia solani, Rhizoctonia leguminicola, Sclerotinia homeocarpa, Sclerotinia sclerotiorum, Stereum purpureum.

Twelve genera of phytopathogenic fungi comprising 27 species previously reported to produce phytotoxins were tested concurrently for animal and plant toxicity. The animal toxin bioassay involved homogenizing the mycelium and filtrate of each fungus and injecting the brew into mice. The mice were observed for 72 hours and mortality was recorded. The plant toxin bioassay involved measuring the growth inhibition of Chlorella pyrenoidosa by these fungi. The effect of media and cultural conditions on toxin production was investigated. All test fungi were grown in Main's medium enriched with Phytone which presented a common source of plant protein. The cultures were incubated at 25 C in still culture for 3 weeks, and bioassays were performed. A. tenuis (M-l) and Fusarium tricinctum gave positive mouse toxicity but lost their phytotoxic potential. Rhizoctonia solani gave a positive mouse assay, whereas the Chlorella assay was negative. Results with the other fungi were unchanged. There appeared to be no direct relationship between the phytotoxic and animal toxic potential of phytopathogenic fungi as a group. (Long-Battelle)
W72-14299

REDUCTION OF THE 20-CARBONYL GROUP OF C-21 STEROIDS BY SPORES OF FUSARIUM SOLANI AND OTHER MICROORGANISMS. I. SIDE-CHAIN DEGRADATION, EPOXIDE CLEAVAGE, AND SUBSTRATE SPECIFICITY,
Montreal Univ. (Quebec). Faculte de Pharmacie.
R. Plourde, O. M. El-Tayeb, and H. Hafez-Zedan.
Applied Microbiology, Vol 23, No 3, p 601-612, March 1972. 9 fig, 2 tab, 34 ref.

Descriptors: *Spores, *Microorganisms, *Reduction (Chemical), *Organic compounds, Fungi, Enzymes, Cultures, Spectrophotometry, Spectroscopy, Bacteria.
Identifiers: *Carbonyls, *Steroids, Characterization, Fate of pollutants, Substrate utilization, Fusarium solani, Cylindrocarpon radicicola, Septomyxa affinis, Bacillus sphaericus, Bacillus lentus, Thin-layer chromatography, 20 alpha-Hydroxy-16 alpha 17 alpha-oxidopregn-4-en-3-one, 20 alpha-Hydroxy-16 alpha 17 apha-oxidopregna-1 4-dien-3-one, 16 alpha-Hydroxy-17a-oxa-androsta-1 4-diene-3 17-dione, 16 alpha 17 beta-Dihydroxy-androsta-1, 4-dien-3-one, 17 alpha-Hydroxy-pregna-1 4-diene-3 20-dione, Androsta-1 4-diene-3 17-dione, 17a-Oxa-androsta-1 4-diene-3 17-dione, Infrared spectroscopy, Ultraviolet spectrophotometry, Ultraviolet absorption , Infrared spectra.

A comparative study of the activities of nongerminating spores and growing cells of Fusarium solani and other microorganisms on different steroids was made to determine the role of 20-reductase in microbial side-chain degradation and the side-chain removal of 16 alpha, 17 alpha-epoxysteroids. The spores of Fusarium solani reduced the C20-carbonyl group, 1-dehydrogenated ring 'A' and cleaved the side chain of 16 alpha, 17 alpha-oxidopregn-4-ene-3,20-dione (16 alpha, 17 alpha-oxidoprogesterone) (I) to give the following products: 20 alpha-hydroxy-16 alpha, 17 alpha-oxidopregn-4-en3-one (II); 20 alpha-hydroxy-16 alpha, 17 alpha-oxidopregna-1,4-dien-3-one (III); 16 alpha-hydroxy-17a-oxa-androsta-1, 4-diene-3, 17-dione (16 alpha-hydroxy-1-dehydrotestololactone) (IV); and 16 alpha, 17 beta-dihydroxy-androsta-1,4-dien-3-one (16 alpha-hydroxy-1-dehydrotestosterone) (V). The 20-reductase system of F. solani, Cylindrocarpon radicicola, Septomyxa affinis, Bacillus lentus, and three strains of B. sphaericus is active only on steriods having the 16 alpha, 17 alpha-oxido, and 4-delta-3-keto functions. Evidence of competition between side-chain degrading enzymes and the 20-reductase for the steriod molecule and evidence of side-chain degradation followed by epoxide cleavage (and not the reverse) are presented. A mechanism for the epoxide opening by nongerminating spores of F. solani is postulated. (Long-Battelle)
W72-14300

HEAVY METALS POLLUTE NATURE, MAY REDUCE PRODUCTIVITY,
Lund Univ. (Sweden). Dept. of Ecological Botany.
G. Tyler.
AMBIO, Vol. 1, No. 2, p 52-59, April 1972. 8 fig, 1 tab, 11 ref.

Descriptors: *Terrestrial habitats, *Heavy metals, *Productivity, *Ecosystems, Potassium, Magnesium, Sodium, Calcium, Hydrogen, Chemical wastes, Lead, Nickel, Toxicity, Bioindicators, Biodegradation, Biomass, Lichens, Mosses, Fungi, Algae, Soil contamination, Trace elements, Ion exchange, Pollutant identification, Copper, Cadmium, Chromium, Nickel, Manganese, Iron, Zinc, Organic compounds, Adsorption.
Identifiers: Vanadium, Bryophytes, Bioaccumulation, Metal complexes, Picea abies, Vaccinium vitis idaea, Vaccinium myrtillus, Deschampsia flexuosa, Parmelia physodes, Hypnum cupressiforme.

The deposition, accumulation, and possible effects of Pb, Cd, Cu, Zn, Ni, Fe, and Mn on terrestrial sites in Scandinavia are discussed. Bryophytes have been cited as the most sensitive biological instruments for measuring the deposition of heavy metals. Additional work has shown dead organic matter, litter, and humus that was derived from mosses and lichens to have a large capacity for capturing heavy metals through passive ion exchange. The great capacity of bryophytes and to a lesser extent, lichens, to capture heavy metals through ion exchange, is attributable to the great stability of the chemical complexes formed between heavy metal ions and negatively charged organic groups. Accumulation in mosses, lichens, and in litter and humus layers of natural and semi-natural ecosystems was found to be governed by ion exchange equilibria dependent on the absorption complex between ions from precipitation, foliage leaching, and the dry deposition present in the water passing through these components. Increasing deposition of heavy metals due to human activity adversely affects biodecomposition rates, affecting a decrease in productivity. (Byrd-Battelle)
W72-14303

TRACE ELEMENTS FOR GROWTH AND BULBIFORMIN PRODUCTION BY BACILLUS SUBTILIS,
Bihar Agricultural Coll., Sabaur (India). Div. of Mycology and Plant Pathology.
M. Mahmood.
Journal of Applied Bacteriology, Vol. 35, No. 1, p 1-5, March 1972. 3 fig, 1 tab, 13 ref.

Descriptors: *Trace elements, *Antibiotics (Pesticides), Water pollution effects, *Nutrient requirements, *Growth, Manganese, Copper, Iron, Molybdenum, Zinc, Bioassay, Cultures, Fungi, Iron, Cobalt, Boron, Heavy metals, Inorganic compounds, *Aerobic bacteria.
Identifiers: *Bacillus subtilis, Bulbiformin, Alternaria tenuis.

The effects of trace elements on the growth and antibiobtic (bulbiformin) production of Bacillus subtilis were determined using cells, grown on basal medium containing dextrose as a carbon source. They were exposed to various amounts of boron, copper, iron, molybdenum, and zinc or combinations of these. The elements Mn and Fe, both alone and together, had a marked effect on growth and bulbiformin production by Bacillus subtilis. Copper, with Fe and/or Mn had a deleterious effect on antibiotic production, whereas Cu plus Zn as well as Mo plus B slightly increased the antibiotic produced over that obtained with Fe plus Mn. The optimum requirement of Fe was 20 p/m for both growth and antibiotic activity. The requirement of Mn for maximum growth was higher (2 p/m) than that for antibiotic activity (1 p/m). (Long-Battelle)
W72-14312

RELATIONSHIPS OF CHLOROPHYLL MAXIMA TO DENSITY STRUCTURE IN THE ATLANTIC OCEAN AND GULF OF MEXICO,
Victoria Univ. (British Columbia).
L. A. Hobson, and C. J. Lorenzen.
Deep-Sea Research, Vol. 19, No. 4, p 297-306, April 1972. 7 fig, 2 tab, 19 ref.

Descriptors: *Chlorophyll, *Spatial distribution, *Density, *Depth, Marine animals, Marine algae, Cyanophyta, Pyrrophyta, Larvae, Sampling, Invertebrates, *Atlantic Ocean, *Gulf of Mexico, Phytoplankton, Cytological studies, Systematics, Biomass, Fluorometry, Microscopy, Zooplankton, Nutrients, Photosynthesis, Standing crop, Ecological distribution, Dinoflagellates, Equipment, Light penetration, Nitrogen, Salinity, Ammonia, Nitrates, Nitrites, Copepods, Sedimentation, Carbon, Protozoa, Radiation, Enzymes, Aquatic life.
Identifiers: *Pycnocline, Chlorophyll a, Pheophytin, Tunicates, Foraminifera, Radiolaria, Trichodesmium, Flagellates, Ciliates, Nauplii, Copepodids.

Spatial distribution of chlorophyll maxima in relation to the depths of pycnoclines were studied in the Atlantic Ocean and in the Gulf of Mexico. The distribution of dissolved inorganic nitrogen and biomass of microorganisms and their taxonomic composition in chlorophyll maxima and surrounding water of the Gulf of Mexico also were examined. Water samples were taken from stations along the southwest coast of Africa, the northeastern U. S. coast, and the Gulf of Mexico at depths to 200 m using Niskin 5-liter non-metallic sampling bottles equipped with reversing thermometers. Salinity measurements were taken with a Hytech model 6210 laboratory salinometer. The start of the pycnocline was determined by the depth at which the stability of the water column exceeded .0001/dz. Standard methods were used to determine ammonia, nitrate, and nitrite and a fluorometric technique was used to measure chlorophyll a. Microorganisms were counted by microscopic techniques and cell volumes were calculated using formulas of geometrical solids that approximated cell shapes. Conversion factors reported earlier were used to convert these volumes to carbon. The spatial distributions of chlorophyll maxima were patchy and the maximum depths to which they follow pycnoclines were variable. This variability apparently relates to light adaptation by phytoplankton cells which may be a function of the taxonomic composition of the phytoplankton crop. (Mortland-Battelle)
W72-14313

ON PRODUCTIVITY ESTIMATIONS OF RIVER WATER SAMPLES BY MEANS OF ALGAE TEST PROCEDURES,
Jena Univ. (East Germany). Biology Section.
W. Braune.
Internationale Revue der Gesamten Hydrobiologie, Vol. 56, No. 5, p 795-810, 1971. 4 fig, 2 tab, 30 ref.

Descriptors: *Primary productivity, Bacteria, Scenedesmus, Growth rates, Cultures, Aquatic productivity, Metabolism, Electrodes, Electrochemistry, Photosynthesis, Rivers, Plant physiology, Testing procedures, Aquatic algae, Chlorophyta, Laboratory tests, Oxygen, Water pollution effects.
Identifiers: Saale River, Germany, Scenedesmus obliquus.

The possible influence of bacteria on the results of long-term algae test procedures (cultivating o algae in isolated unsterile water samples) was investigated and differences in the growth rate between nonaxenic and axenic Scenedesmus cultures were observed, showing differences dependent on experimental conditions. The necessity o a long experimental time in such test method proved to be disadvantageous because there wa always the possibility that in the unsterile wate

sample secondary alterations (caused by bacteria) may occur, the action of which is hard to estimate under test conditions. To diminish these disadvantages a physiological test procedure was tried out. Compared to methods used till now the new method allowed short-term estimations (in a few hours) of the productivity of algae (unialgal and mixed material) in water samples by continuously recording the 02-metabolism (electrochemical 02-determination by means of membrane covered Pt-electrodes). In water samples taken from a point below the town of Jena in the river Saale there were regularly higher rates of net-photosynthesis than in samples taken from above the town (test organism: Scenedesmus obliquus). The results agreed with findings obtained by other in vitro-methods and are in contradiction to testing results in situ. (In German) (Mortland-Battelle)
W72-14314

THE EFFECT OF CHLOROFORM, PHENOLS, ALCOHOLS AND CYANOGEN IODIDE ON THE SWELLING OF PSEUDOMONAS AERUGINOSA IN VARIOUS SALTS,
Duke Univ. Medical Center, Durham, N.C. Dept. of Physiology and Pharmacology.
F. Bernheim.
Microbios, Vol. 5, No. 18, p 143-149, March-April 1972. 3 fig, 1 tab, 6 ref.

Descriptors: *Organic compounds, *Salts, *Membrane processes, *Phenols, Alcohols, Ions, Osmosis, Water pollution effects, Environmental effects, Pseudomonas, Phosphates, Sulfates, Chlorides, Antibiotics (Pesticides), Calcium, Cultures, Physical properties, Spectrophotometry, Turbidity.
Identifiers: *Pseudomonas aeruginosa, *Chloroform, *Cyanogen iodide, Synergistic effects, Organic solvents, Spermidine, Characterization, Spermine, p-Chlorophenol, Cyclohexanol, Cyclohexanone, Propanol, 2-propanol, Butanol, Cyclobutanol, Ninhydrin.

The effect of drugs and other agents on the osmotic swelling and shrinking of Pseudomonas aeruginosa in various salts was investigated using acetone, butanol, chloroform, cyclobutanol, cyclohexanol, cyclohexanone, cyanogen iodide, ninhydrin, phenol, propanol, and 2-propanol. Cell suspensions of P. aeruginosa, containing one of these agents, were incubated in sodium chloride, phosphate or sulphate and the resultant change in optical density was measured spectrophotometrically (500 millimicrons). The cells decreased less in size in sodium phosphate at pH 6.8 than in sodium chloride or sodium sulfate. The ratio of change in optical density for cells incubated in chloride or phosphate was 1 to 23, respectively. The effect of various agents and drugs on cells incubated in salt was to alter membrane permeability to the osmotic reagent resulting in swelling. Addition of chloroform, acetone, or phenols to the cells in sodium chloride or phosphate increases transport of both chloride and phosphate so there is little change in the 1:23 ratio. Cyanogen iodide and ninhydrin react with membrane sulfhydryl groups thereby increasing chloride uptake, and aliphatic alcohols increase phosphate uptake. Spermidine was antagonistic to the effects of these agents but it has a synergistic effect as well. (Long-Battelle)
W72-14315

PRODUCTIVITY OF THE BENTHIC MICROFLORA OF SHOAL ESTUARINE ENVIRONMENTS IN SOUTHERN NEW ENGLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
N. Marshall, C. A. Oviatt, and D. M. Skauen.
Internationale Revue der Gesamten Hydrobiologie, Vol. 56, No. 6, p 947-956, 1971. 4 fig, 1 tab, 13 ref.

Descriptors: *Estuarine environment, *Primary productivity, *Shoals, *Benthic flora, Sea water, Sediments, Light intensity, Diatoms, Carbon radioisotopes, New England, Aquatic life, Aquatic microorganisms, Marine algae, Salinity, Migration, Tides, Low water mark, Chrysophyta.
Identifiers: *C-14 productivity, Liquid scintillation, Sample preparation, Zostrea, Ulva.

Carbon-14 productivity by benthic microflora from shoal estuarine environments in southern New England was measured by a C-14 uptake method. Representative and intact sediment samples were collected and the C-14 counted by liquid scintillation after being passed through a pulverized filter and suspended in Cab-O-Sil. Productivity was measured by calculating the difference in C-14 uptake measured between light and dark flasks. Sediment variability caused extremely high deviations in productivity values, probably as a result of irregular microflora distribution. Results obtained with the Cab-O-Sil suspension processing technique when compared with the wet oxidation method proved to be achieved more easily, directly, and consistently; however, similar results were obtained from both methods. The average yearly C-14 productivity of all sampled estuarine shoals equalled 20.1 mg/sq m/hr with high peaks of productivity occurring in the warmer months. The limited tests for light effects seemed to indicate that the strongest mid-summer light peaks are in excess of the optimum and that an upward migration of diatoms at low tide may result in increased productivity. (Byrd-Battelle)
W72-14317

EFFECTS OF THE OIL INDUSTRY ON SHORE LIFE IN ESTUARIES,
University Coll. of Swansea (Wales). Dept. of Zoology.
A. Nelson-Smith.
Proceedings of the Royal Society of London, Series B, Vol. 180, No. 1061, p 487-496, March 21, 1972. 4 fig, 14 ref.

Descriptors: *Oil industry, *Estuaries, *Aquatic life, *Oil pollution, Water pollution, Oil wastes, *Oil spills, Oily water, Water pollution effects, *Toxicity, Salt marshes, Organic matter, Mollusks, Phaeophyta, Rhodophyta, Aromatic compounds, Bioassay, Mud, Sands, Marsh plants, Emulsifiers, Gastropods, Shores.
Identifiers: Crude oil, Petroleum products, Lichens, Fuel oil, Ramalina spp, Spartina, Pelvetia canaliculata, Fucus spiralis, Fucus serratus, Gigartina stellata, Verrucaria mucosa, Gelliswick Bay, Littorina neritoides, Chthamalus stellatus, Patella vulgata, Monodonta lineata, Littorina saxatilis neglecta.

The effects of oil pollution on shore life in estuaries depend partly on the nature of the oil and partly on the means by which it reaches the shore. Crude petroleum and products refined from it may be spilt at any point from well up river to far out at sea. Crude oils are moderately toxic; some products may be very harmful, but heavy fuel oils are almost inert. Toxic fractions are removed by weathering, but oils split around tanker-terminals in estuaries reach the shore very soon after release. In Milford Haven, spillages average some 50 tons per year, about 0.0001 percent of the volume handled. Oil which has not been emulsified rarely penetrates mud or sand but is trapped on salt-marsh vegetation; annuals and shrubby perennials are badly affected, although other perennials recover well. On rocky shores, grazing molluscs may be killed, especially if aromatic-based emulsifiers are used to remove the oil. This permits the widespread growth of seaweeds, with repercussions on other shore life. Repeated spills may gradually eliminate some gastropods. Chronic pollution by oil in low concentrations can gravely damage salt-marsh and produces detectable effects on rocky shores. Speed is essential in dealing with a spillage; the most effective treatment is dispersal with emulsifiers and this is best done before the slick becomes stranded. Oiled shores should be left alone wherever possible; mechanical removal is preferable to spraying. (Byrd-Battelle)
W72-14318

THE ECOLOGY OF SOME BRITISH RIVERS IN RELATION TO WARM WATER DISCHARGES FROM POWER STATIONS,
Central Electricity Generating Board, Ratcliffe-on-Soar (England). Freshwater Biology Unit.
T. E. Langford, and R. J. Aston.
Proceedings of the Royal Society of London, Series B, Vol. 180, No. 1061, p 407-419, March 21, 1972. 16 fig, 14 ref.

Descriptors: *Ecology, *Water pollution effects, *Thermal pollution, *Rivers, *Powerplants, *Discharge (Water), *Biological communities, Environmental effects, Water temperature, Aquatic life, Freshwater, Aquatic microorganisms, Aquatic animals, Fish, Invertebrates, Sampling, Measurement, On-site tests, Wildlife, Oligochaetes, Annelids, Aquatic insects, Mayflies, Caddisflies, Midges, Diptera, Amphipoda, Crustaceans.
Identifiers: Macroinvertebrates, Species diversity, *River Severn, *River Trent, Chironomids, England, Limnodrilus hoffmeisteri, Tubifex tubilex, Nymphs, Characterization, Ephemerella ignita, Taeniopteryx nebulosa, Heptagenia sulphurea, Psychomia pusilla, Emergence.

The effects of powerplant warm water discharges on the local aquatic life in the English Rivers Severn and Trent were used as an indicator of the effects of thermal pollution on the environment. Various sampling stations were placed downstream from the powerplant outflow to measure temperature fluctuations and to observe local aquatic life. In the Severn River temperatures up to 28 degrees C below the outfalls had no effect on the invertebrate fauna. There were slight alterations in the hatching of insect nymphs which may have been attributable to temperature, though natural variations from year to year were much more obvious. Emergence of adult Ephemeroptera and Trichoptera was not affected by temperatures of 26 to 28 degrees C. The River Trent is used for cooling by some 14 power stations. There were no obvious changes in the diversity of the invertebrate fauna which could be related to temperature, though pollution from other sources caused very marked changes. However, at Drakelow power plant, the most polluted reach changes were observed in the oligochaete community, and experiments showed that Limnodrilus haffmeisteri had a wider temperature distribution range for reproduction than Tubifex tubifex. Fish populations were shown to withstand quite sudden and wide temperature fluctuations. (Long-Battelle)
W72-14319

THE EFFECTS OF PESTICIDES ON LIFE IN FRESH WATERS,
Freshwater Fisheries Lab., Pitlochry (Scotland).
A. V. Holden.
Proceedings of the Royal Society of London, Series B, Vol. 180, No. 1061, p 383-394, March 21, 1972. 1 tab, 23 ref.

Descriptors: *Pesticides, Water pollution effects, *Aquatic life, *Pesticide toxicity, Invertebrates, Mortality, Fry, Organophosphorus pesticides, Freshwater fish, Chlorinated hydrocarbon pesticides, Bioassay, Resistance, Pesticide kinetics, Crustaceans, Aquatic populations, Pesticide residues, Environmental effects, Trout, Perch, Pikes, Aldrin, Dieldrin, 2 4 D, DDT, Dalapon, Diazinon, Diquat, DDE, Endrin, Daphnia, Sunfishes, Lethal limit, Mercury.
Identifiers: Metabolites, 2 4-D amine, Maleic hydrazide, Simazine, Dichlobenil, BHC, TDE, MCPA, MCPB, Dichlorprop, Dichloflaunid, Fen-

tin hydroxide, Thiram, Captan, Dinocap, Mercabam, Chara, Diuron, Vertebrates, Tissue, Gammarus fasciatus, Daphnia magna, Gamma BHC, Carbophenothion, Simocephalus serrulatus, Dichloronaphthaquinone, Electron capture gas chromatography, Demeton, Malathion, DNBP, Mecoprop, p p' DDT, p p' TDE, p p' DDE.

About sixty pesticides are estimated to be used in Britain in circumstances where some contamination of fresh waters could occur. Apart from major fish kills, most of the evidence of contamination must be obtained from chemical analyses of water or fish, although these are mainly restricted to a few organochlorine and organophosphorus compounds. The potential hazards to fish and invertebrates have been identified in laboratory experiments and toxicity tests, but routine population surveys of susceptible species in rivers and lakes are rarely made. The nature of possible environmental effects of various types of pesticides is described, and the information on toxic levels of some chemicals, obtained from laboratory tests, is compared with the limited data available on levels existing in the environment. The need for more extensive screening of pesticide chemicals, especially the more persistent types, is discussed. Both adult fish and fry of several species should be used in tests, as well as representative invertebrates, which are known to be more susceptible to some pesticides than are fish. Long-period tests are also required, as for some pesticides the lethal concentrations are much lower in extended tests than in the usual short-period tests. Where possible, the test species, whether fish or invertebrates, should be analyzed for the chemical under test. Analytical techniques should be developed, for levels existing in the environment, of a wider range of compounds than is currently investigated. (Long-Battelle)
W72-14320

PHYSIOLOGICAL AND MORPHOLOGICAL EFFECTS OF PHENETHYL ALCOHOL UPON A GRAM-NEGATIVE MARINE PSEUDOMONAD,
Macdonald Coll., Sainte Anne de Bellevue (Quebec). Dept. of Microbiology.
J. Thompson, and I. W. DeVoe.
Canadian Journal of Microbiology, Vol 18, No 6, p 841-852, June 1972. 10 fig, 1 tab, 29 ref.

Descriptors: *Pseudomonas, *Marine bacteria, Water pollution effects, Organic compounds, Marine microorganisms, Growth rates, Absorption, Electron microscopy, Physical properties, Radiochemical analysis, Carbon radioisotopes, Bioindicators, Sodium, Potassium, Inhibition, Membrane processes, Amino acids, Aerobic bacteria.
Identifiers: *Phenethyl alcohol, *Waste characterization, Alpha-aminoisobutyric acid, C-14, Freeze etching technique, Pseudomonads, Bacterial physiology.

The effects of phenethyl alcohol (PEA) upon a gram-negative marine pseudomonad were studied in order to determine the primary target of PEA at the cellular level. Phase contrast and electron microscopic and freeze-etching techniques were used to examine the morphological and physiological changes caused by PEA. Sodium and potassium as well as C-14 alpha-aminoisobutyric acid (AIB) were used as indicators of PEA-induced changes in membrane permeabilities. PEA (0.15 percent v/v) inhibited the organisms growth; however, after removal of PEA the cells remained viable even when pre-exposed to PEA concentrations as high as 0.25 percent (v/v). PEA concentrations of 0.25 percent or less inhibited AIB uptake unless potassium was added to the uptake system. Both AIB and potassium were lost from preloaded cells after addition of PEA. It seems likely that the inhibition of cell growth by PEA is due to two major causes: (1) direct interference of the compound with the normal physiological functions of the cytoplasmic membrane and, (2) PEA induced structural changes occurring within the cell envelope. (Long-Battelle)
W72-14323

A STUDY OF THERMOPHILIC AEROBIC SPOREFORMING BACTERIA ISOLATED FROM SOIL AND WATER,
Missouri Univ., Columbia. Dept. of Food Science and Nutrition.
O. Harris, and M. L. Fields.
Canadian Journal of Microbiology, Vol 18, No 6, p 917-923, June 1972. 5 tab, 9 ref.

Descriptors: *Aerobic bacteria, *Thermophilic bacteria, Spores, Hydrogen ion concentration, Cultures, Water pollution sources, Pollutant identification, Temperature, Soil bacteria, Aquatic bacteria, Laboratory tests, Growth.
Identifiers: *Waste characterization, Guanine, Cytosine, DNA, Bacillus stearothermophilus, Bacillus coagulans, Biochemical tests, Standard methods, Substrate utilization, Culture media.

Thirty-three strains of thermophilic, aerobic, spore-forming bacteria isolated from soil and water were studied by classical bacteriological methods and by the percent guanine plus cytosine (percent GC) in their DNA. For temperature studies all organisms were grown at 55 degrees; to determine maximum growth temperatures tests were run at 55C and at 5 degree intervals until no growth occurred. Percent GC was determined by a previously described method. The cultures fell into two groups based upon percent GC. There were 12 strains with percent GC of 52-53.1 which were characteristic of Bacillus stearothermophilus. These strains were also classifiable as B. stearothermophilus by classical determinative bacteriological methods except three were aciduric. The other 21 strains had percent GC ranging from 38.8 to 43.9 with a mean percent GC of 42.04. Ten strains of the 21 could be B. coagulans by classical determinative bacteriological methods but not by percent GC. The other 11 strains were not determinable by current classical determinative keys. These strains may be thermophilic variants of mesophilic species. (Long-Battelle)
W72-14324

DISTRIBUTION OF CLOSTRIDIUM BOTULINUM TYPE E IN THE GULF OF ST. LAWRENCE IN RELATION TO THE PHYSICAL ENVIRONMENT,
Fisheries Research Board of Canada, Halifax (nova Scotia). Halifax Lab.
R. A. Laycock, and D. H. Loring.
Canadian Journal of Microbiology, Vol 18, No 6, p 763-773, June 1972. 3 fig, 28 ref.

Descriptors: *Sediments, *Sea water, *Distribution patterns, *Ecological distribution, Clostridium, Cultures, Sampling, Rivers, Marine bacteria, Geographical regions, Estuaries, Water flow, Geomorphology, Toxicity, Public health, Aquatic soils, Water pollution, Pathogenic bacteria, St. Lawrence River.
Identifiers: *Clostridium botulinum, Biochemical tests, *Gulf of St. Lawrence.

Three hundred ninety sediment samples were collected June-September 1970 from the Gulf of St. Lawrence and the lower reaches of the St. Lawrence River in order to determine the distribution of Clostridium botulinum type E. The samples were collected with gravity corers and a pipe dredge, placed in sterile polyethylene bags and refrigerated until analysis. About 10 g of sediment was inoculated into a supplemented (glucose, peptone, trypticase, yeast extract) cooked meat medium in 60 cu cm bottles and incubated at 25 degrees C for 5 days in a 95 percent nitrogen, 5 percent carbon-dioxide atmosphere. Subsamples of incubated medium were centrifuged and the presence of toxic material detected by mouse intraperitoneal injection of 0.5 ml of supernate diluted 4:1 with gelatin-phosphate buffer. Samples, lethal to mice within 48 h, were further tested for specific toxins of C. botulinum. C. botulinum was shown to be present in high incidence in some areas while it appeared to be absent from others. No other types of C. botulinum were encountered. The results indicate a close correlation between patterns of terrigenous sedimentation and of distribution of C. botulinum type E. (Long-Battelle)
W72-14325

APPARATUS FOR CONTINUOUS MEASUREMENT OF ACTIVE UPTAKE OF RADIOACTIVE SUBSTANCES,
Regensburg Univ. (West Germany).
For primary bibliographic entry see Field 05A.
W72-14326

ISOLATION AND CHARACTERIZATION OF ULTRAVIOLET LIGHT-SENSITIVE MUTANTS OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 05A.
W72-14327

HETEROTROPHIC NITRIFICATION BY ARTHROBACTER SP.,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
W. Verstraete, and M. Alexander.
Journal of Bacteriology, Vol 110, No 3, p 955-961, June 1972. 2 fig, 2 tab, 26 ref.

Descriptors: *Nitrification, Ammonia, Nitrites, Nitrates, Mass spectrometry, Methodology, Nutrients, Chemical reactions, Organic compounds, Ammonium compounds, Nitrogen cycle, Hydrogen ion concentration, Iron, Carbon, Nitrogen, Deficient elements, Environmental effects, Cultures, Sewage bacteria, Pollutant identification, Inhibition.
Identifiers: *Heterotrophic bacteria, *Arthrobacter, Culture media, Enrichment, Hydroxylamine, Benzophenone oxime, l-nitrosoethanol, Substrate utilization, Mass spectra, Infrared spectra.

Arthrobacter sp., isolated from sewage, oxidized ammonium to hydroxylamine, a bound hydroxylamine compound, a hydroxamic acid, a substance presumed to be a primary nitro compound, nitrite, and nitrate. The concentration of free hydroxylamine-nitrogen reached 15 micrograms/ml. The identification of hydroxylamine was verified by mass spectrometric analysis of its benzophenone oxime derivative. The bound hydroxylamine was tentatively identified as l-nitrosoethanol on the basis of its mass spectrum, chemical reactions, and infrared and ultraviolet spectra. Hydroxylamine formation by growing cells was relatively independent of pH, but the accumulation of nitrite was strongly favored in alkaline solutions. The formation of hydroxylamine but not nitrite was regulated by the carbon to nitrogen ratio of the medium. The hydroxamic acid was the dominant product of nitrification in iron-deficient media, but hydroxylamine, nitrite, and l-nitrosoethanol formation was favored in iron-rich solutions. Heterotrophic nitrification by Arthrobacter sp. was not inhibited by several compounds at concentrations which totally inhibited autotrophic nitrification. (Snyder-Battelle)
W72-14328

EFFECT OF AMINO ACIDS ON THE GROWTH OF ACETOBACTER SUBOXYDANS,
The Pennsylvania State Univ., University Park. Dept. of Microbiology.
R. T. Belly, and G. W. Claus.
Archiv fur Mikrobiologie, Vol 83, No 3, p 237-245, April 1972. 1 fig. 2 tab, 24 ref.

Descriptors: *Amino acids, *Cultures, *Nutrient requirements, *Growth, Growth rates, Ammonium compounds, Organic compounds, Nutrients, Water pollution effects, Inhibition, Microbiology, Acid bacteria.
Identifiers: *Acetobacter suboxydans, Biosynthesis, Substrate utilization, Glutamate, Glutamine, alpha-Ketoglutarate, Proline, Histidine, Glycine, Hydroxyproline, Mesaconate, Lysine, Leucine, Aspartate, Cysteine, Methionine, Phenylalanine, Arginine, Alanine, Tryptophan, Serine, Tyrosine, Threonine, Isoleucine, Valine, Culture media.

The role of amino acids in the nutrition of Acetobacter suboxydans ATCC 621 has been considered and an assessment made of the relative capacity of the organism for amino acid biosynthesis. Cells were grown on a chemically defined basal medium, to which were added amino acids. Changes in growth rates were noted and recorded graphically. A chemically defined medium containing no amino acids supported cellular growth. Growth was stimulated by the addition of either glutamate, glutamine, alpha-ketoglutarate, proline, histidine, and to a lesser extent by the addition of either glycine, hydroxyproline, or mesaconate. (Long-Battelle)
W72-14329

INTERACTIONS OF LIGHT AND INORGANIC NITROGEN IN CONTROLLING NITROGEN UPTAKE IN THE SEA,
Washington Univ., Seattle. Dept. of Oceanography.
J. J. MacIsaac, and R. C. Dugdale.
Deep-Sea Research, Vol 19, No 3, p 209-232, March 1972. 9 fig, 6 tab, 31 ref.

Descriptors: *Oceans, *Light intensity, *Photosynthesis, Limiting factors, Productivity, Sea water, Nitrogen, Nitrates, Ammonium compounds, *Phytoplankton, *Euphotic zone, *Nutrients, Nutrient removal, Kinetics, Oligotrophy, Eutrophication, Carbon, Water pollution, Profiles, Pollutant identification, Absorption.

The uptake of ammonium and nitrate in natural populations of marine phytoplankton is light dependent and often can be described adequately by the Michaelis-Menten equation. The half-saturation constant for light intensity in nitrate and ammonium uptake is found to be from 1 to 14 percent of surface light intensity, an intensity range occurring near the bottom of the euphotic zone. Since the uptake of these compounds as a function of substrate concentration is also described by the same equation, many vertical profiles of nitrate and ammonium uptake obtained with the N-15 technique can be interpreted from the interaction of light and nutrient concentration at different depths. In oligotrophic waters, nutrient uptake is severely limited by nutrient concentrations; but in eutrophic areas, light intensity very often is the limiting factor. In the former, maximal uptake may occur deep in the euphotic zone, while in the latter, the maximum occurs near the surface. Ammonium is taken up more readily than nitrate by populations in all areas, and in oligotrophic regions may account for 80 percent of the inorganic nitrogen uptake. In eutrophic areas, most of the inorganic nitrogen uptake is based on nitrate. Ratios of carbon to nitrogen taken up by phytoplankton vary over a wide range (12-76), with some indication that the lower values are associated with regions having a certain degree of environmental stability--either very rich or very poor waters. (Byrd-Battelle)
W72-14333

THE EFFECT OF COMPOUNDS CONTAINING AMINO GROUPS ON MICROBIAL GROWTH IN THE MEDIUM WITH OIL FUEL, (IN RUSSIAN),
Moscow State Univ. (USSR); and Institut Neftekhimicheskoi i Gazovoi Promyshlennost, Moscow (USSR).
T. P. Vishniakova, I. D. Vlasova, and N. N. Grechushkina.
Mikrobiologiya, Vol 41, No 1, p 73-76, January/February 1972. 1 tab, 7 ref.

Descriptors: *Cultures, *Fuels, *Growth, *Oil, Organic compounds, Pseudomonas, Methodology, Microbiology, Pollutant identification, Water pollution effects, Hydrogen ion concentration, Nitrogen compounds, Microorganisms, Environmental effects.
Identifiers: Amines, Cladosporium resinae, Pseudomonas pyocyanea, Urea, Waste characterization.

The inhibition of microbial growth by water soluble amino compounds was studied in a water-fuel system. A 100 percent inhibition of growth was found when 0.04 percent 1,2-diaminopropane or hexamethylene diamine, 0.12 percent ethylene diamine, hydroxylamine chloride or acid methylamine tartrate, 0.16 percent trimethylamine or N-butylamine was added to the water-mineral phase. A 98 percent growth inhibition was found upon addition of 0.08 percent N-butylamine, ethylene diamine, hydroxylamine chloride or methylamine oxalate and a 96 percent growth inhibition was observed with N-heptylamine. Dimethylamine, m-phenylene diamine and methylamine tartrate caused partial growth inhibition. Urea, p-amino-salicylic acide and dimethylamine chloride at concentrations of 0.04-0.16 percent did not inhibit the growth. The majority of active compounds altered the initial pH of the water phase (6.9-7.2) to the acidic (4-5) or alkaline (9-10) values. The compounds with a low inhibiting effect or manifesting no activity almost did not change pH of the water phase. (Long-Battelle)
W72-14334

THE ASSIMILATION OF MONOCARBON COMPOUNDS BY PSEUDOMONAS SP. 2,
Moscow State Univ. (USSR).
N. N. Kirikova, Yu. A. Trotzenko, and E. N. Kondratieva.
Mikrobiologiya, Vol 41, No 1, p 5-10, January-February 1972. 6 tab, 4 ref.

Descriptors: *Organic compounds, *Pseudomonas, Cultures, Growth, Enzymes, Aerobic bacteria, Oxidation, Chemical reactions, Inhibition, Antibiotics (Pesticides), Organic acids, Amino acids, Carbon, Radioactivity techniques, Carbon radioisotopes.
Identifiers: *Substrate utilization, *Assimilation, Hydrocarbons, Culture media, Waste characterization, Fate of pollutants, C-14.

The cell suspensions of Pseudomonas sp. 2, capable for the growth on media with ethanol and formiate, actively fixed C-14 from these substrates as well as C-1402. Hypophosphite and fluoroacetate inhibited the incorporation of C-14 from methanol, formaldehyde and formiate. Formaldehyde inhibited the incorporation of C-14 in the cells from methanol and formiate. Sulphanilamide inhibited the bacterial growth in the presence of methanol. When the cells were exposed to C-14-methanol for a short time, the label was detected in malic and fumaric acids, serine, glycine, aspartic and glutamic acids. Therefore, Pseudomonas sp. 2 assimilated carbon from monocarbon compounds after their oxidation to CO2 and on a higher reduced level. The second process seems to proceed with the participation of tetrahydrofolate and reactions of the tricarboxylic acid cycle. The functioning of this cycle in Pseudomonas sp. 2 is confirmed by the presence of malate dehydrogenase, isocitrate dehydrogenase, succinate dehydrogenase and alpha-ketoglutarate dehydrogenase. (In Russian) (Long-Battelle)
W72-14335

EVALUATION OF BENSULIDE FOR MUTAGENIC PROPERTIES IN MICROBIAL TEST SYSTEM,
Battelle Columbus Labs., Ohio.
K. J. Andersen, and A. J. Cutaia.
Journal of Agricultural and Food Chemistry, Vol 20, No 3, p 656-658, May/June 1972. 3 tab, 5 ref.

Descriptors: *E. coli, *Herbicides, *Bacteriophage, Evaluation, Chemical properties, Water pollution sources, Testing, Statistics, Methodology, Statistical methods, Water pollution effects.
Identifiers: *Mutagenicity, *Bensulide, 5-bromouracil, Acetone, Sodium chloride.

The frequency of mutations in the T-4 bacteriophage/ E. coli B system was measured in order to determine mutagenic properties of the herbicide, bensulide, as well as sodium chloride, acetone, and 5- bromouracil. The procedure involved subjecting the bacteriophage-E. coli system to the chemicals and statistically analyzing the frequency of rII-type mutants. The data obtained were subjected to distribution analysis using the chi-square test for Poisson distribution variables. Although acetone and bensulide caused slight increases in mutation rates over a control, there was not sufficient data to show the mutagenicity of bensulide. (Long-Battelle)
W72-14336

BENTHIC FAUNAL RECOVERY IN A SWEDISH FJORD FOLLOWING THE CLOSURE OF A SULPHITE PULP MILL,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
R. Rosenberg.
OIKOS, Vol 23, No 1, p 92-108, 1972. 18 fig, 6 tab, 29 ref.

Descriptors: *Benthic fauna, *Fjords, *Pulp wastes, *Sulfite liquors, Water pollution sources, Physiochemical properties, Water quality, Waste water (Pollution), Sediments, Cores, Sampling, Distribution patterns, Biological communities, Systematics, Water pollution effects, Annelids, Discharge (Water), Marine animals, Hydrography, Water temperature, Salinity, Dissolved oxygen, Biochemical oxygen demand, Hydrogen ion concentration, Organic matter, Trawling, Industrial wastes, Sulfides, Resins, Sodium, Calcium, Magnesium, Chloride, Sulfides, Biomass, Sieve analysis, Clams, Gastropods, Mollusks, Crustaceans.
Identifiers: *Sweden, Sample preservation, Macroinvertebrates, Sulfites, Nemerteans, Echiuroids, Phoronids, Echinoderms, Gullmarsfjord, Mercaptans, Saltkallifjord, Cerianthus lloydi, Edwardsia, Peachia hastata, Lepidonotus squamatus, Gattyana cirrosa, Polynoe kinbergi, Pholoe minuta, Anaitides groenlandica, Eteone longa, Ophiodromus flexuosus, Glycera alba, Goniada maculata, Nephtys hombergi, Nephtys incisa, Nephtys ciliata.

The recolonization of benthic fauna was studied in Saltkallefjord on the west coast of Sweden following the discontinuation of sulfite pulp manufacture at a pulp mill that discharges waste water into the fjord. Hydrographic measurements included temperature, salinity, DO, BOD, and pH. A core sampler was used to collect sediment samples, which were analyzed in 2-cm sections for organic matter and ignition loss. Benthic fauna were sampled quantitatively at 53 stations using a 0.1-sq m Smith McIntyre bottom sampler. Sieve residues restrained by a millimeter mesh was preserved in 70 percent alcohol for further laboratory analysis. The wet weight was determined after blotting on filter paper and the quantity of dry organic matter was estimated using a conversion factor obtained from earlier studies. The analyses indicated that water quality improved as a result of reduced waste water discharges. After 1968, the benthic macrofauna had colonized fjord areas that in the early 1960's were azoic or occupied by only a poor fauna. During May-October 1969 the number of species in these areas increased monthly. (Mortland-Battelle)
W72-14337

THE ECOLOGY OF MORECAMBE BAY. II. INTERTIDAL INVERTEBRATES AND FACTORS AFFECTING THEIR DISTRIBUTION,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
S. S. Anderson.
Journal of Applied Ecology, Vol 9, No 1, p 161-178, April 1972. 8 fig, 2 tab, 27 ref.

Descriptors: *Invertebrates, *Intertidal areas, *Distribution patterns, *Estuarine environment, *Soil analysis, *Ecological distribution, Systematics, Ecology, Sands, Physiochemical properties, Sampling, Cores, Sieve analysis, Sediments, Annelids, Mollusks, Marine animals, Spatial distribution, Nematodes, Aquatic soils, Estuaries, Particle size, Nitrogen, Calcium, Spectrophotometry, Phosphorus, Colorimetry, Salinity, Isopods, Crustaceans, Seasonal, Carbon, Organic matter, Impoundments, Amphipoda, Gastropods, Clams, Worms.
Identifiers: *Morecambe Bay, Arthropods, Nemerteans, Macroinvertebrates, Barrage, Sample preservation, England, Arenicola marina, Macoma balthica, Hydrobia ulvae, Corophium volutator, Kjeldath procedure, Atomic absorption spectrophotometry, Nereis diversicolor, Nereis virens, Nepthys hombergi, Pygospio elegans, Organic nitrogen, Lanice conchilega, Cardium edule, Scrobicularia plana, Mya arenaria, Tellina tenuis, Mytilis edulis, Crepidula fornicata, Bathyporeia pilosa, Marinogammarus marinus, Crangon vulgaris, Carcinus maenas, Ligia oceanica, Polychaetes.

A series of surveys was carried out on the numbers and distribution of intertidal invertebrates in Morecambe Bay, England. The purpose was to see if environmental factors would be correlated with the abundance of species, in order to forecast any population changes of invertebrate species likely to result from barrage construction. A 1-mm mesh sieve was used in the laboratory and the animals retained were preserved in formalin, identified and counted. Physical and chemical characteristics of the sands that were considered to affect invertebrate distribution were also studied. Standard methods were used in analyzing particle size to arrive at a medium particle diameter. Ignition losses were measured in a muffle furnace at 500C for 2 hr and expressed as a percentage of dry weight, which gave a rough estimate of organic carbon. An automated colorimetric system based on the indophenol blue reaction was used to estimate organic nitrogen. Calcium was determined by atomic absorption spectrophotometry and phosphorus by colorimetry based on the phospho-molybdenum blue reaction. The high level flats above plus 6 ft O.D. consisted of fine-grained sediments which were relatively rich in organic carbon, organic nitrogen and phosphorus. A relationship between grade of deposits and quantities of carbon, nitrogen and phosphorus was demonstrated. The sandflats below plus 6 ft O.D. were characterized by coarser deposits and correspondingly lower values of carbon, nitrogen and phosphorus. High calcium values were associated with the coarsest sediments and with areas of abundant mollusc spat. One dominant species and three groups of species could be recognized on the basis of distribution and species density. (See also W72-14339) (Mortland-Battelle)
W72-14338

THE ECOLOGY OF MORECAMBE BAY. IV. INVERTEBRATE DRIFT INTO AND FROM THE RIVER LEVEN,
Freshwater Biological Association, Ambleside (England).
J. M. Elliott, and J. Corlett.
Journal of Applied Ecology, Vol 9, No 1, p 195-205, April 1972. 1 fig, 8 tab, 21 ref.

Descriptors: *Invertebrates, *Drifting (Aquatic), Sampling, Lotic environment, Zooplankton, Systematics, Larvae, Estuarine environment, Aquatic animals, On-site tests, Freshwater, Copepods, Crustaceans, Fish, Water pollution sources, Nets, Equipment, Daphnia, Plankton nets, Aquatic insects, Diptera, Isopods, Gastropods, Water beetles, Mayflies, Midges, Amphipoda, Waterfleas, Stoneflies, Caddisflies.
Identifiers: River Leven, *Morecambe Bay, Lake Windermere, Colonization, Repopulation, Arthropods, Macroinvertebrates, Diaptomus gracilis, Daphnia hyalina, Bosmina coregoni, Sida crystallina, Cyclops spp, Chaoborous spp, Leptodora kindti, Bythotrephes longimanus, Gammarus pulex, Crangonyx pseudogracilis, Asellus aquaticus, Glossiphonia complanata, Limnaea peregra, Chironomids, Bugs, Lemnephilids, Tipulids, Black flies, Nauplii, Barrage, Amphinemura sulcicollis, Nemoura cinerea, Leuctra inermis, Leuctra geniculata, Perlodes microcephala, Isoperla grammatica, Chloroperla torrentium, Ephemerella ignita, Caenis rivulorum, Baetis rhodani, Heptagenia sulphurea, Sigara dorsalis, Rhyacophila dorsalis, Agapetus fuscipes, Psychomyia pusilla, Hydropsyche instabilis, Elmis aenea, Oulimnius tuberculatus, Simulium spp, Gammarus zaddachi, Asellus aquaticus, Erpobdella octoculata, Limnaea truncatula, Lampetra planeri, Anguilla anguilla, Pleuronectes flesus, Salmo salar, Protonemura meyeri, Glossosoma boltoni, Agapetus fuscipes, Polycentropus flavomaculatus, Hydropsyche pellucidula, Cheumatopsyche lepida, Silo pallipes.

In order to assess the importance of drifting invertebrates as potential colonizers of certain freshwater areas, the qualitative and quantitative composition of invertebrate drift into (outflow of Lake Windermere) and from (Low Wood Bridge) the River Leven which flows into Morecambe Bay were studied. Drift samples were taken at two stations by a procedure that insured samples from different points across the river at different times of the day. The physical conditions were recorded for the two stations. Copepoda and Gladocera were predominant in the drift samples at the lake outflow. Although very large numbers were drifting out of the lake, no planktonic species were found in the drift samples at Low Wood Bridge. A plankton net used at Low Wood Bridge caught nauplii and viable eggs of copepods. Therefore, some planktonic species do survive the journey down the River Leven and would rapidly colonize a freshwater reservoir at the mouth of the Leven estuary. Large numbers of lotic invertebrates were taken in the drift samples at Low Wood Bridge, especially at night. These drifting invertebrates would rapidly colonize the Leven estuary if ever it became freshwater. As many species in the drift have also been found in still water, there would also be a rapid colonization of a freshwater reservoir at the mouth of the estuary. (See also W72-14338) (Long-Battelle)
W72-14339

STRATIGRAPHIC RECORD OF POLLUTION IN SHAGAWA LAKE, NORTHEASTERN MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
J. P. Bradbury, and R. O. Megard.
Geological Society of America Bulletin, Vol 83, No 9, p 2639-2648, September 1972. 4 fig, 3 tab, 27 ref.

Descriptors: *Water pollution effects, *Eutrophication, *Lakes, *Minnesota, *Bottom sediments, Cores, Stratigraphy, Water pollution sources, Mine wastes, Sewage, Productivity, Nutrients, Lake sediments.
Identifiers: *Shagawa Lake (Minn).

Shagawa Lake in northeastern Minnesota is an anomalously productive lake in a region dominated by many very fresh and unproductive lakes. It receives treated sewage from the town of Ely. Mine wastes once entered the lake. A 1-m core of lake sediments was studied to ascertain the prehistoric trophic status of this lake and its response to mining, lumbering, and intensive human settlement in its watershed. The core contains three distance zones. The lower zone (100 to 75 cm) is dominated by benthic and littoral diatoms and by a diverse assemblage of Cladocera. These features suggest that the littoral zone was more extensive or more productive (or both) than when the upper zones were deposited. The middle zone (75 to 25 cm) contains a planktonic diatom flora characterized by Cyclotella comta, a common form in the unpolluted lakes of this latitude. The upper zone (25 to 0 cm) contains abundant remains of Stephanodiscus minutus, Fragilaria crotonesis, and F. capucina, which are planktonic diatoms living today in the lake and in many highly enriched lakes to the south. This zone coincides with the appearance of hematite and limonite mineral grains that entered the lake when mining began in the area about 1890 and with an increase in ragweed (Ambrosia) pollen that marks land clearance and the beginning of European settlement. Shagawa Lake responded rapidly to increased nutrient levels caused by a variety of human activities in and around the lake. (Knapp-USGS)
W72-14349

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb, N. J. Brogdon, Jr., and H. B. Simmons.
Available from NTIS, Springfield, Va. 22151, as AD-735 849 Price $3.00 paper copy; 95 cents microfiche. Miscellaneous Paper No 2-912, September 1966. 24 p, 24 plate, 6 tab.

Descriptors: *Model studies, *Estuaries, *Dredging, *Environmental effects, *Virginia, Ecology, *Oysters, Salinity, Tidal effects, Currents (Water), Hydrologic data, Data collections, Forecasting, Engineering, Channel improvement, Navigation.
Identifiers: *James River estuary (Va).

A model which reproduces tides, currents, and salinities in the James River and tributaries was used to determine the probable effects of a proposed 10-ft increase in the depth (from 25 ft to 35 ft below mean low water) of the navigation channel between Newport News and Richmond. That reach of the James River is the major source of seed oysters for the 5,000,000 per annum Chesapeake Bay oyster industry. Measurements of salinities and currents were made throughout the reach at half-hourly intervals over a complete tidal cycle, and the results were averaged to determine the average salinity or average velocity values. The proposed 10-ft deepening of the navigation channel was determined to have no significant effects on tides, currents, or salinities. (Woodard-USGS)
W72-14376

ASSESSING TEMPERATURE EFFECTS WITH BIOLOGY,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Biological and Chemical Section.
K. M. MacKenthun, and L. E. Keup.
Proceedings of the American Power Conference, Volume 31, p 335-343, 1969. 2 ref.

Descriptors: *Thermal pollution, Biology, *Bioassay, *Temperature, Biological communities, Aquatic habitats, Aquatic life, Thermal power plants, Fish, Fish food organisms, Food chains, Metabolism, Spawning, Marine biology, Freshwater, Physicochemical properties, Beds under water, Water pollution effects.
Identifiers: *Temperature effects, *Temperature criteria, *Thermal discharge, Fish populations.

A biological study of any proposed area of thermal discharge should be instituted two years prior to the anticipated discharge and should continue for two years following plant installation. The paper summarizes the effects of thermal discharges on biota and methods of their determination and discusses temperature criteria issued by the National Technical Advisory Committee on Water Quality Criteria. A before-and-after environmental study can prevent many problems. Some of the values obtained are: (1) Valuable resources may be located prior to construction and the disposal site can then be modified to preserve them; likewise the lack of resources can be substantiated thereby saving unwarranted expenditures. (2) If damages do occur, the information will provide a basis for corrective procedures. (3) The data will provide information to defend against alleged damages; also, the data may point up benefits to a particularly desirable resource. (4) The experiences and results may save both time and money on the next thermal electric installation.
W72-14401

PREDICTING QUALITY EFFECTS OF PUMPED STORAGE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
C. W. Chen, and G. T. Orlob.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 65-75, June 1972. 7 fig, 2 tab, 13 ref.

Descriptors: *Water quality, *Hydroelectric plants, *Mathematical models, Thermal stratification, Temperature, Dissolved oxygen, Computers, Algae, Aquatic life, Environmental effects, Environmental engineering, *Virginia, Projections, Model studies.
Identifiers: *Pumped storage operation, Smith Mountain Reservoir (Va).

Pumped storage operation (PSO) affects the water quality and in turn the resident biota. A predictive technique was adapted from a recently developed ecologic model to calculate the environmental changes and to evaluate the alternatives of PSO that might enhance a normal ecological succession, forestalling adverse environmental problems. The model, in an application to Smith Mountain Reservoir, Virginia, predicted accurately for an entire year the daily temperature, dissolved oxygen and other quality constituents of the water at varying depths. PSO, under simulated conditions, was found to improve water quality by deepening the epilimnion. A prolonged pumping schedule at a reduced rate, however, was a better alternative, because it would provide a more stable ecosystem without substantially altering the thermal stratification. Thermal stratification is necessary to regulate energy loss, and thus control evaporation, and to ensure a varied environment suitable for hosting a diverse and stable biota. (Eagle-Vanderbilt)
W72-14405

ENERGY USE IN CALIFORNIA: IMPLICATIONS FOR THE ENVIRONMENT,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
E. J. List.
EQL Report No. 3, December 1971. 58 p, 3 fig, 25 tab, 39 ref. NSF GI-29726.

Descriptors: *Electric power production, *Energy, *California, *Thermal pollution, *Thermal powerplants, Pacific Coast Region, Electrical power, Energy dissipation, Air pollution, Natural gas, Oil, Fuels, Nuclear powerplants, Solar radiation.
Identifiers: *Pacific Gas and Electric Company, Emission levels, Emission factors, Combustion, Energy consumption, Aggregate energy, Air basin.

Energy use in California in 1969 and its implications for thermal and air pollution are examined. The energy consumed within each of eleven designated air basins is considered with respect to the source of the energy and its uses. It is shown that 94% of the energy for the State was provided by hydrocarbon fossil fuels, mainly natural gas and gasoline. Half of the energy demand for the State was within the 9200 square miles constituting the South Coast Air Basin; 36.5% of the total demand was within Los Angeles County alone. Air pollution emission factors characterizing each fuel source for a given use are compiled in the form of units of emittant per unit of energy. It is shown that some fuels for some purposes are inherently 'dirty' energy sources and possible fuel substitutions are suggested. Ambient air heating problems (thermal pollution) from energy released within air basins are considered and the resulting possible changes in ambient air temperature are discussed. In order to control air pollution in high energy demand areas, either energy sources with zero emission factors must be used or the use of fossil fuels as an energy source must be curtailed. (Oleszkiewicz-Vanderbilt)
W72-14408

PHOSPHATES, HEAVY METALS, AND DDT: POLLUTION CONTROL COSTS AND IMPLICATIONS,
For primary bibliographic entry see Field 05G.
W72-14424

DDT IN WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-14431

PROCEEDINGS OF CONFERENCE ON INLAND LAKE RENEWAL AND SHORELAND MANAGEMENT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W72-14439

CHEMICAL STUDIES ON TOXINS FROM GYMNODINIUM BREVE AND APHANIZOMENON FLOS-AQUAE,
New Hampshire Univ., Durham. Dept. of Biochemistry.
M. Alam.
PhD Thesis, November 1972. 95 p, 25 fig, 12 tab, 30 ref. OWRR A-013-NH (5) and A-021-NH (2).

Descriptors: *Algal toxins, *Red tide, *Beggiatoa, *Phytotoxicity, *Cyanophyta, *New Hampshire, Marine algae, Phytoplankton, Aquatic plants, Chemical properties, Water quality.
Identifiers: *Kezar Lake (NH).

Part I: This investigation concerns the isolation and chemical characterization of the toxin (s) from Gymnodinium breve which is lethal to marine organisms. Unialgal cultures of G. breve were grown and the toxic material isolated. The partially purified toxin on column chromatography gave a toxic pale yellow glassy residue. The infra-red spectrum indicated presence of a carbonyl group and absence of hydroxyl and aromatic groups. Ultra-violet spectrum indicated toxin possibly contaminated with very small amt of pigment. Molecular weight determined by mass spectrometry and osmometry. On basis of present information it is difficult to assign a definite formula to the toxin from G. breve. Part II: The purpose of this investigation was to isolate and characterize the toxic compound (s) from natural blooms of A.flos-aquae. The toxin was purified and obtained as a pale yellow powder in a chromatographically pure form. The A.flos-aquae toxin was a very basic substance. It differed from saxitoxin in its Rf values and its behavior to several spray reagents. Partially hydrated form had different infra-red spectrum than does saxitixin. On basis of this and other information it is concluded that A.flos-aquae is different from saxitoxin.
W72-14542

THE ECE SYMPOSIUM ON PROBLEMS RELATING TO ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14546

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 06G.
W72-14564

DDT AND PCB IN FISH,
E. Karppanen, and K. Henriksson.
Suom Elainlaakaril. Vol 77, No 12, p 429-437. 1971. Illus. Map. English summary.
Identifiers: *DDT, *Finland, Fish, *Polychlorinated biphenyls, Water pollution effects.

DDT and PCB (polychlorinated biphenyls) determinations made from various species of fish are presented. The material consisted of 136 samples of fish, from various sites in the Gulfs of Finland and Bothnia and from lake waters in different parts of Finland. Besides some background contamination observable in certain 'clean' waters, a slightly increased content of DDT and PCB was encountered in material from the bays of the Baltic. Increases in the DDT content in occasional lake systems probably depend on an earlier practice of treating timber with DDT compounds, nowadays prohibited. Relatively high contents of PCB received at the mouth of the Kokemaki river, called for a closer study of the material from the Tampere area, where among other industries, a condenser factory which uses PCB is located. A marked increase of the PCB content was observed in samples from waters below the industrial areas of Tampere and Nokia. gas chromatographic analyses revealed, besides the known peaks of technical PCB-compounds used by the industry and which contain 50-60% and 42% chlorine, the presence of other PCB. The occurrence of different known and unknown PCB compounds and their possible transformation is discussed. A control of PCB outlets in the waters is called for and the danger of such outlets in connection with the destruction of small condensers from household appliances like refrigerators and washing machines is stressed.--Copyright 1972, Biological Abstracts, Inc.
W72-14583

GROWTH AND MORTALITY OF CRUCIAN CARP (CARASSIUS CARASSIUS (L.)) MORPHA HUMILIS HECKEL 1840, IN THE NATURAL POND MANSFELDOVA IN THE CENTRAL ELBE BASIN,
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
Karel Cerny.
Vestn Cesk Spol Zool. Vol 35, No 4, p 251-260. 1971. Illus.
Identifiers: Carassius-Carassius-Morpha-Humilis, *Carp, *Crucian carp, Czechoslovakia, *Elbe basin, Growth, Mansfeldova, *Mortality, Natural ponds.

Results are presented of growth analyses of 533 specimens of crucian carps from the natural pond Mansfeldova in the central Elbe basin. The whole material was collected after the pond was poisoned by DDT and HCH in Oct. 1953. Growth rate in this natural pond is low. Furthermore, the

values of annual survival rates, of annual mortality rates and of instantaneous mortality rates were determined in fish specimens. The results are discussed in comparison with other studies concerning the growth of this species in other natural ponds of the Elbe basin and other localities.--Copyright 1972, Biological Abstracts, Inc.
W72-14586

MERCURY STIRS MORE POLLUTION CONCERN.
For primary bibliographic entry see Field 05B.
W72-14619

TOXIC EFFECTS OF CADMIUM: A REVIEW,
Food and Drug Administration, Rockville, Md. Bureau of Drugs.
D. F. Flick, H. F. Kraybill, and J. M. Dimitroff.
Environmental Research, Vol 4, p 71-85, 1971. 87 ref.

Descriptors: *Cadmium, *Toxicity, *Trace elements, *Distribution patterns, Industrial production, Path of pollutants, Epidemiology, Pathology, Air environment, Soil environment, Water pollution effects, Foods, Human diseases.
Identifiers: *Cadmium metabolism, *Cadmiosis, Cadmium accumulation, Industrial use.

The review includes current unpublished and published knowledge on cadmium toxicity. The survey included worldwide epidemiology of the metal, distribution patterns in our environment, industrial production and uses, modes of incorporation into the human body, and possible significance of the metal with respect to metabolism. The findings revealed that cadmium is virtually ubiquitous, deposited and accumulated in various body tissues, and found in varying concentrations throughout all environmental compartments in which man must live. Within the past two decades there has been increased industrial production and use of the metal. Concomitantly, there has been an increased incidence of both acute and chronic cases of clinically identifiable cadmiosis. Cadmium may function in or may be an etiological factor for various pathological processes including testicular tumors, renal dysfunction, hypertension, arteriosclerosis, growth inhibition, chronic diseases of old age, and cancer. In addition, cadmium may result in hemorrhagic lesions in sensory ganglia within the central nervous system. A number of investigators found some toxic aspects of exogenously administered cadmium to be partially or even totally prevented by zinc, cobalt, selenium, estrogen, British antilewisite (BAL) and thiol compounds. (Oleszkiewicz-Vanderbilt)
W72-14621

LEVELS OF ANTIMONY, CADMIUM, CHROMIUM, COBALT, MANGANESE, AND ZINC IN INSTITUTIONAL TOTAL DIETS,
Food and Drug Administration. Cincinnati, Ohio.
For primary bibliographic entry see Field 05A.
W72-14622

PRELIMINARY STUDY OF MERCURY RESIDUES IN SOILS WHERE MERCURY SEED TREATMENTS HAVE BEEN USED,
Agricultural Research Service. Hyattsville, Md.
For primary bibliographic entry see Field 05B.
W72-14623

MOST ANGLING WATERS MERCURY-SAFE,
R. H. Stroud.
SFI (Sport Fishing Institute) Bulletin, No 218, p 1-3, September 1970.

Descriptors: *Mercury, *Sport fishing, *Freshwater fish, *Water pollution, Legal aspects, Standards, Diets, Fish, Industries, Rivers, Lakes, United States.
Identifiers: Ontario.

It is becoming evident that most waters are mercury-safe from the standpoint of sport fishing and anglers. Probably well over 90 per cent of America's inland waters would fail, on detailed sampling of their aquatic life, to yield fish that are contaminated with dangerous quantities of mercury. The maximum mercury level in fish allowable by the FDA is 0.5 ppm. Studies indicate that both humans and fishes are capable of excreting mercury from their systems at the rate of about 0.05 mg per day. In order to exceed an average safe level intake in total food of 0.05 mg per day, it would be necessary to eat 80 pounds of fish flesh per year - all of it containing the allowable maximum. Waters in 12 states of the U.S. and in Ontario with excessive levels of mercury are listed. The Department of the Interior has urged strong action to halt the discharge of mercury in waste effluents from industrial plants and has taken legal action against eight firms for failure to end their discharges of mercury. (Eagle-Vanderbilt).
W72-14625

THE TRANSITIONAL CONDITION OF MINAMATA BAY AND THE NEIGHBORING SEA POLLUTED BY FACTORY WASTE WATER CONTAINING MERCURY,
Kumamoto Univ. (Japan). Dept. of Hygiene; and Kumamoto Univ. (Japan). Medical School.
M. Fujiki.
Presented at 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-23, 1972. Paper No 12, Section C, Session 6, June 20, 1972. 13 p, 1 fig, 9 tab, 11 ref.

Descriptors: *Mercury, Water pollution effects, Water pollution sources, Fish, Shellfish, Poisoning, Mud, Aquatic habitats, Pollutant identification.
Identifiers: *Minamata Bay, *Methylmercury, *Acetaldehyde manufacturing, Methylation mechanism, Mercury accumulation.

Since 1960, the mercury content of fish and shellfish collected from Minamata Bay has been measured yearly; results over this period are reported. A brief history of the disease outbreak is given followed by a description of manufacturing processes that lead to disastrous pollution. The mercury content in the muds from various points did not decrease during 7 years, except in a few places where it was probably due to constructional dredging. The mercury compounds in the muds were inorganic such as mercuric oxide and sulfide and the highest concentration of methylmercury in the mud was 0.007 ppm as Hg (wet wt). The mercury concentration in the fish has decreased markedly since 1966 from 12 ppm in 1965 down to 0.2 ppm in 1970. Data on mercury concentration in the hair of the inhabitants are also tabulated. The mechanisms for formation of methylmercury compounds in the reaction fluid of the polluting acetaldehyde plant are based principally on the reaction of inorganic mercury with paracetic acid. It was postulated that methylmercury contamination around Minamata district started long before 1959. (Oleszkiewicz-Vanderbilt)
W72-14628

THE ENRICHMENT OF HEAVY METALS IN SUBMERGED PLANTS,
Ruhrverband, Essen (West Germany).
F. Dietz.
Presented at 6th International Water Pollution Research Conference, Jerusalem, Israel, June 18-23, 1972. Paper No 4, Section A, Session 2, June 19, 1972. 8 p, 1 fig, 10 tab.

Descriptors: *Trace elements, *Heavy metals, *Bioassay, *Aquatic plants, Rooted aquatic plants, Copper, Lead, Zinc, Iron, Manganese, Mercury, Nickel, Mosses, Water pollution effects, *Eutrophication.
Identifiers: *Enrichment factor, *Macro nutrients, *Ruhr River, Atomic absorption, Chloroplants.

Results of an investigation based on the sampling of water and plants and determining the macronutrients and trace heavy metals, are presented. The samples were collected from the Ruhr River and at the confluence of some tributaries. The content of macro-nutrients incorporated in the water plants is largely independent of the local medium and therefore of the water quality. Comparing the enrichment factors for minor elements it was found that the most intense enrichment takes place in mosses. In all the plants tested manganese and zinc showed the most intense enrichment whereas with iron, nickel, copper, lead, no difference in the intensity of enrichment could be observed. Therefore it must be supposed that enrichment is dependent primarily on the species of plant and specific selectivity. Evaluating data with regard to the limits of variability - as referred to the minimal and maximal values - a small variation is found in spite of the many influencing factors. On that account it is to be concluded that the enrichment of minor elements in water plants is useful criterion to calculate the average concentration of these elements in water. By means of a relatively small number of samples it is possible to assess the trend of water pollution by metals. (Oleszkiewicz-Vanderbilt)
W72-14629

IMPROVEMENTS IN THE DETERMINATION METHOD OF METHYL MERCURY IN FISH TISSUES AND THE RATIO OF METHYL MERCURY TO TOTAL MERCURY IN FISH TISSUES,
Kanagawa Prefectural Environmental Control Center, Yokohama (Japan).
For primary bibliographic entry see Field 05A.
W72-14630

MERCURY: ITS HISTORICAL PRESENCE IN NEW YORK STATE FISHES,
New York State Dept. of Environmental Conservation, Rome. Rome Pollution Lab.
E. J. Harris, and R. W. Karcher, Jr.
The Chemist, p 176-179, May 1972. 4 tab, 4 ref.

Descriptors: *Mercury, Water pollution, *Fish, Analytical techniques, Walleye, Bass, Trout, Pollutant identification.
Identifiers: *Background level, *Atomic absorption spectrophotometry.

Fish obtained in New York by the State Conservation Department between 1927 and 1939 and fish from the collections of the American Museum of Natural History, the Philadelphia Academy of Sciences, and Cornell University were analyzed for total mercury content using a flameless Atomic Absorption technique. Dates the fish were caught ranged from 1880 to 1939. Those taken from Lake Ontario and Lake Champlain 30 or 40 years ago contained about as much mercury as those caught today. The buildup of mercury in the biomass is not found to be a phenomenon of recent origin. Mercury has been released to the environment by mirror manufacturers, gold and silver miners, and the burning of coal. Mercury is released naturally through the chemical weathering of rock structures. Despite these sources, there is no evidence to indicate that injury to human health has occurred as a result of eating these fish or that freshwater fish have been damaged by their body burden of mercury. (Eagle-Vanderbilt)
W72-14632

FISH AND MERCURY.

Prevention, p 175-188, January 1972. 3 photos.

Descriptors: *Mercury, *Fish, *Diets, Freshwater fish, Water pollution effects, Marine fish, Environmental effects, Public health.
Identifiers: *Mercury poisoning, *Swordfish, Predators, Mercury accumulation, Industrial discharges, Chemical discharges, FDA food standards.

A general discussion of development of the mercury problem is followed by analysis, from the consumer's viewpoint, of the so called 'swordfish dilemma'. Organic forms of mercury are the most severe pollutants, the metallic form being very significantly less toxic. Doctors and dieticians are quoted recommending variety in food consumption, moderate consumption of fish, concentrating on smaller fish such as mackerel, herring, and sardine, and avoiding larger predators like swordfish which tend to accumulate mercury in their tissue. (Oleszkiewicz-Vanderbilt)
W72-14633

MERCURY POLLUTION: THE MAKING OF AN ENVIRONMENTAL CRISIS,
Massachusetts Inst. of Tech., Cambridge. Lab. of Nuclear Science.
A. Katz.
CRC Critical Reviews in Environmental Control, Vol 2, Issue 4, p 517-534, January 1972. 1 fig, 1 tab, 54 ref.

Descriptors: *Mercury, *Toxicity, *Water pollution effects, *Legal aspects, Water pollution sources, Air pollution, Fish, Seed treatment, Wildlife habitats, Public health, Human pathology, Regulation, Human diseases, Path of pollutants, Standards.
Identifiers: *Methylmercury, *Mercury poisoning, *Governmental regulation, *Intake level, Minamata Disease, Phenylmercury compounds, Mercury transformations, Industrial releases, Industrial use, FDA standards.

Following a historical outline of mercury poisoning incidents in various countries, the sources and uses of Hg are discussed. The largest consumer is the electrical industry (26.6%) followed by the chlor-alkali industry (23.1%) and industrial control equipment manufacturers (10.6%). Methylation pathways under anaerobic and aerobic conditions are presented. The impact of mercury on man depends on the form of the metal. Inorganic mercury poisoning is partially or wholly reversible; methyl mercury poisoning (Minamata Disease) is essentially irreversible. The mercury content in fish is almost totally methyl mercury. Methyl mercury is easily absorbed through the digestive tract into the blood stream. The human body does not detoxify methylmercury, its excretion of organic mercury is very slow. Damage is irreversible when symptoms appear associated with the cerebellar and cerebral regions of the brain. Evidence of possible genetic damage has been noted. A threshold level of brain cell damage may exist, so that long-term exposures may present a major health problem. (Oleszkiewicz-Vanderbilt)
W72-14637

THE METHOD OF SEDIMENTATION OF HYDROCARBONS USED AT THE TIME OF THE 'TORREY CANYON' DISASTER: THE NAUTEX HYDROPHOBE, (LA METHODE DE SEDIMENTATION,
Societe OMYA (France).
For primary bibliographic entry see Field 05G.
W72-14653

VITAL CONDITIONS FOR THE ORGANIZATION OF A THALASSOTHERAPIE CENTER TO FACILITATE INDUSTRIAL MANAGEMENT OF THE LITTORAL, (CONDITIONS INDISPENSABLES POUR L'ORGANISATION D'UN CENTRE DE THALASSOTHERAPIE EN FONCTION DE L'AMENAGEMENT INDUSTRIEL DU LITTORAL),
Federation Internationale de Thalassotherapie.
D. Leroy.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 11 p.

Descriptors: *Coasts, *Littoral, Project, Public health, *Environmental effects, *Monitoring, *Tides, *Currents (Water), Biology, Chemistry, Water pollution effects, Balance of nature, Toxicity, Sewage, Treatment facilities.
Identifiers: *Thalassotherapy centers, Readaptation.

The need for the establishment of 'Thalassotherapy' centers near coastal industrial zones is discussed. These centers would monitor the tides, currents, chemistry, biology and pollution of the seas and littoral zones. The qualitative chemical identity between human plasma and sea-water is emphasized. The necessity of man's re-equilibration becomes more important as accumulative poisoning from industrial air and water pollution causes a loss of the ions necessary to normal cellular life. Thus functional readaptation centers are a coming necessity. Sewage discharge and purification facilities are also discussed. (Ensign-PAI)
W72-14654

KAISER REFRACTORIES ENVIRONMENTAL STUDIES, FINAL REPORT: 1 JUNE 1971,
Moss Landing Marine Labs., Calif.
J. P. Harville.
Technical Publication 71-3, June 1971. 178 p, 61 fig, 33 tab, 73 ref, 2 append. NOAA USDC, Grant No. GH-94.

Descriptors: *California, *Industrial wastes, *Environmental effects, *Ecology, *Water structure, *Topography, *Bottom sediments, *Aquatic animals, *Plankton, *Benthic fauna, Fish, Waste dilution, Bioindicators, Laboratory tests, On-site investigations, Water pollution effects.
Identifiers: Kaiser refractories, Moss Landing.

A long range study of potential effects of Kaiser Refractories industrial effluent on the marine environment of the Moss Landing area was undertaken in September 1967. The physical characteristics and dynamics of the water mass were determined and bottom structure, sediments and sediment transport characteristics assessed. The bottom fauna of the proposed outfall area, with ancillary studies of plankton, fishes, and intertidal fauna were investigated. Field and laboratory studies of the impact of various dilutions of Kaiser effluent on selected bioindicator plant and animal species were conducted. (Ensign-PAI)
W72-14656

ECOLOGICAL ASPECTS OF RADIOACTIVITY IN THE MARINE ENVIRONMENT,
Bureau of Commercial Fisheries, Beaufort, N.C. Center for Estuarine and Menhaden Research.
T. R. Rice, and J. P. Baptist.
In: Environmental Radioactivity Symposium, January 19-20, 1970. The Johns Hopkins University, The Department of Geography and Environmental Engineering, Baltimore, Maryland, p 107-180, 14 fig, 10 tab, 93 ref.

Descriptors: *Radioactivity effects, *Ecology, *Environmental effects, *Marine biology, *Biological communities, Cycles, Absorption, Human pathology, Strontium, Cesium, Waste dilution, Dispersion.
Identifiers: Nuclides, Induced nuclides, Fission products, Radionuclide cycling, Biological accumulation.

Four important aspects of environmental radioactivity are discussed in detail, the cycling and biological accumulation of radionuclides, effects of radiation, environmental radiation and man, and the research needs to enable man to cope with the prospect of increased levels of radioactivity in the environment. Only by understanding these aspects of radiation biology of the various species of our diverse ecosystem can effective measures and regulation of the controlled release of radioactivity be achieved. (Ensign-PAI)
W72-14658

STUDIES ON THE EFFECTS OF A STEAM ELECTRIC GENERATING PLANT ON THE MARINE ENVIRONMENT AT NORTHPORT, NEW YORK,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
G. C. Williams, J. B. Mitton, T. H. Suchanek, Jr., N. Gebelein, and C. Grossman.
Technical Report Series No 9, November 1971. 123 p, 44 fig, 9 tab, 59 ref.

Descriptors: *New York, *Power plants, *Stream, *Thermal pollution, *Environmental effects, *Ecology, *Plankton, *Algae, Biological communities, Productivity, Life cycles, Growth stages, Distribution, Behavior, Seasonal, Water pollution effects.
Identifiers: *Northport plant (Long Island).

The results of a continuing group of investigations on effects of the power plant at Northport are summarized. The effects on the plankton community originally in the water used for cooling of steam condensers and discharged back into Long Island Sound were investigated by measuring productivity changes and by a direct seasonal observational study of the life cycle stages, distribution and behavior of plankton algae before and after use. Results left little doubt that waste heat is the primary ecological disturbance in the discharge area. (Ensign-PAI)
W72-14659

INDUSTRIAL FEASIBILITY OF MANMADE ISLANDS CONSTRUCTED FROM THE OFFSHORE DISPOSAL OF DREDGED SPOIL,
Naval Academy, Annapolis, Md.
J. F. Hoffman.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 13 p, 3 tab, 15 ref.

Descriptors: *Artificial beaches, *Islands, Construction, *Leaching, *Dredging, *Chemical wastes, *Oil wastes, Environmental effects, Ecology planning, Area redevelopment, Industries, Recreation, Docks.
Identifiers: Airports.

The use of artificial islands constructed from dredge spoil for industrial areas, maritime quays, airports and recreation zones is discussed. The various methods of spoil stabilization and the potential ecological problems such as damage to marine life from careless offloading, metal leaching, chemical discharges, and oil leaks are considered. The controlled development of any resource is necessary in order to prevent destruction of other equally important natural resources. (Ensign-PAI)
W72-14662

RESOURCES, ENVIRONMENTAL PROBLEMS AND TECHNOLOGICAL SOLUTIONS IN CHESAPEAKE BAY,
Army Engineer District, Baltimore, Md.
K. L. Beal.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 8 p.

Descriptors: *Chesapeake Bay, *Eutrophication, Loads, *Nutrients, *Chemical wastes, *Sediment load, *Erosion, Environmental effects, Hydraulic models, Future planning (Projected), Management, *Thermal pollution.

The deterioration of Chesapeake Bay by increased nutrient and chemical loads; waste heat; inter- and intra-basin diversions of fresh water; increased sediment loading and erosion is discussed. Hydraulic models were used to study conditions and problems in the bay. The hydraulic model will be of great assistance in designing a viable management scheme to aid in determining the future of the bay. (Ensign-PAI)
W72-14664

METHODS OF FISH RESEARCH CONCERNING THE EFFECTS OF WASTE WATER POISONS, (METHODIK DER FISCHUNTERSUCHUNGEN IM HINBLICK AUF DIE WIRKUNG VON ABWASSERGIFTEN),
Munich Univ. (West Germany). Zoologisch-Parasitologisches Institut.
H. H. Reichenbach-Klinke.
In: Methodik der Untersuchung von Abwasser und Vorfluter, Munchen und Wien, p 60-68, 1971. 6 fig, 5 ref.

Descriptors: *Waste water (Pollution), *Toxicity, *Poisons, Research priorities, Phenols, Detergents, Chemical wastes, Pesticides, Fish physiology, Water pollution effects.
Identifiers: Anatomical studies, Histological studies.

Research methods to determine the toxicological effects of wastewater poisons on fish are discussed. Possibilities for this research are: registration of the phases of fish damage; anatomical and histological studies; taste tests and laboratory toxicity tests. The different stages of fish toxicity are described along with the various changes in fish tissues. The value and problems of the toxicological tests are analyzed. Distinct temporal intervals between water analyses and micro-analyses of fish organs with regard to common poisons such as phenols, detergents, cyanides and pesticides are recommended. (Ensign-PAI)
W72-14665

SOME ECOLOGICAL POINTS REGARDING WATER POLLUTION, (EINIGE OKOLOGISCHE GESICHTSPUNKTE BEIM GEWASSERSCHUTZ),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 05B.
W72-14669

WATER POLLUTION BY OIL. THE PROBLEM OF PERSISTENT CHEMICALS PRESENT IN THE ENVIRONMENT, (VERUNREINIGUNG DER GEWASSER DURCH OL. ZUM PROBLEM DER PERSISTENTEN CHEMIKALIEN IN DER UMWELT),
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-14670

EFFECTS OF 'RED MUD' ON EMBRYOS AND LARVAE OF THE HERRING CLUPEA HARENGUS, (WIRKUNGEN VON 'ROTSCHLAMM' AUF EMBRYONEN UND LARVEN DES HERINGS CLUPEA HARENGUS),
Biologische Anstalt Helgoland (West Germany).
H. Rosenthal.
Helgolander Wissenschaftliche Meeresuntersuchungen, Hamburg, Vol 22, No 3-4, p 366-376, December 1971. 6 fig, 3 tab, 8 ref.

Descriptors: Industries, *Aluminum, Wastes, *Mud, *Herrings, *Larvae, *Embryonic growth stage, *Mortality, *Growth rates, Environmental effects, Fish physiology, Absorption, Feeding rates, Water pollution effects.
Identifiers: *Red mud, Ferric hydroxide, North Sea.

In aluminum production, treatment with water dissolves the aluminum, but iron remains undissolved as ferric hydroxide or red mud. The biological effects of red mud, soon to be released into the North Sea in large quantities, on herring eggs and larvae from Baltic spring spawners were tested. Eggs were artificially fertilized and incubated in 1 liter aerated containers. The addition of red mud reduced percentages of survival to about 40-50%. The red mud particles adhered to the eggshells, forming an almost regular layer, thereby interfering with gaseous and other exchanges between eggs and surrounding medium. Speed of development was retarded and a number of embryonic malformations increased with increasing concentrations. Many larvae absorbed red mud particles blocking their food intake. (Ensign-PAI)
W72-14672

DISCOLORATION OF ALGAL BLOOMS AND SEAWEEDS (VEGETATIONSFARBUNGEN UND WASSERBLUTEN),
Oesterreichische Gesellschaft fuer Meteorologie, Vienna (Austria).
F. Wawrik.
Wetter und Leben, Vol 23, No 9-10, p 203-210, 1971. 11 ref.

Descriptors: Water pollution effects, *Organic matter, *Decomposing organic matter, *Eutrophication, *Phytoplankton, *Algae, *Aquatic weeds, *Weeds, *Red tide, Coasts, Lakes, Ponds, Water pollution control, Aircraft, Copper sulfate.

The complex phenomena of organic water pollution, observed in pools, alpine lakes and coastal areas, are discussed. Causes and consequences of organic pollution and control of harmful seaweeds are included. The first few blooms of the red tide are controlled by the use of CuSo4-crystals dispersed from airplanes. (Ensign-PAI)
W72-14673

INVESTIGATIONS INTO THE DISTRIBUTION OF INORGANIC NITROGEN COMPOUNDS IN RELATION TO THE INCREASING DETERIORATION OF THE WATER IN THE BALTIC SEA (UNTERSUCHUNGEN UBER DIE VERTEILUNG DER ANORGANISCHEN STICKSTOFFVERBINDUNGEN I M HINBLICK AUF DIE ZUNEHMENDE WASSERVERSCHLECHTERUNG IN DER OSTSEE),
Deutsche Akademie der Wissenschaften zu Berlin, Rostock (East Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 05B.
W72-14674

PETROLEUM HYDROCARBONS: UPTAKE AND DISCHARGE BY THE MARINE MUSSEL MYTILUS EDULIS,
Scripps Institution of Oceanography La Jolla, Calif.
R. F. Lee, R. Sauerheber, and A. A. Benson.
Science Vol 177, No 4046, p 344-346, July 28, 1972. 2 tab, 14 ref. NSF GB-24834 NIH ES-00603.

Descriptors: *Oily water, *Aromatic compounds, *Mussels, *Absorption, Oil pollution, Water pollution effects, Organic compounds, Aquatic life, Marine animals, Seawater.
Identifiers: *Mineral oil, *Heptadecane, *Bioaccumulation, Mytilus spp., 1,2,3,4-tetrahydronaphthalene, Toluene, Naphthalene, 3,4-benzopyrene, Tetralin.

The common marine mussel Mytilus edulis has been observed to rapidly take up mineral oil, (C-14) heptadecane, 1,2,3,4-tetrahydronaphthalene, (C-14) toluene, (C-14) naphthalene, and (H-3)3,4-benzopyrene from seawater solution. This species of mussel did not metabolize any of these compounds, and transfer of the mussel to fresh seawater, after exposure to the hydrocarbon in solution, resulted in the discharge of most of the hydrocarbon, although significant amounts remained (between 1 and 400 micrograms per mussel). The nontoxic parafinic hydrocarbons, mineral oil and heptadecane, were taken up (10 milligrams per mussel) to a much greater extent than the aromatic hydrocarbons (2 to 20 micrograms per mussel). (Svensson-Washington)
W72-14683

SIZE-RELATED METABOLIC RESPONSES OF THE PINFISH LAGODON RHOMBOIDES, TO SALINITY VARIATIONS AND SUB-LETHAL PETROCHEMICAL POLLUTION,
Texas Univ., Port Aransas. Inst. of Marine Science.
T. C. Kloth, and D. E. Wohlschlag.
Contributions in Marine Science, Vol 16, p 125-137, 1972. 1 fig, 5 tab, 37 ref. NSF - GB6889.

Descriptors: *Saline water, *Fish physiology, *Fish behavior, *Chemical wastes, Salinity, Water pollution effects, Respiration, Metabolism, Growth stages, Industrial wastes, Oily water, *Oil wastes.
Identifiers: *Petrochemical effluent, *Sublethal effects, *Pinfish, Lagodon spp.

The effects of salinity variations on the respiratory metabolism of large and small pinfish in unpolluted water and in water slightly polluted with a 0.5% petrochemical effluent were investigated at near saturation dissolved oxygen levels and at a near optimum temperature of 20C. A salinity range of 20-45 ppt did not significantly affect the respiratory metabolism of large or small pinfish in unpolluted water. However, sustained swimming velocities were found at 20 ppt, for both large and small pinfish, and the velocities decreased as salinity increased. Sustained swimming velocities of large pinfish decreased more than those of small pinfish. Sublethal pollution uniformly depressed small fish metabolism at all salinities. With large pinfish, pollution depressed metabolism at 20 and 32 ppt, but elevated metabolism at 45 ppt. Multiple regression analysis showed that salinity had a statistically significant effect on respiration only with large pinfish in polluted water. (Svensson-Washington)
W72-14684

THE TOXICITY OF 140 SUBSTANCES TO THE BROWN SHRIMP AND OTHER MARINE ANIMALS.
Ministry of Agriculture, Fisheries and Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann, and K. W. Wilson.
Ministry of Agriculture, Fisheries and Food, Shellfish Information Leaflet No 22, December 1971. 11 p, 1 tab, 4 ref.

Descriptors: *Toxicity, *Bioassay, Marine animals, *Pollutants, Oysters, Crabs, Bullheads, Shrimp, *Pink shrimp, *Shellfish, Polychlorinated biphenyls, Water pollution, Pesticides, Inorganic compounds, Organic compounds, Lethal limit, Water pollution effects.
Identifiers: Starfish, Flatfish, Shore crabs, Cockles, *Brown shrimp, Armed bullheads, Surface active agents, Solvent emulsifiers, LC50.

A table is presented giving LC50 values for the substances tested. The toxic materials include surface active agents, solvent emulsifiers, pesticides, Polychlorinated biphenyls, pure inorganic chemicals, and pure organic chemicals. Between eight and twenty-five test animals were exposed to serial dilutions in seawater of the chemical under test. The usual test period was 48 hr. Test organisms included pink shrimp, brown shrimp, cockles, armed bullheads, flatfish, starfish, shore crabs and oysters. (Svensson-Washington)
W72-14686

REACTIONS OF YOUNG SALMONIDS TO SUDDEN CHANGES OF PH, CARBON-DIOXIDE TENSION AND OXYGEN CONTENT,
Uppsala Univ. (Sweden).
L. B. Hoglund, and J. Hardig.
Institute of Freshwater Research, Drottningholm, Sweden, Report No 49, p 76-119, 1969. 10 fig, 5 tab, 60 ref.

Descriptors: *Atlantic salmon, *Dissolved oxygen, *Carbon dioxide, *Bioassay, *Fish

physiology, *Acidic water, Salmonids, Water pollution effects, *Hydrogen ion concentration, Respiration, Fish behavior, Bicarbonates, Hardness (Water), Water quality, Ventilation.
Identifiers: Oxygen tension, Carbon dioxide tension, Chromatophore reactions.

Decreasing pH, combined with increasing CO2 tension, provokes changes in locomotor behavior and ventilation among second-summer parr of Atlantic Salmon. Extremely adverse pH/CO2 conditions, in combination with low 02, also give rise to delayed chromatophore reactions. The locomotor reactions, mainly due to CO2, are particularly intense on the introduction of a changed water quality into the test apparatus. The intensity of reaction depends on the time of contact, the combination and the quantity of the external factors varied, i.e. the degree of deviation from the pre-acclimatization water quality, which is the control condition of the tests. Similar reactions but reversed in time and less intense also occur after a test period in conjunction with and after the return once again to control conditions. Pure oxygen depletion--down to a critical value in the range of 1-3 mg/l--provokes hyperventilation, but does not initiate any changes in behavior, e.g. any locomotor activities. Similar experiments, starting with a softer surface water from the River Dalalven, confirm that the reactions displayed in Uppsala water are mainly due to CO2. (Svensson-Washington)
W72-14688

ENVIRONMENTAL LIMITS OF PLANTS IN FLOWING WATERS,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
Symposium of the Zoological Society of London, No 29, p 3-19, 1972. 60 ref.

Descriptors: *Running waters, *Aquatic plants, *Aquatic environment, Water pollution effects, Streams, Rivers, Rooted aquatic plants, Aquatic algae, Water temperature, Acid streams, Hydrogen ion concentration, Heavy metals, Dissolved oxygen, *Plant growth, Light intensity, Toxicity, Primary productivity, Standing crops, *Photosynthesis.
Identifiers: Diversity indices.

A review is presented summarizing the literature and some unpublished data on attached photosynthetic plants in certain extreme flowing water environments. With upper temperature limits, it is possible to compare situations occurring naturally and those arising as a result of pollution. Such comparisons show up obvious anomalies. The limits of plants under low pH conditions and high levels of heavy metals are also reviewed, although with these extremes the data are insufficient for comparison of natural and polluted conditions. Sections of a more speculative nature are added on light, climate, and dissolved oxygen as factors which at high and low levels may limit the growth of plants. The quantitative methods which have been used for comparing the effects of extreme environments on plants fall into four main categories: use of toxicity tests; use of diversity indices; measurement of primary production; measurement of standing crops. These methods do not necessarily give similar results. An improvement in methods of quantifying the extent to which an environment is extreme is important if the significance of environmental limits of plants in natural and polluted waters is to be evaluated. (Svensson-Washington)
W72-14690

EFFECT OF TOXIC WASTES ON TREATMENT PROCESSES AND WATERCOURSES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05D.
W72-14691

FILAMENTOUS ALGAE AS WEEDS,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
In: 3rd Symposium on Aquatic Weeds, European Weed Research Council, Oxford, 1971, p 249-263. 40 ref.

Descriptors: *Eutrophication, *Aquatic algae, *Algal control, *Aquatic weed control, Biochemical oxygen demand, Lake stages, Limnology, Nuisance algae, Nutrient removal, Nutrients, Water pollution effects, Water quality, Herbicides, Odor-producing algae.
Identifiers: *Filamentous algae, *Aquatic angiosperm weeds, Cladophora.

It still remains difficult to evaluate the nuisance value of filamentous algae on a world scale, and it would at present be impossible to estimate even roughly their economic significance, either as an absolute value or in comparison with that of aquatic angiosperm weeds. It does, however, seem clear these algae are a special nuisance in at least two rather different types of situation. They are a problem at the edges of several large lakes, like Ontario and Zurich, which have a high amenity value, and which have been subject to considerable eutrophication in recent years. They are also a particular problem in warm dry climates in channels used for the transport of water for irrigation and other purposes. They may also be a problem in many other types of situation, as for instance the drainage ditches of flat, low-lying areas like parts of the Netherlands, but they then often occur together with aquatic angiosperm weeds, and both these latter and the filamentous algae can now be treated simultaneously by chemical means. (Svensson-Washington)
W72-14692

TOXICITY OF HEAVY METALS TO FRESHWATER ALGAE: A REVIEW,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
Phykos, Vol 9, No 2, p 116-125, 1970. 38 ref.

Descriptors: *Reviews, *Heavy metals, *Algae, *Aquatic environment, *Toxicity, *Water pollution effects, Zinc, Lead, Copper, Chromium, Silver, Chlorophyta, Cyanophyta, Algal control, Algicides, Copper sulfate, Salinity, Hardness (Water), Chelation, Mine drainage, Water properties.
Identifiers: *Freshwater algae, EDTA.

A review is presented of the literature on toxicity of heavy metals to freshwater algae. Metals considered include zinc, lead, copper, chromium, and silver. The account is concerned mainly with field observations and those laboratory studies which are particularly helpful in interpreting field data. Effects of salinity, water hardness, and organic complexation on toxicity are discussed. (Svensson-Washington)
W72-14694

EFFECTS OF DRESSING AND COOKING ON DDT CONCENTRATIONS IN CERTAIN FISH FROM LAKE MICHIGAN,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.
R. E. Reinert, D. Stewart, and H. L. Seagran.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 525-529, 1972. 1 fig, 4 tab, 3 ref.

Descriptors: *Pesticide residues, *DDT, *Public health, *Pesticide removal, *Yellow perch, *Lake trout, Pesticides, Insecticides, Chlorinated hydrocarbon pesticides, *Lake Michigan, Salmon, Foods.
Identifiers: *Coho salmon, *Bloaters, *Food processing effects, Perca spp., Coregonus spp., Salvelinus spp., Oncorhynchus spp., Cooking effects, Dressing effects.

Concentrations of DDT residues were highest in parts of the body with the highest oil content in four species of fish from Lake Michigan: yellow perch (Perca flavescens), bloater (Coregonus hoyi), lake trout (Salvelinus namaycush), and coho salmon (Oncorhynchus kisutch). Dressing reduced the DDT levels and oil content by more than 90% in yellow perch, but had little effect in the other three species. The concentration of DDT residues in bloaters was changed little by smoking, but was reduced 64-72% by other methods of cooking: from 8.0 mg/kg (raw) to 2.2 mg/kg after frying in corn oil; from 10.7 to 3.9 mg/kg after frying in lard; and from 9.1 to 3.2 mg/kg after broiling. The concentration of DDT residues in fillets of yellow perch changed only from 0.3 mg/kg (raw) to 0.4 or 0.5 mg/kg after baking, frying or broiling. (Svensson-Washington)
W72-14695

THE NATURE AND MAGNITUDE OF THE EFFECT OF KRAFT MILL EFFLUENTS ON SALMON,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
C. C. Walden, and T. E. Howard.
Paper presented to the International Symposium on Identification and Measurement of Environmental Pollutants, June 17, 1971, Ottawa, Canada. 29 p, 6 fig, 3 tab, 41 ref.

Descriptors: *Pulp wastes, *Toxicity, Water pollution effects, Water quality, *Salmon, Bioassay, Industrial wastes, *Bleaching wastes, Chemical wastes, Effluents, *Sulfite liquors, Sulfides, Alkalis (Bases), Lethal limit.
Identifiers: *Sublethal effects, Methyl mercaptans, Resin acids.

The toxicity to salmon of kraft mill effluents varies widely between mills and, with time, within individual mills. The inherent toxicity of kraft mill effluents is low, but it is of consequence because of the tremendous volumes discharged and because all major process sewers demonstrate a toxicity. Molecular entities responsible for toxicity of pulping effluents have been only partially identified and include sulfides, ethyl mercaptan, excess hydroxyl ion and resin acids, of which only the latter is of significance in most field situations. Data relating to bleach effluents are almost totally lacking. Thus comparative standards cannot be prepared for chemical or biological evaluations and even comparison between mills is difficult. Measurement of sublethal effects is necessary to ensure the validity of discharge requirements, now based on standard lethal bioassay procedures. A variety of behavioral, biochemical and physiological changes in fish tissues have been reported. A 'clinical profile' suggests an immediate stress reaction upon exposure, with the possibility of ill defined chronic effects also occurring. Estimates of the threshhold level of response are about 0.12 to 0.24 TLm96 value. One quantitative technique has been developed for measuring this threshhold value. (Svensson-Washington)
W72-14697

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH, REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.

European Inland Fisheries Advisory Commission Technical Paper No 15, 1972. 18 p, 2 tab, 99 ref.

Descriptors: *Phenols, *Freshwater fish, *Toxicity, *Water quality standards, *Chemical oxygen demand, chemical wastes, Water pollution sources, Water pollution effects, Fisheries, Water quality, Salmonids, Absorption, Water temperature, Taste, Organic compounds, Commercial fish, Europe, Aquatic environment, Rough fish.

Identifiers: *Phenolic wastes, Xylenol, Cresol, Sublethal effects.

Phenolic wastes can contain monohydric phenols, including phenol, the three cresol isomers, and the six xylenol isomers, together with other substances. They may adversely affect freshwater fisheries by their direct toxicity to fish and fish food organisms, by their high oxygen demand resulting in oxygen depletion of the receiving water, and by the production of undesirable flavors in the edible flesh of fish. Laboratory tests show that the toxicity of phenol is increased by decrease in dissolved oxygen concentration, increase in salinity, and decrease in temperature. Salmonids and newly hatched fish are more sensitive than coarse fish and adults respectively. Cresols, xylenols, and phenols are of similar toxicity, and the toxicity of mixtures of phenols is apparently additive, although the toxicity of phenolic wastes may be greater than expected from chemical analyses, since these may not be equally sensitive to all phenols and may neglect the contribution from other poisons. Tentative criteria for salmonid, coarse fish, and commercial fisheries are given. They range from 0.5 mg/l to 2.0 mg/l depending on type of fish, the phenolic waste, and temperature conditions. (Svensson-Washington)
W72-14698

EFFECTS OF LONG-TERM EXPOSURE TO CARBARYL (SEVIN) ON SURVIVAL, GROWTH, AND REPRODUCTION OF THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
National Water Quality Lab., Duluth, Minn.
A. R. Carlson.
Journal of the Fisheries Research Board of Canada, Vol 29, No 5, p 583-587, 1972. 4 tab, 18 ref.

Descriptors: *Pesticide toxicity, *Carbamate pesticides, *Fish physiology, Minnows, Pesticides, Insecticides, Lethal limit, Mortality, Animal growth, Reproduction, Larvae.
Identifiers: *Fathead minnows, *Sevin, *Sublethal effects, Pimephales spp., Carbaryl, 1-Naphthyl methylcarbamate.

When fathead minnows were exposed to five concentrations (0.008-0.68 mg/l) of the insecticide carbaryl for 9 months and throughout a life cycle, the highest concentration prevented reproduction and decreased survival. At the high concentration, testes contained motile sperm and ovaries contained flaccid eggs and appeared to be in a resorptive state. Also at the 0.68 mg/l concentration, carbaryl appeared to contribute to mortality of larvae (produced by unexposed parents) within 30 days of hatching. Survival of young grown in the 0.008 mg/l concentration was reduced. Since no demonstrable effects were noted for survival, growth or reproduction at the 0.017, 0.062, and 0.21 mg/l concentrations, this low survival value is considered not due to carbaryl. The 96 hr median tolerance concentration (TL-50) and the lethal threshold concentration (LTC) for 2 month old fathead minnows were 9.0 mg/l. The maximum acceptable toxicant concentration (MATC) for fathead minnows exposed to carbaryl in water with a hardness of 45.2 mg/l and pH of 7.5 lies between 0.21 and 0.68 mg/l. (Svensson-Washington)
W72-14699

TISSUE CULTURE BIOASSAY METHOD FOR WATER POLLUTION WITH SPECIAL REFERENCE TO MERCURIC CHLORIDE,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05A.
W72-14700

TRANSFER OF MERCURY FROM FISHES TO SARCOSAPRO-PHAGOUS FLIES,
Helsinki Univ. (Finland).
For primary bibliographic entry see Field 05B.
W72-14701

IMPACTS OF OIL ON THE GULF COAST,
Louisiana Wild Life and Fisheries Commission, New Orleans.
L. S. St. Amant.
In: Transactions of the 36th North American Wildlife and Natural Resources Conference, March 7-10, 1971, p 206-219, 1971. 9 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Regulation, *Water policy, *Gulf of Mexico, *Louisiana, Water pollution sources, Oil, Oil industry, Oily water, Oil spills, Oil wastes, Environmental sanitation, Natural gas, Oysters, Management, Water pollution control, Ecology.
Identifiers: Sublethal effects.

The coast of Louisiana is a unique, geologically unstable, highly productive area of both petroleum products and environmentally dependent living resources. The rise in petroleum production coincidentally parallels a rise in fisheries production. After 1950, the impact of petroleum industry activities on fishery production, particularly oyster growing, became evident; this led to a pollution control system, the development of a marine research program and the birth of an administrative procedure designed to protect the coastal environment. Much of this work necessarily dealt with the gross and more immediate effects of industrial activities on coastal ecology and natural resource production. The accumulative results of the introduction of sublethal amounts of oil or other pollutants into the environment for long periods of time and the additive effect of apparently innocuous ecological changes are unknown. These two factors may, in the long run, result in disastrous management of the environment if decisions are based only on the obvious short term effects of multiple use programs on eco-systems. (LeGore-Washington)
W72-14702

THE EFFECT OF HIGH WATER TEMPERATURE ON THE RAZOR CLAM, SILIQUA PATULA (DIXON),
Washington State Dept. of Fisheries, Ocean Park.
C. S. Sayce, and D. F. Tufts.
1971 Proceedings, National Shellfisheries Association, Vol 62, p 31-34, 1972. 2 fig, 2 tab, 9 ref.

Descriptors: *Lethal limit, *Water pollution effects, *Thermal pollution, *Bioassay, *Clams, Water temperature, Sea water, Cooling water, Mortality, Heated water, Nuclear powerplants, Washington.
Identifiers: *Razor clams, Siliqua spp.

Razor clams, in groups of ten, were exposed to warmed seawater for periods of 1,2,3, and 4 hr, then returned to ambient seawater, in two series of experiments. The seawater temperatures used in the first series were 20 C through 29 C in 1.0 degree increments. Mortalities were recorded for a 48 hr period following exposure to the experimental temperature. Mortalities began at 21 C with one clam dying after a 4 hr exposure. One hundred per cent mortalities occurred at 26 C after a 4 hr exposure, at 27 C after a 3 hr exposure, at 28 C after a 2 hr exposure, and at 29 C after a 1 hr exposure. By inspection, LD-50 appears to range from about 22.5 C for razor clams exposed 4 hr to about 27.5 C for razor clams exposed 1 hr to warmed seawater. The second series of experiments was conducted at 5, 10, 15, and 20 C above ambient temperature. Mortalities began (10%) after 4 hr exposure to seawater 10 C above ambient. The LD-50 point was 11.2 C after 4 hr exposure, 14.1 C after 3 hr exposure, 14.3 C after 2 hr and 14.8 C after the 1 hr exposure. (Svensson-Washington)
W72-14703

COELOMOCYTE AGGREGATION IN CUCUMARIA FRONDOSA: EFFECT OF ETHYLENEDIAMINETETRAACETATE, ADENOSINE, AND ADENOSINE NUCLEOTIDES,
Memorial Univ. of Newfoundland, St. John's.
P. B. Noble.
Biological Bulletin, Vol 139, p 549-556, December 1970. 2 fig, 1 tab, 17 ref.

Descriptors: *Chelation, *Cytological studies, *Invertebrates, Animal physiology, Calcium, Magnesium, Water pollution effects.
Identifiers: *EDTA, *Sea cucumbers, *Coelomocytes, *Adenosine, Ethylene-diaminetetraacetate, Cucumaria spp., Holothurians, Morphological changes.

Cells found within the coelomic cavity of the sea cucumber, Cucumaria frondosa, aggregated rapidly upon removal from the body. This cell aggregation is normally characterized by a morphological change in the bladder amoebocyte which becomes a filiform cell. A method has been devised whereby the effects of EDTA, adenosine, and adenosine nucleotides could be observed upon coelomocyte aggregation. EDTA at pH 6.0 in artificial seawater (Ca (2+) and Mg (2+) free) prevented the morphological change from bladder to filiform amoebocyte as well as cell aggregation. EDTA at pH 7.8 in artificial seawater (Ca (2+) and Mg (2+) free) did not prevent the morphological change although it did prevent cell aggregation. Based on the different chelating affinities of EDTA for calcium ions at these two different pH values, it is suggested that coelomocyte aggregation has two components: (1) the morphological change, which is Ca (2+) independent and possibly requires the removal of some other cation or is a direct effect of EDTA upon some cellular component, and (2) the cell aggregation itself, which appears to be Ca (2+) dependent. Adenosine and adenosine nucleotides in general did not appear to influence coelomocyte aggregation. These results raise the question as to whether or not the mechanism of coelomocyte aggregation is similar to and can be described in the same terms as the mechanism currently used to explain avian and mammalian cell aggregation. (Svensson-Washington)
W72-14704

SOME COMMENTS UPON ACID-BASE BALANCE IN TELEOST FISHES AND ITS RELATIONSHIP TO ENVIRONMENTAL TEMPERATURE,
Marquette Univ., Milwaukee, Wis. Dept. of Biology.
A. H. Houston.
Comparative Biochemistry and Physiology, Vol 40A, p 535-542, 1971. 1 fig, 1 tab, 44 ref.

Descriptors: *Fish physiology, *Water temperature, *Teleosts, Hydrogen ion concentration, Acidity, Alkalinity, Water pollution effects.
Identifiers: *Acid-base regulation, Poikilotherms, Homeotherms.

It has been hypothesized that acid-base regulation in mammalian species is directed toward stabilization of body fluid pH, whereas among the poikilotherms control centers upon the maintenance of relative alkalinity. Consequently, given the known relationship between temperature and the dissociation constant of water reductions in mammal body temperature should be accompanied by decreases in the OH (-)/H (+) ratio while, under similar circumstances, the pH of the poikilothermic body fluid system should increase. Although this hypothesis appears to have been validated with respect to homeothermic and poikilothermic tetrapods, extension of the concept of relative alkalinity regulation to teleost fishes is not wholly consistent with the data presently available. Recorded blood and plasma pH values for teleost fishes are generally below those reported for amphibians and reptiles, tending to fall within or below the levels observed in mammals

under comparable thermal conditions. Moreover, they seemingly display little tendency to vary in an inverse fashion with temperature. (Svensson-Washington)
W72-14705

THE EFFECT OF CCC AND DIETHYLAMINE HYDROCHLORIDE ON CERTAIN SPECIES OF ALGAE BELONGING TO CYANOPHYCEAE, CHLOROPHYCEAE, AND DIATOMEAE,
Bialystok Medical Academy (Poland). Dept. of Biology.
R. Czerpack.
Acta Hydrobiologia, Vol 12, No 2-3, p 143-151, 1970. 5 fig, 33 ref.

Descriptors: *Inhibition, *Plant growth regulators, *Chlorides, *Cyanophyta, *Chlorophyta, *Chrysophyta, Toxicity, Inhibitors, Toxins, Inorganic compounds, Algae, Diatoms, Chlamydomonas, Scenedesmus, Bio-assay, Resistance, Lethal limit, Poisons, Water pollution effects.
Identifiers: *Chlorocholine chloride, *CCC, *Diethylamine hydrochloride, Merismopedia spp., Anabaena spp., Gomphonema spp., Nitzchia spp., Sensitivity.

The effects of chlorocholine chloride (CCC) and ditethylamine hydrochloride on the concentration of cells, their size, total chlorophyll content and the dynamics of the growth of nine species of algae belonging to Cyanophyceae (Merismopedia glauca, Anabaena cylindrica), Chlorophyceae (Chlamydomonas nivalis, Scenedesmus quadricauda, S. acuminatus, S. basiliensis, S. bijugatus), and Diatomeae (Gomphonema parvulum, Nitzchia palea) were investigated. Diethylamine, the chemical analog of CCC, had similar effect--even a somewhat stronger one--to that of CCC as a typical growth retardant at similar concentrations. Both growth regulators had an inhibitory effect on the cell concentration, their growth dynamics, and the total chlorophyll content of the algae. The Diatomeae and filamentous Cyanophyceae were the most sensitive to the regulators investigated. On the other hand, a slight stimulatory effect was observed with Chlorophyceae when the chemicals were applied in concentrations of 10 to the (-5) power to 10 to the (-7) power M. (LeGore-Washington)
W72-14706

ABSENCE OF POLYCHLORINATED BIPHENYLS IN HUMAN MILK AND SERUM FROM TEXAS AND HUMAN MILK FROM NEW GUINEA,
William Beaumont General Hospital, El Paso, Tex.
For primary bibliographic entry see Field 05B.
W72-14708

EFFECTS OF MIREX ON SELECTED ESTUARINE ORGANISMS,
Environmental Protection Agency, Gulf Breeze, Fla.
J. I. Lowe, P. R. Parrish, A. J. Wilson, P. D. Wilson, Jr., and T. W. Duke.
In: Transactions of the 36th North American Wildlife and Natural Resources Conference, March 7-10, 1971, p 171-186, 1971. 2 fig, 4 tab, 9 ref.

Descriptors: *Water pollution effects, *Pesticide toxicity, *Bioassay, *Toxicity, *Organic pesticides, Lethal limit, Chemcontrol, Shrimp, Pink shrimp, Crabs, Crustaceans, Persistence.
Identifiers: *Mirex, *Fire ant control, Brown shrimp, Penaeus spp., Palaemontes spp., Grass shrimp, Callinectes spp., Fiddler crabs, Uca spp., Pinfish, Lagodon spp.

Exposure to mirex (dodecachlorooctahydro- 1, 3, 4-metheno-2H-cyclobuta (cd) pentalene) under laboratory conditions affects certain estuarine crustaceans by causing irritability, loss of equilibrium, undirected movement, paralysis, and, frequently, death. Juvenile brown shrimp, Penaeus aztecus, and grass shrimp, Palaemonetes pugio, died after exposure to mirex fire ant bait at levels as low as one particle of bait per shrimp in standing seawater. Juvenile pink shrimp, Penaeus duorarum, died after exposure to technical mirex dissolved in flowing seawater. Although only 25% of a population of pink shrimp died during a 7 day exposure to 1.0 microgram/liter of mirex, all remaining shrimp died within four days after being placed in mirex-free seawater. Mirex was toxic to juvenile blue crabs, Callinectes sapidus, and to fiddler crabs, Uca pugilator. Mirex was apparently not toxic to pinfish, Lagodon rhomboides. Mirex can be transferred through simple food chains in laboratory experiments. The insecticide mirex remained in fire ant bait months after the bait was placed in open seawater. About 34% of the mirex in samples of bait was still present after 9 months of soaking in seawater. (LeGore-Washington)
W72-14710

MONITORING OF ORGANO-CHLORINE RESIDUES IN FISH FROM AROUND ENGLAND AND WALES, WITH SPECIAL REFERENCE TO POLYCHLORINATED BIPHENYLS (PCBS),
Ministry of Agriculture, Fisheries and Food, Burhham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W72-14711

THE LEVELS OF CERTAIN METALS IN FISH FROM COASTAL WATERS AROUND ENGLAND AND WALES,
Ministry of Agriculture, Fisheries and Food, Burhham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
International Council for the Exploration of the Sea, Fisheries Improvement Committee, C. M. 1971/E:13, 1971. 8 p, 2 tab, 2 ref.

Descriptors: *Heavy metals, *Marine fish, *Assay, Water pollution effects, Cadmium, Chromium, Copper, Lead, Mercury, Zinc, Coasts, Herring, Public health.
Identifiers: Cod, Whiting, Plaice, Mackerel.

Samples of fish, each usually consisting of ten individuals of each species, were collected twice yearly from nine representative ports around England and Wales. The species sampled were: cod, whiting, plaice, herring and mackerel. In addition, samples of these and other common commercial species were collected from the North Sea and distant-water fishing grounds. The muscle tissue of each individual fish, together with a homogenate of the bulked livers of each sample, was analyzed for cadmium, chromium, copper, lead, mercury, and zinc by atomic absorption spectrophotometry. Results are given in tabular form. (Svensson-Washington)
W72-14712

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05A.
W72-14728

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-14765

CARBON AND NITROGEN AS REGULATORS OF ALGAL GROWTH IN TREATED SEWAGE,
Kentucky Water Resources Inst., Lexington.
G. Foree, and R. Scroggin.
Available from the National Technical Information Service as PB-212 375, $3.00 in paper copy, $0.95 in microfiche. Research Report No. 49, March 1972. 61 p, 15 fig, 7 tab, 32 ref. OWRR A-023-KY (2).

Descriptors: *Carbon, *Nitrogen, *Algae, Plant growth, Sewage effluents, Regulation, Cyanophyta, Chlorophyta, Hydrogen ion concentration, Chemical porperties, Nitrogen fixation, Cultures, Carbon dioxide, Nutrients, Limiting factors, Allogenic succession, Eutrophication.
Identifiers: *Algal growth, Continuous cultures, Batch cultures.

To provide information on algal growth regulators the first phase of this investigation was a continuous flow culture study in which algae were grown under various conditions. When the cultures reached steady state, they were assayed to determine the extent and rate of growth, algal genera present, nutrient utilization, and algal composition. The second phase was a batch culture study which provided means for comparing the two types of cultures (i. e., batch and continuous) and verification of some conclusions of the continuous culture study. Even in sewage effluents containing significant concentrations of both organic and inorganic carbon, algal growth was limited by availability of carbon dioxide. The results indicated that in natural situations where excess carbon dioxide might be available, but nitrogen is deficient in solution, algal succession may occur with shifts to certain blue-green forms containing atmospheric nitrogen fixing capabilities. A previously developed kinetic theory which describes algal growth as being proportional to the cellular concentration of the growth regulating nutrient was confirmed when applied to the carbon dioxide enriched conditions with 10 mg/l ammonia nitrogen in the feed solution. (Jones-Wisconsin)
W72-14790

EUTROPHICATION OF SMALL RESERVOIRS IN THE GREAT PLAINS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
J. Hammer, and L. Hergenrader.
Available from the National Technical Information Service as PB-212 376, $3.00 in paper copy, $0.95 in microfiche. Nebraska Water Resources Research Institute I. Project completion report (1972), 18 p. 3 fig, 2 tab, 3 ref. OWRR A-014-NEB (6).

Descriptors: *Eutrophication, *Reservoirs, *Great Plains, Nebraska, Recreation, Nutrients, Runoff, Photosynthesis, Turbidity, Cyanophyta, Aquatic weed control, Light penetration, Dyes.
Identifiers: Salt Valley (Neb.), Photosynthesis control, Blue dye.

Several small reservoirs were built within a 20 mile radius of Lincoln, Nebraska, for flood control and soil conservation while recreation developed as a secondary benefit. Runoff waters entering the lakes are principally from cultivated farmland. Runoff from intense rains is turbid with suspended silt and clay. In the larger reservoirs, the soil grains settle out of suspension quickly even though the water is stirred by wind; in shallow reservoirs with long reaches in the direction of prevailing winds, the water remains turbid. Eutrophication rates, nutrient sources, and eutrophication control have been examined in five of the reservoirs. Impounded runoff waters have sufficient nutrient salts to support abundant growths of aquatic plants; those reservoirs light-limited by soil turbidity support neither abundant growths of aquatic plants nor dense blue-green algal blooms; clear water reservoirs are very eutrophic--shorelines choked with rooted aquatics, dense blooms of blue-green algae, odorous emissions, and occasional fish kills are typical characteristics. Projections based upon existing data indicate that the useful life of these

reservoirs for body-contact recreation is only a few years. Weed and algae control experiments are being evaluated directed to control photosynthesis by inhibiting sunlight penetration by application of variously colored dyes. (Jones-Wisconsin)
W72-14791

TOXICITY OF KRAFT MILL EFFLUENT TO SELECTED ESTUARINE ORGANISMS FROM YAQUINA BAY, OREGON,
Environmental Protection Agency, Cincinnati, Ohio.
P. Parrish, and F. Horton.
Northwest Sci. Vol. 45, No. 4: p244-251. 1971.
Identifiers: *Water pollution effects, *Pulp wastes, Bays, Cancer magister, Effluents, Embiotoca lateralis, Hexagrammus decagrammus, Parophrys vetulus, Phanerodon furcatus, Platichthys stellatus, *Toxicity, Yaquina Bay (Oregon).

Median tolerance limits of kraft mill effluent were estimated on Phanerodon furcatus, Embiotoca lateralis, Hexagrammus decagrammus, Platichthys stellatus, Parophrys vetulus, and Cancer magister.--Copyright 1972, Biological Abstracts, Inc.
W72-14792

PHYSIOLOGY OF ACIDOPHILIC BACTERIA OF ACID MINE WATER,
Maryland Univ., College Park. Water Resources Research Center.
L. Manning, and M. Cook.
Available from the National Technical Information Service as PB-212 377, $3.00 in paper copy, $0.95 in microfiche. Completion report, February 1972. 50 p. 15 fig, 5 tab, 37 ref. OWRR A-016-MD (2).

Descriptors: *Plant physiology, *Acid bacteria, *Acid mine water, Pseudomonas, Organic acids, Hydrogen ion concentration, Enzymes, Proteins, Water pollution, Cytological studies, Acidic water, Ecology.
Identifiers: *Pseudomonas acidophila sp. n, Pseudomonas fluorescens.

Two new acidophilic bacteria (strains M-1 and M-2) were isolated, characterized, and placed in the genus Pseudomonas, as Pseudonomas acidophila, sp. n. Obligate acidophiles unable to grow at neutrality, they are capable of rapid and vigorous growth at pH 3.5, with a range of pH 2.5-4.5, in an especially devised yeast extract-glucose salts medium. Unlike the ferrobacilli and thiobacilli, they are heterotrophs (that is, use organic compounds for growth) rather than autotrophs. They differ from other acid-tolerant heterotrophic bacteria of such environments in being obligate acidophiles and fail to grow on routine bacteriological culture media. An acidic yeast extract-glucose salts culture medium was developed for heterotrophs such as P. acidophila and an improved iron salts agar medium for the autotrophic iron-oxidizing ferrobacilli. Various morphological and physiological characteristics of the two strains were determined. A low level of yeast extract (0.025-0.050%) stimulates growth, but growth is progressively inhibited above 0.1%. Both inorganic and organic nitrogen sources are utilized for growth. Growth with ammonium salts lowered the pH of the medium but growth with organic nitrogen sources such as L-histidine, hydrolyzed casein or urea consistently raised the pH from an initial value of 4.0 to 5.0 or higher. (Jones-Wisconsin)
W72-14793

GRAZING BY THE CILIATED PROTOZOON LOXODES MAGNUS ON THE ALGA SCENEDEMUS IN A EUTROPHIC POND,
Freshwater Biological Association, Ambleside, (England).
R. Goulder.
Oikos, Vol. 23, No. 1, p. 109-115, 1972. 4 fig., 3 tab., 12 ref.

Descriptors: *Grazing, *Protozoa, *Algae, Scenedesmus, Eutrophication, Ponds, Feeding rates, Benthos, Standing crops.
Identifiers: *Loxodes magnus.

An assessment was made of the importance of grazing by Loxodes magnus, one of a group of benthic ciliated protozoa feeding on Scenedesmus denticulatus, S. quadricauda, and S. acuminatus. The rate at which L. magnus digests Scenedesmus was estimated by means of a laboratory starvation procedure and it was assumed that, under natural conditions, the digestion rate equals the feeding rate. No correlation was found between numbers of L. magnus (and also the ciliate Loxodes striatus) and Scenedesmus crops. Scenedesmus cells per square meter in the sediment decreased from S. quadricauda to S. denticulatus to S. acuminatus but inside L. magnus, numbers of S. denticulatus were highest, decreasing to S. quadricauda and finally S. acuminatus; therefore, L. magnus may be able to distinguish between species of Scenedesmus in its feeding. The population feeding rate of L. magnus represented between 0.003% and 0.68% of the Scenedesmus crop eaten per day; therefore grazing by L. magnus probably had no significant effect. Other ciliates were eating Scenedesmus, and also perhaps benthic rotifers and crustaceans, consequently grazing by all invertebrates could be significant. L. magnus utilizes other food than Scenedesmus--members of this genus are known to feed on both algae and bacteria. (Jones-Wisconsin)
W72-14796

QUANTITATIVE STUDIES ON THE PHYTOPLANKTON OF THE RIVERS THAMES AND KENNET AT READING,
Reading Univ. (England). Dept. of Zoology.
T. J. Lack.
Freshwater Biology, Vol. 1, p. 213-224, 1971. 2 fig., 2 tab., 22 ref.

Descriptors: *Algae, *Phytoplankton, *Rivers, *Diatoms, Chlorophyta, Benthic flora, Eutrophication, Dominant organisms, Biological communities, Nutrients, Scenedesmus, Chrysophyta, Seasonal, Silica, Discharge (Water).
Identifiers: *Centric diatoms, *River Thames (England), River Kennet (England), Stephanodiscus hantzschii, Cryptomonas, Rhodomonas.

Seasonal changes in density and species composition of River Thames phytoplankton and its tributary, River Kennet, at Reading (England) were studied. Observations extended from May 1966 to May 1968. Samples consisting of 250 ml of subsurface water were taken weekly from the center of each river approximately 200 m upstream of the confluence. These were concentrated by sedimentation and counted in a haemocytometer. Data on discharge, temperature, and silica concentration are followed by descriptions of the variations in number and phytoplankton composition. In both rivers there were spring and autumn peaks of the centric diatom, Stephanodiscus hantzschii. Chlorophyceae were most abundant during summer. Two cryptophyceans, Cryptomonas and Rhodomonas, were sometimes numerous. In the Thames, population size was closely correlated with the discharge, highest numbers always occurring during low discharge periods. In the Kennet, increases in discharge often brought about increases in cell number due to influx of benthic forms. It seems highly probable that the rivers maintain high levels of nitrates and phosphates since both carry considerable quantities of treated sewage effluent. Comparisons with earlier studies on the Thames showed difference in phytoplankton composition which were almost certainly due to eutrophication. (Jones-Wisconsin)
W72-14797

THE INFLUENCE OF VARIOUS CONCENTRATIONS OF NATURAL FOOD ON THE DEVELOPMENT, FECUNDITY AND PRODUCTION OF PLANKTONIC CRUSTACEAN FILTRATORS,
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.

Ekologia Polska, Vol. 19, No. 30, p. 427-473, 1971. 15 fig., 16 tab., 100 ref.

Descriptors: *Fecundity, *Productivity, *Plankton, *Crustaceans, Foods, Daphnia, Life history studies, Zooplankton, Thermal properties, Trophic level, Growth rates, Reproduction, Eutrophication, Biomass, On-site investigations, Temperature.
Identifiers: Daphnia cucullata, Daphnia longispina, Diaphanosoma brachyurum, Chydorus sphaericus, Eudiaptomus graciloides, Mikolajskie Lake (Poland).

Planktonic crustacean filtrators are an important link in production of freshwater ecosystems. As primary consumers, directly utilizing primary production, they largely decide the character of the energy flow through the ecosystem. The relation of natural food concentration to the development, growth, and fecundity rates of these filtrators, which dominate the pelagic area of Mikolajskie Lake, Poland was studied. The production of zooplankton communities under various thermal and trophic conditions was calculated. Two basic problems are solved: is the food available for planktonic crustacean filtrators sufficient for optimal development and growth, and how the fluctuations of food abundance in nature can influence production in Mikolajskie Lake, a typical eutrophic lake in a temperate climate. The results show that the food concentration available is as important a factor for development, growth and production of planktonic filtrators as temperature. A positive dependence of the length and rate of development on a trophic factor was found for all investigated species in may food concentrations. Quantity of food available for planktonic filtrators in the eutrophic lake can be a limiting factor for development and production of individuals. The limiting factor of food varies for different species utilizing different food. (Jones-Wisconsin)
W72-14799

LIGHT-INDUCED FLUORESCENCE CHANGES IN CHLORELLA, AND THE PRIMARY PHOTOREACTIONS FOR THE PRODUCTION OF OXYGEN,
Rockefeller Univ., New York.
D. Mauzerall.
Proceedings of the National Academy of Sciences, Vol 69, No 6, p 1358-1362, 1972. 3 fig, 27 ref.

Descriptors: *Algae, *Fluorescence, *Chlorella, *Photoactivation, *Oxygen, Light, Photosynthesis, Optical properties, Absorption, Mathematical studies, Chlorophyll, Oxidation reduction potential.
Identifiers: Chlorella vulgaris.

The increase of the quantum fluorescence yield in green plants and algae with increasing illumination has long been an indicator of the state of the photoreactive centers in photosynthesis. There are different parts of this nonlinear fluorescence; some parts are fairly slow (seconds to minutes); others are fast (milliseconds). The light-induced increases of the effective fluorescence yield in Chlorella are too slow to be a primary process in photosynthesis. The fast transient state is attributed to a priming reaction for the photosystem that makes oxygen. The slower cyclical process is attributed to the dark reactions that make oxygen after photoexcitation of this system. The slower cyclical process is also distinguished by a narrower emission spectrum that peaks at a shorter wavelength than the dark adapted or fast transient state. A minimum of six different fluorescent

states are required to explain the data. In addition to the usual assumption about changing quantum yield of fluorescence in these processes, the data suggest that changes in cross section of optical absorption must also be considered. The slowest relaxation times observed are well correlated with the slow steps detected in evolution of oxygen. (Jones-Wisconsin)
W72-14800

EXPERIMENTAL INVESTIGATIONS ON THE ACTIVITY OF BACTERIA IN RELATION TO THE METABOLISM OF NITROGEN COMPOUNDS IN GRAVEL-PIT LAKES (EXPERIMENTELLE UNTERSUCHUNGEN UEBER DIE AKTIVITAET VON BARTERIEN BEIM VMSATZ VON N-V ERBINDUNGEN IN BAGGERSEEN),
Landesstelle Gewaesserkunde, Baden-Wuerttemberg (West Germany); and Slovenska Akademie Vied, Bratislava (Czechoslovakia). Limnobiologisches Institut.
R. Ritter, I. Daubner, and W. Schmitz.
Archiv fur Hydrobiologie, Vol 69, No 3, p 294-308, 1971. 10 fig, 5 tab, 9 ref. English summary.

Descriptors: *Nitrogen cycle, *Bacteria, *Metabolism, Ammonia, Nitrites, Nitrates, Oxygen, Ammonification, Aerobic conditions, Anaerobic conditions, Nitrification, Denitrification.
Identifiers: Gravel-pit lakes, Upper Rhine Valley.

The part which physiological groups of bacteria play in the nitrogen cycle in gravel-pit lakes of the Upper Rhine Valley was investigated by experimental methods. Metabolic potential was studied by estimating activity of ammonifying, nitrifying, and denitrifying bacteria in water samples after addition of corresponding specific nutrients. The metabolic rate was determined by estimating nitrogen compounds concentration changes in natural or specially prepared water samples with oxygen content controlled as a function of time. Ammonifying and nitrifying potential were maximum during early September, while the nitrifying potential was maximum during fall. Ammonifying and nitrifying potentials are not dependent on water oxygen content although higher potentials occur in the hypolimnion than in epilimnion. Influence of oxygen content is greater on denitrifying and nitrifying potentials. During incubation, concentration changes of nitrogen compounds in water samples occur in two phases, depending on oxygen; during the first aerobic phase, ammonia concentrations decrease, while nitrite and nitrate increase; during the following anaerobic phase, the nitrate content decreases, but nitrite and ammonia increase. In other experiments, the first phase is similar, but during the second, at lower oxygen concentrations, ammonia as nitrate decreases while nitrite increases slightly. (Jones-Wisconsin)
W72-14802

A STUDY OF NITRIFICATION IN FORT LOUDOUN RESERVOIR,
Tennessee Univ., Knoxville. Water Resources Research Center.
W. B. Bondurant.
Report No. 13. MS thesis, March 1972. 74 p, 20 fig, 12 tab, 57 ref, 3 append. OWRR A-013-TENN (3). 1431-0001-3243.

Descriptors: *Nitrification, *Reservoirs, *Tennessee, Computer models, Ammonia, Nitrates, Nitrites, Nitrogen, Dissolved oxygen, Fluorescent dye, Oxidation, Temperature, Biochemical oxygen demand, Computer programs, Curves, Model studies, Bacteria, Fungi, Actinomycetes, Inhibitors, Biochemistry, Hydrogen ion concentration, Methodology.
Identifiers: *Fort Loudoun Reservoir (Tenn), Nitrosomonas, Nitrobacter.

Changes in nitrogen forms as water moves through Fort Loudoun Reservoir, Tennessee are investigated and a field test made of applicability of a model predicting changes with time in ammonia nitrogen, nitrite nitrogen, and nitrate nitrogen concentration, and rate of oxygen uptake at different times. Slugs of water were tagged with fluorescent dye and samples were taken from the tagged sediments. Ammonia nitrogen, nitrite nitrogen, and nitrate nitrogen concentrations were determined on each sample. A tracer was necessary because of unsteady flow conditions resulting from power dams above and below the reservoir. The nitrogen concentrations were plotted against time and the rates of nitrification were determined graphically. Input was determined for the computer prediction model, and the predicted nitrogen versus time curves were compared with the actual curves. In all, four studies were conducted--one during nonstratified conditions and three during stratified conditions. Although agreement between actual and predicted oxidation was not exact, no indication could be found that biological or chemical factors caused the disagreement. The prediction model as proposed serves as an adequate description of the nitrification processes that occur in polluted waters. (Jones-Wisconsin)
W72-14803

CHROMATOGRAPHIC AND BIOLOGICAL ASPECTS OF POLYCHLORINATED BIPHENYLS,
National Institute of Environmental Health Sciences, Research Triangle Park, N.C.
L. Fishbein.
Journal of Chromatography, Vol 68, p 345-426, 1972. 8 fig, 37 tab, 113 ref.

Descriptors: *Polychlorinated biphenyls, *Chromatography, *Analytical techniques, Ecological distribution, Toxicity, Pesticides, Chlorinated hydrocarbon pesticides, Mass spectrometry, Pollutant identification, Aroclors, Lethal limit, Pathology, Pesticide residues, DDT, DDD, DDE.
Identifiers: *Pesticide analysis, Chlorinated napthalines, Organochlorine pesticides, Dibenzofurans.

Information relative to the biological decomposition of polychlorinated biphenyls is scant. They are more stable than DDT and its metabolites since the PCBs lack the ethane component between the aromatic rings. This factor coupled with their physical and chemical characteristics for persistence indicates that these materials are capable of biological magnification up the food chain. Their high lipid solubility results in accumulation in fatty tissues of lower animals and marine life. Because of very low aqueous solubility, they accumulate on underwater sediments in relatively high concentration and redissolve very slowly. In describing effects and interactions of environmental chemicals (aspirin, caffeine, Aroclor 1254, carbaryl, parathion, DDT, and several insecticide metabolites) on human cells in tissue culture, aspirin and caffeine were 8 to 20 times less toxic than the other agents studied while the PCB plasticizer Aroclor 1254 was as toxic as DDT. The chromatographic (column, thin-layer and gas-liquid and combined gas-liquid chromatography and mass spectros copy) and biological aspects of the polychlorinated biphenyls are reviewed with primary focus as to their utility, ecological distribution and toxicity as well as diverse techniques for their separation from chlorinated pesticides and subsequent analysis. (Jones-Wisconsin)
W72-14804

SOME DATA ON THE ROLE OF FOOD IN THE BIOLOGY OF EUDIAPTOMUS ZACHARIASI POPPE,
Instytut Rybactwa Srodladowego, Warsaw (Poland).
E. Grygierek.
Ekologia Polska, Vol 19, No 21, p 277-292, 1971. 8 fig, 38 ref.

Descriptors: *Crustaceans, *Foods, *Life history studies, Copepods, Diatoms, Chlorophyta, Temperature, Size, Fecundity, Algae.
Identifiers: *Eudiaptomus zachariasi.

The role of food in the development of the crustacean, Eudiaptomus zachariasi, in a natural habitat was studied. By daily sampling from six similar fry ponds, examination was made of the relation between duration of development, size, and fecundity and the amount of its food. Analysis was made of total abundance, of variation in age and sex structure, in length of individuals at different stages of development, abundance of eggs and numbers of females with eggs. Eudiaptomus zachariasi fed on rotifers, but when there were few rotifers, its food was algae, measuring up to 50 microns, more difficult to digest than rotifers. The development cycle of the generation of E. zachariasi hatched from resting eggs lasted from 13 to 23 days, as did that of the next generation. Differences were not greater than a few days and might have been caused by amount of food during development period of the generation. In extreme cases the food level limits the number of generations. The size of individuals, sex structure and particularly individual fecundity of E. zachariasi depended on amount of food. Individual fecundity did not always determine the fecundity of the whole population. (Jones-Wisconsin)
W72-14805

THE DEPENDENCE OF PRIMARY PRODUCTION UPON PHYSICAL AND CHEMICAL FACTORS IN A SMALL, SENESCING LAKE, INCLUDING THE EFFECTS OF COMPLETE WINTER OXYGEN DEPLETION,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.; and North Dakota State Univ., Fargo.
D. W. Schindler, and G. W. Comita.
Archiv fur Hydrobiologie, Vol 49, No 4, p 413-451, 1972. 17 fig, 8 tab, 17 ref.

Descriptors: *Anaerobic conditions, *Primary productivity, *Chemical properties, *Physical properties, Lakes, Eutrophication, Oxygen, Ice cover, Winter, Phytoplankton, Minnesota, Standing crops, Biota, Productivity, Regression analysis, Thermal stratification, Chlorophyll, Cyanophyta, Diatoms, Daphnia, Nutrients, Sediments, Hydrogen sulfide, Temperature, Zooplankton, Fishkill, Turbidity.
Identifiers: *Oxygen depletion, Severson Lake (Minn).

Limnological observations with measurements of water chemistry, primary production and phytoplankton, were made in small eutrophic Severson Lake, Minnesota for several years. Detailed information was obtained in 1955 and in 1964-65. Light penetration was reduced by blue-green algal blooms in 1955. Primary production/standing crop was low. There were large blue-green blooms in the fall of 1964, production exceeding those in 1955. In May after a winter when oxygen depletion caused complete fish kills, diatom and green flagellates appeared. They were quickly grazed by Daphnia pulex which appeared for the first time, displacing D. parvule completely and Diaptomus siciloides partially. In June 1965, very low phytoplankton standing crops and production, but no Cyanophyta, accompanied by high transparency, caused increased aquatic macrophyte growth. Chlorophyll, temperature, dissolved inorganic nitrogen and incident solar radiation were shown by multiple regression analysis to be the most important causes of productivity in 1964-65. Chlorophyll, temperature, and light explained much of the variance in 1955 production. Some hypotheses are suggested to explain changes in terms of chemical and physical parameters, particularly those occurring under winter ice. (Jones-Wisconsin)
W72-14806

RELATIVE TOLERANCE OF NITROGEN-FIXING BLUE-GREEN ALGAE TO PESTICIDES,
Indian Agricultural Research Inst., New Delhi.
G. S. Venkataraman, and B. Rajyalakshmi.
Indian Journal of Agricultural Sciences, Vol 42, No 2, p 119-121, 1972. 1 tab, 11 ref.

Descriptors: *Algae, *Cyanophyta, *Pesticides, Fungicides, Herbicides, Irrigation, Agriculture, Rice, Crop response.
Identifiers: *Tolerance, Anabaena, Nostoc, Aulosira, Tolypothrix, Anacystis nidulans.

In-vitro tolerance of blue-green algae to pesticides was studied. Twenty-seven strains of nitrogen-fixing Cyanophyta from four genera were tested. Commercial preparations of ceresan M, dithane, 2,4-D, delapon, propazine, cotoron, diuron, and linuron were used at concentrations varying from 0.01 to 2000 ppm. Most nitrogen-fixing blue-green algae could tolerate high pesticide levels although they showed wide variation in relative tolerance. Levels of different pesticides are described in relation to specific strains; for example, though most of the strains of Anabaena could tolerate 100 ppm of ceresan, strain 310 was sensitive to a concentration of 0.01 ppm; though dithane was lethal to some strains of Anabaena and Nostoc at the lowest concentration used, some strains could grow well at 50 ppm. High concentrations of ceresan, dithane, 2,4-D and delapon were tolerated by Tolypothrix tenuis and Aulosira fertilissima. Propazine, cotoron, and linuron were lethal, and diuron lethal to both algae. Specific strains should be used with different pesticides and a mixture of different strains--not a single strain--should be used as seeding material when more than one pesticide is applied to the crop. (Jones-Wisconsin)
W72-14807

OBSERVATIONS ON THE CYTOLOGY AND ULTRASTRUCTURE OF THE NEW ALGAL CLASS, EUSTIGMATOPHYCEAE,
Leeds Univ. (England). Dept. of Botany.
D. J. Hibberd, and G. F. Leedale.
Annals of Botany, Vol 36, p 49-71, 1972. 2 fig, 7 plates, 65 ref.

Descriptors: *Cytological studies, *Systematics, *Algae, Chrysophyta, Phaeophyta.
Identifiers: *Eustigmatophyceae, Xanthophyceae, Polyedriella helvetica, Pleurochloris commutata, Pleurochloris magna, Vischeria punctata, Vischeria stellata, Ellipsoidion acuminatum.

The first detailed account of a new class of algae, Eustigmatophyceae is given. Its unique features are emphasized in comparison with those coccoid forms which must be considered as members of the Xanthophyceae sensu stricto. The zoospores, and to a lesser extent, the vegetative cells of six species of Eustigmatophyceae species were studied with light and electron microscopy. The features of organization are compared in detail with the same components in the Xanthophyceae and other classes of algae, with particular reference to the motile cells. It is concluded that Eustigmatophyceae is less like the Xanthophyceae sensu stricto than the latter is like the Chrysophyceae and Phaeophyceae, and in most characteristics shows fundamental differences from all other classes of algae. The taxonomic difficulty raised by eustigmatophycean possession of an anterior hairy flagellum of typically 'heterokont' construction is discussed. The taxonomic and nomenclatural problems resulting from the removal of several species from the Xanthophyceae into the Eustigmatophyceae are briefly considered and previous observations by other authors on species now placed in the Eustigmatophyceae are reviewed. (Jones-Wisconsin)
W72-14808

EFFECT OF TEMPERATURE AND AERATION ON THE SURVIVAL AND GROWTH OF SALMONELLA TYPHIMURIUM IN DAIRY WASTE,
Auburn Univ., Ala.
M. A. Jaleel.
MS thesis, March 1972. 78 p, 6 fig, 3 tab, 171 ref, append. OWRR B-017-ALA (1).

Descriptors: *Salmonella, *Temperature, *Aeration, *Mortality, Dairy industry, Period of growth, Wastes, Coliforms, Pathogenic bacteria, Epidemiology, Cattle, Isolation, Separation techniques, Human diseases, Animal diseases, Carriers, Water pollution, Sampling, Cultures, Hydrogen ion concentration, Oxidation-reduction potential, Farm wastes.
Identifiers: *Salmonella typhimurium, *Dairy wastes, Salmonella survival, Detection procedure.

Dissemination of Salmonella typhimurium by dairy cattle leading to water contamination prompted study of the viability of this bacterium in liquid bovine waste. Salmonella detection and enumeration procedure of Cheng, et al. was modified by concentrating the enrichment medium rather than the inoculum. Confirmation of Salmonella was accomplished by inoculating the suspected colonies from brilliant green agar into triple sugar iron agar. Serological confirmation was done by using polyvalent O antiserum. Results showed that S. typhimurium survived longer (mean survival time 44.4 days) at 10C as compared to 3.4 days at 35C. A 99% kill of S. typhimurium in the aerated sample at 10C was much faster (18-21 days) when compared to the 99% kill in the nonaerated sample at 10C (28-35 days). Mean survival time in aerated dairy waste at 35C was much longer (16 days) than the mean survival time in the nonaerated sample (3.4 days). A 99% reduction of Salmonella in aerated waste occurred during 12-18 days of incubation whereas in nonaerated waste 99% reduction occurred between 3 and 6 days of incubation. (Jones-Wisconsin)
W72-14809

MICROBIOLOGICAL STUDIES ON NITROGEN FIXATION IN AQUATIC ENVIRONMENTS--III. ON THE NITROGEN FIXING BACTERIA IN OFFSHORE REGIONS,
Kyoto Univ. (Japan). Research Inst. for Food Science; and Mie Prefectural Univ., Tsu (Japan).
A. Kawai, and I. Sugahara.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 37, No 10, p 981-985, 1971. 2 fig, 3 tab, 4 ref.

Descriptors: *Nitrogen fixation, *Nitrogen fixing bacteria, *Oceans, Bottom sediments, Standing crops, Surface waters, Pacific Ocean.
Identifiers: Japan Sea, Suruga Bay (Japan), Sagami Bay (Japan), East China Sea.

The number of nitrogen fixing bacteria was counted in the open waters of the mid-Pacific Ocean and Japan Sea and in the bottom sediments of some sea water environments. The standing crop of nitrogen fixing bacteria was quite small in the surface waters of the mid-Pacific Ocean and the Japan Sea, that is, at most 200 cells/l and 400 cells/l, respectively. Nitrogen fixing bacteria occur more abundantly in the bottom sediments than in the water, namely 1-10 cells/1 g of wet mud in offshore regions and open seas such as Suruga Bay, Sagami Bay, and the East China Sea. In general, nitrogen fixing bacteria in offshore or open sea water are extremely scanty compared with those in inland bays. According to these results, it seemed likely that the nitrogen fixation in an open sea may be carried out mainly in the water column rather than in the bottom mud in respect to the bulk of water mass, even though the standing crop of nitrogen fixing bacteria in 1 g of wet mud is considerably larger than that in 1 ml of water. (Jones-Wisconsin)
W72-14810

THE INFLUENCE OF EXPERIMENTAL INCREASE OF BIOMASS OF THE BLUE-GREEN ALGAE GLOEOTRICHIA ECHINULATA (SMITH) RICHTER ON PHYTOPLANKTON PRODUCTION,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
I. Spodniewska.
Ekologia Polska, Vol 19, No 31, p 476-483, 1971. 2 fig, 5 tab, 4 ref.

Descriptors: *Algae, *Biomass, *Cyanophyta, Phytoplankton, Productivity, Photosynthesis, Epilimnion, Light intensity, Respiration, Limiting factors.
Identifiers: *Gloeotrichia echinulata, Mikolajskie Lake (Poland), Ceratium hirundinella.

Investigations in Mikolajskie Lake, Poland were made of the possibilities of increasing phytoplankton production in particular trophic conditions by increasing biomass of the planktonic blue-green alga Gloeotrichia echinulata and of the estimation of net production of this species in natural conditions. This species was chosen because of the good possibility of isolating it from other phytoplankton. Surface water plankton was condensed and colonies separated. Primary production was estimated. Of three experimental series, the first and second were just under the water surface, and the third at various depths of the trophogenic layer (0-6 m). Phytoplankton production of an unchanged biomass was compared with phytoplankton production to which a known number of colonies of G. echinulata was added. Production was then calculated from the difference. In each one of the experimental series, independent of the period they were carried out, and thus independent of the possible existence of differences in physiological algal properties and/or in environmental conditions at the time, it was found that production increases as a result of an increase of phytoplankton density due to addition of G. echinulata colonies. (Jones-Wisconsin)
W72-14812

FLUORIDE CHLORINITY RATIOS IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
For primary bibliographic entry see Field 02L.
W72-14813

EFFECTS OF CERTAIN PARAMETERS ON BACTERIAL POLLUTION AT A COASTAL SITE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W72-14817

THE PRODUCTIVITY OF ATTACHED ALGAE IN RIVER, (IN JAPANESE),
Research Inst. for Natural Resources, Tokyo (Japan).
Tokio Okino.
Mis Rep Res Inst Nat Resour. 74. p 72-79. 1970. English summary.
Identifiers: *Algae, Biomass, Flow rates, Photosynthesis, *Productivity, Rivers, Streams.

The relation between the population increase of attached algae and water flow was discussed from experiments using artificial streams. One artificial stream was set in a constant temperature room and the other was outdoors. The stream length and the velocity of flow of the former were 3 m and 3.3 cm/sec, respectively, and those of the latter were 31 m and 16 cm/sec. Glass slides (7.5 x 2.5 cm2) were used as the artificial substrate for attached algae. The increase of the biomass on artificial substrates was faster in the high velocity flow. The rate of photosynthesis per unit area increased at the beginning and attained a constant rate in running water, while the rate in still water

decreased gradually from the beginning. The increase of the amounts of chlorophyll/100 hr at the beginning was about 200 mg chlorophyll (a + b) m2 for 16 cm/sec flow, 50 mg for 3.3 cm/sec flow, and 20 mg in still water. The increase of the biomass in running water may indicate photosynthesis of attached algae is accelerated by flow.--Copyright 1972, Biological Abstracts, Inc.
W72-14821

PRIMARY PRODUCTION IN THE BAIE-DES-CHALEURS (SAINT-LAWRENCE GULF),
Station Zoologique, Villefranche-sur-Mer (France).
L. Legendre.
Nat Cn. Vol 98, No 5, p 743-773. 1971. Illus. Map. English summary.
Identifiers: *Primary productivity, Baie-Des-Chaleurs, Canada, Gulfs, *Gulf of St. Lawrence.

Evidence from 2 series of summer hydrographic observations gives support to the existence of an upwelling zone, in the center of the intermediate area of Baie-des-Chaleurs. The production system of the bay is influenced by the upwelling through its effect on the vertical distribution of nutrients. Nutrient-rich water of Baie-des-Chaleurs yields high primary production and summer averages near 1 g C/m2/day are reached; the factor accounting for the largest fraction of the variance in primary production is chlorophyll a.--Copyright 1972, Biological Abstracts, Inc.
W72-14823

THE TOXICITY OF MICROCYSTIS AERUGINOSA KUTZ FROM SOME ENGLISH RESERVOIRS,
Freshwater Biological Association, Ambleside (England).
S. I. Heaney.
Water Treat Exam. Vol 20, No 4, p 235-244. 1971. Illus.
Identifiers: Public health, Mice, *Microcystis aeruginosa, Reservoirs, *Toxicity.

In 1968, 1969 and 1970 some of the reservoirs belonging to the Metropolital Water Board of Northern Ireland produced dense growths of M. aeruginosa, a feature which has been of common occurrence for at least 60 yr. Results of an investigation into the toxicity of some of these waterblooms to mice are presented and discussed in relation to its toxicity in nature and humans.--Copyright 1972, Biological Abstracts, Inc.
W72-14824

HYDROBIOLOGY OF SOUTHEASTERN LAKES: PHYSICOCHEMICAL CHARACTERISTICS OF THE WATERS,
Bordeaux Univ. (France). Lab. of Botany.
R. Baudrimont.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). Vol 273, No 18, p 1567-1569. 1971.
Identifiers: Algae, France, Hydrobiology, *Lakes, Myriophyllum D, Nymphaea D, Phragmites M, *Chemical properties, Potamogeton M, Scirpus M, Organic matter, Sphagnum.

A study of a series of lakes in southeastern France showed that their waters are homoiohalines, slightly acid and well oxygenated. In the shore areas populated by Sphagnum, the pH was definitely acid (5-5.5). In the areas populated by Myriophyllum and Potamogeton, the 02 content of the water amounted to 14 mg/l. The amount of organic matter in the water varied from 2 to 10.5 mg/l; high concentrations were found during the proliferation of algae and at the time of the destruction of Phragmites, Scirpus, Myriophyllum, Potamogeton and Nymphaea.--Copyright 1972, Biological Abstracts, Inc.
W72-14825

HYDROBIOLOGICAL EVALUATION OF THE SEPETIBA BAY,
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil). Div. of Zoology.
Lejeune P. H. Oliveira.
Mem Inst Oswaldo Cruz (Rio De J). Vol 69, No 1, p 1-31. 1971. Illus. Map. English summary.
Identifiers: Algae, Bays, Brazil, Hydrobiology, Penaeus schmidti, *Water pollution, *Sepetiba Bay (Brazil).

Physical, chemical and biological characteristics of Sepetiba Bay, Rio de Janeiro, Brazil are given. Coloration of the water due to algal blooms, notes on the shrimp Penaeus schmidti and pollution of the bay are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-14826

A PRE-IMPOUNDMENT STUDY OF THE NORTH ANNA RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W72-14846

CHARACTERISTICS OF YEASTS ISOLATED FROM PHENOL- AND CATECHOL-ADAPTED ACTIVATED SLUDGE,
Indian Inst. of Science, Bangalore. Microbiology and Pharmacology Lab.
For primary bibliographic entry see Field 05D.
W72-14860

STUDIES ALONG THE EDGE OF A LICHEN DESERT,
Sheffield Univ. (England). Dept. of Landscape Architecture.
O. L. Gilbert.
Lichenologist (Oxf). Vol 5, No 1/2, p 11-17. 1971. Illus.

Descriptors: *Air pollution, Desert, England, *Lichens, Parmelia saxatilis, Sulfur.

In 1964, a coal-fired power station was completed at Blyth on the Northumberland coast, just within the 600 miParmelia saxatilis desert which covers the Northumberland and Durham Coalfield. It was expected that there would be an increase in SO2, and therefore chart quadrats were prepared at 13 places in the Blyth area and 4 controls set up in a climatically similar area near Belsay, 21 km (13 mi) to the northwest. In the 6 yr period a great reduction in the cover of P. saxatilis was particularly noticeable. Many apparently well established and healthy colonies disappeared between mappings. As colonies become affected, they take on a highly characteristic crescent-shaped appearance. No new colonies appeared during the 6 yr of observation. The only growth observed was some radial increase of margins. Numerous transverse sections of thallus lobes were prepared and compared with material from the control sites. The chief difference was that the P. saxatilis from the edge of the desert showed an orange coloration, which might be associated with the decomposition of a lichen acid. An anomalous population of P. saxatilis was discovered deep in the coalfield area, which showed a healthy growth pattern and no reddish coloration. It seems likely that this population represents an ecotype possessing enhanced resistance to SO2. Although a well-defined set of symptoms can be detected in wall-top populations of P. saxatilis subject to levels of air pollution of about 50-120 micro g/SO2/m3, the mechanism of the SO2 toxicity is probably complex and inexplicable in terms of a single factor.--Copyright 1972, Biological Abstracts, Inc.
W72-14873

NEW BIOLOGICAL AGENT FOR NATURAL SELF-PURIFICATION OF SURFACE WATERS,
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 05G.
W72-14904

FOUR PROBLEM AREAS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
G. A. Swanson.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 141-151.

Descriptors: *Environment, *Population, Technology, *Quality control, *Management, Rural areas, Eutrophication, Pesticides, Strip mines, Research and development, Regulation, Education, *New York, Maine.
Identifiers: Broome County (N.Y.), Lake George (N.Y.), Sebago Lake (Maine).

Concern for the environment stems from two main causes: increasing numbers of people and increasing capability of technology to modify the environment. Four problem areas in environmental quality control are: (1) rural living, (2) cultural eutrophication of water, (3) pesticides, and (4) strip mining, especially for oil shale. A study conducted by Broome County, New York which investigated the various aspects of its rural population is discussed. Eutrophication has been hastened by greatly increased erosion and siltation, particularly by the inflow of nutrients from runoff of agricultural lands and the inflow of both treated and untreated sewage. An important problem for managing the quality of the aquatic environment is to develop methods of municipal sewage treatment which will remove the nitrates and phosphates efficiently. Two examples of adverse effects of pesticides on fishes are: Lake George, New York and Sebago Lake, Maine. There is a need for research and regulation which will eliminate the persistent wide spectrum of pesticides. There has been little research which estimates the effects of oil shale mining on the environment. Whereas the first example requires public education, the other three examples demand further research, public education, and government regulation. (Strachan-Chicago)
W72-14908

5D. Waste Treatment Processes

SEWAGE-POLLUTION PREVENTION.

Mich. Public Acts No. 33 (1971).

Descriptors: *Michigan, *Legislation, *Grants, *Treatment facilities, Government finance, Pollution abatement, Financing, Water pollution control, Legal aspects, Water law, Sewage treatment, Regulation, Sewage, Sewage disposal, Local governments, Administration.
Identifiers: *Michigan Sewage Treatment Law.

The amendment to Michigan's sewage treatment law designates the proportions and limits of financial assistance local agencies may receive from state and federal sources for the construction of treatment works to prevent discharges of inadequately treated sewage or other liquid wastes into any waters of the state. Financial assistance shall be given to a local agency only if it is eligible for federal funds; if construction contracts were awarded or construction commenced after June 30, 1967; and if the local agency has agreed to adjust the amount of its request for federal grants to the amount that is determined by the water resources commission to be available for apportionment. The Water Resources Commission shall establish a priority list of eligible projects to be approved by the state legislature. This list is

designated as the priority list from which projects shall be certified to the administering federal agency for federal grants. Prerequisites to priority certification by both the state agency and the federal agency are listed. A point total is assigned to each application timely filed in conformity to this Act and the requirements of the federal agency. (Brackins-Florida)
W72-14254

VERMONT WHEY POLLUTION ABATEMENT AUTHORITY LAW.
For primary bibliographic entry see Field 05G.
W72-14255

WATER SUPPLY AND WASTE DISPOSAL SERIES: VOLUME I. TERMINOLOGY STANDARDIZATION AND MICROBIOLOGY.
Federal Highway Administration, Washington, DC, Office of Research; and Federal Highway Administration, Washington, D.C. Office of Development.
For primary bibliographic entry see Field 05B.
W72-14363

A COST ANALYSIS OF WASTE MANAGEMENT IN THE STEEL INDUSTRY,
Rand Corp., Santa Monica, Calif.
D. P. Tihansky.
Available from the National Technical Information Service as AD-742 381, $3.00 in paper copy, $0.95 in microfiche. January 1972, 18 p., 7 tab, 18 ref.

Descriptors: *Cost analysis, *Waste water treatment, *Capital costs, *Operating costs, Steel, Cost comparison, Air pollution, Total costs, Pollution abatement, Liquid wastes.
Identifiers: *Steel industry, Departmental costs, Process costs.

A cost analysis of waste management in the steel industry was presented. It was reported that during a 20 year period starting in 1951 steel corporations in the United States have committed almost $1 billion to water and air pollution abatement facilities with 55% of this amount being spent on water quality improvement. Annual operating costs for liquid and gaseous waste reduction were comparable in magnitude, each totalling $30 million. Capital and operating costs by department for a specific steel company were presented in tabular form. For the period 1951-1967 capital costs for water pollution abatement totalled $3,815,000, and operating costs totalled $452,000 during 1965. Also, the cost of rolling mill scale treatment, with annual scale loads of approximately 15,000 tons and the cost of by-product coke plant waste treatment, with annual effluent loads of 565 million gallons were presented in tabular form. (Galwardi-Texas)
W72-14379

MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM, WASTEWATER COLLECTION, TREATMENT AND DISPOSAL.
Humboldt County Planning Commission, Eureka, Calif.; and Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Information Service as COM-72-10417, $6.00 in paper copy, $0.95 in microfiche. July 1971, 217 p., 60 fig, 48 tab.

Descriptors: *Planning, *Waste water disposal, *Waste water treatment, *Treatment facilities, Regional analysis, *Costs, Financial analysis, Reclaimed water, Pulp and paper industry, *California, Pollution abatement.
Identifiers: Regional planning, Urban planning, Economic development, Waste water collection, *Humboldt County (Calif).

The need for a study of wastewater collection, treatment, and disposal facilities in the western mid-portion of Humboldt County, California, and long-range plans for development of such facilities were described. Plans were broken down by service areas and included financing and cost data. Alternative plans explored pros and cons of consolidation of wastewater treatment facilities and recommended total consolidation in 1985. Plans for individual service area collection systems were recommended. Also, it was recommended that tow pulp mills on the Samoa Peninsula study possible use of treated wastewater as a supplemental water source. (Galwardi-Texas)
W72-14380

ADSORPTION OF F2 BACTERIOPHAGE BY ACTIVATED CARBON AND ION EXCHANGE RESINS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
J. T. Watson, and W. A. Drewry.
Available from Univ. of Tennessee, Knoxville, Dept. of Civil Engineering, for $3.00 per copy. Research Series No 11, and Tennessee Water Resources Research Center Report No 14, August 1971. 221 p, 16 fig, 78 tab, 51 ref, 1 append. OWRR A-018-TENN (2).

Descriptors: *Viruses, *Activated carbon, *Ion exchange, *Tertiary treatment, *Bacteriophage, Flow rates, Mathematical models, Performance, Weight, Height, *Waste water treatment.
Identifiers: *f2 Bacteriophage, Amberlite IRA-402, Amberlite IR-122, Column height, River water, Waste water treatment effluent.

Two activated carbons and two ion exchange resins were utilized to determine the degree to which the f2 bacteriophage were adsorbed by the media. The activated carbons were Pittsburgh (8 x 30 mesh) and West Virginia Nuchar C-190 (plus 30 mesh). The ion exchange resins used were an anion resin, Amberlite IRA-402, and a cation resin, Amberlite IR-122. The results of the study revealed that both of the activated carbons and the anion resin definitely have the capability to adsorb virus particles from water. The cation resin, Amberlite IR-122, was not effective as a virus adsorbent during any of the tests. The batch tests revealed that the virus removal could be described by first-order equations. West Virginia Nuchar C-190 was found to be the most effective adsorbent in both the batch tests and the column experiments when compared on a weight basis. However, the Amberlite IRA-402 resin achieved the best virus removals in both test waters when the same depth of adsorbents was used in the column runs. This removal was in excess of 99.9% in both test waters using a flow rate of 0.5 gpm/sq. ft. (Galwardi-Texas)
W72-14381

REST AREA WASTEWATER DISPOSAL,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. O. Sylvester, and R. W. Seabloom.
Available from the National Technical Information Service as PB-208 522, $3.00 in paper copy, $0.95 in microfiche. January 1972. 72 p, 10 fig, 16 tab, 20 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage disposal, Lagoons, Septic tanks, *Waste water disposal.
Identifiers: Highway rest areas, *Toilet systems (Recirculating).

The development of alternative methods of wastewater disposal in Highway Department Safety Rest Areas was investigated. Existing and planned rest area installations were studied to establish critical operating parameters and relative effectiveness of existing waste disposal systems. State-of-the-art systems and various additives were examined and tested to determine if system efficiency can be increased. Recommendations were made as to disposal systems which were suited to the conditions existing in rest areas including the desirable and undesirable features of each system considered. (Galwardi-Texas)
W72-14382

SANITARY WASTE WATER TREATMENT AND DISPOSAL AS RELATED TO DEVELOPMENT--LAKE COUNTY, FLORIDA.
Florida Dept. of Community Affairs, Tallahassee. Technical Assistance Div.

Available from the National Technical Information Service as PB-207 102, $3.00 in paper copy, $0.95 in microfiche. June 1971. 68 p, 44 fig, 6 tab. HUD Grant support.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage disposal, *Septic tanks, *Florida, Discharge (Water), Industrial wastes, Municipal wastes, Pollution abatement, Regulation, Regional analysis, Water pollution sources.
Identifiers: *Lake County (Florida), Agricultural wastes.

Total population and percent of total population served by municipal sewage treatment facilities, septic tanks, and private sewage treatment facilities were listed. An inventory of pollution sources such as drain wells, dumps and landfills, industrial wastes and sewage treatment facilities was presented. The daily discharge of the three major pollution sources were reported as: agriculture, 250 mgd, urban drainage, 50 mgd including 3.5 mgd of sewage, and industrial discharges, 23 mgd. The question of where and under what conditions septic tank development should be permitted in Lake County was discussed. Areas were suggested in which septic tank usage should be prohibited. Also, implementation techniques for septic tank regulation were suggested. (Galwardi-Texas)
W72-14383

POWER PLANT CYCLES FOR DRY COOLING TOWERS,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
P. Leung, and R. E. Moore.
Journal of the Power Division, Proceedings of ASCE, Vol 97, No PO4, Proc. Paper 8565, p 729-747, December 1971. 5 fig, 8 tab, 11 ref.

Descriptors: *Cooling towers, *Air, *Heat flow, *Powerplants, Power, Cycles, Towers, Turbines, Nuclear powerplants, Environmental gradient, Economics, Heated water, Heat exchange.
Identifiers: *Air cooling, *Steam-electric powerplants, Plant layout, Heat sink, Fossil-fueled power plants.

The use of dry cooling towers with air as the cooling medium will become more prevalent in the not-too-distant future as water quantities available for consumption in evaporative cooling processes for steam-electric generating plants become limited. Special considerations for designing either fossil-fueled or nuclear-fueled plants are required due to significant differences in turbine exhaust pressures which result in sizable capability losses. Those design considerations affecting turbine thermal cycles for steam-electric generating plants employing dry cooling towers are analyzed in this paper. Effects on major plant components, such as turbine exhaust end sizes, cycle parameters, and steam conditions, and the extent of feedwater heating within the regenerative cycle will be analyzed. Plant siting constraint considerations and general economic appraisals of fossil-fueled and nuclear-fueled cycles are summarized. (Oleszkiewicz-Vanderbilt)
W72-14395

THE CAPACITY OF COOLING PONDS TO DISSIPATE HEAT,
Ebasco Services Inc., New York.

W. D. Patterson, J. L. Leporati, and M. J. Scarpa.
Proceedings of the American Power Conference, Vol 33, p 446-456, 1971. 3 fig, 7 ref.

Descriptors: *Cooling, *Powerplants, *Thermal water, Model studies, Water treatment, Distribution, Heat transfer, Mathematical models, On-site data collections, Evaporation, Heat budget, Geographical regions, *Thermal pollution.
Identifiers: *Cooling ponds.

The use of once-through cooling systems for heated discharges from steam electric powerplants is declining due to increasing standards. Cooling ponds are one of several supplemental and closed-cycle systems being studied by utilities. The advantages of cooling ponds are given. A method of analyzing the heat dissipation from cooling ponds is then presented which uses the equations of Edinger and Geyer. These equations are first used to predict cooling pond temperatures at four existing steam electric powerplants. Good overall agreement between predicted and actual pond temperatures is shown at all stations. The same equations are used to plot the residual temperature rise for open and closed-cycle ponds against thermal loadings for fossil and nuclear plants at six different geographical locations. Total evaporative losses for closed-cycle ponds are then plotted against thermal loadings greater than 1 1/2 acres per megawatt for fossil and nuclear plants at the same six locations. The cooling pond requirements for a 2000-MW nuclear plant located in the Central United States are then computed to show the usefulness of the presented data. (Bass-Vanderbilt)
W72-14398

ECONOMICS AND OPERATING EXPERIENCE WITH AIR-COOLED CONDENSERS,
GEA-Gesellschaft fuer Luftkondensation m.b.H., Bochum (West Germany).
H. H. Von Cleve, W. J. Westre, and J. Y. Parce.
Proceedings of the American Power Conference, Volume 33, p 511-523, 1971. 7 fig, 4 ref.

Descriptors: *Thermal powerplants, *Heat, *Cooling, *Air, *Condensers, *Economics, Operating costs, Capital costs, Heat budget, Water pollution, *Thermal pollution, Evaporation, United States.
Identifiers: *Air-cooled condensers, *Operating experience, *Dry-cooled powerplants, Auxiliary equipment cost, Unit cost, Total energy cost, Wet-cooled powerplants.

The total energy cost for Neil Simpson Station No. 5 using an air-cooled unit is 79 percent of the total energy cost for Ben French Station No. 1 using a water cooled unit. This total energy comparison is for kWh delivered to the bus at each of these units. The only major difference in the performance of the equipment of the two units is the boiler and turbine which, due to design, are less efficient in both cases on the air-cooled unit. The one item which gives the air-cooled unit the advantage is the cost of fuel -- by being located at the fuel source, no transportation charges are incurred. An important cost factor which was not investigated in this comparison is the cost of developing and maintaining an adequate water supply for the water-cooled unit. Comparisons of different condensing systems should be carried out by optimizing the entire power station. Optimizations give exact results only when based on an estimated load-temperature schedule. The duration of extreme conditions should be considered. (Oleszkiewicz-Vanderbilt)
W72-14400

DRY-TYPE COOLING TOWERS,
Beck (R. W.) and Associates, Denver, Colo.
J. A. Cecil, P. R. Cunningham, C. J. Steiert, and J. O. Young.
Journal of the Power Division, Proceedings of ASCE, Vol. 98, No. P01, p 11-19, June 1972. 2 fig, 1 tab, 1 ref.

Descriptors: *Cooling towers, *Cooling water, *Electric powerplants, Electric power production, Utilities, Heat transfer, Heat exchangers, Power, *Thermal pollution, Heated water, Water utilization, Water supply, Water conservation.

Dry-type cooling towers offer a solution to power plant siting problems related to thermal pollution and water supply. Dry cooling towers are being used successfully with steam electric generating plants in other countries (particularly in Europe). At present, only two small dry cooled electric generating units are operating in the United States but plans for a 200 mw dry cooled generating unit in Wyoming have been announced recently. Direct and indirect dry-type towers are compared. The advantages of the dry cooling tower can be realized at a relatively low cost even if certain offsetting economies are not considered. All or part of the cost penalty related to dry cooling may be offset by fuel cost savings, water cost savings, transmission savings, or other savings resulting from the flexibility in plant siting permitted by the use of dry cooling systems. (Eagle-Vanderbilt)
W72-14404

OPTIONS FOR COOLING LARGE PLANTS IN THE 70'S,
T. C. Elliot.
Power, p 84-85, December 1970. 1 fig, 1 tab, 2 photos.

Descriptors: *Cooling towers, *Heat exchangers, *Thermal water, Cooling, Powerplants, *Thermal pollution, Water utilization.
Identifiers: Cooling lakes, Spray ponds.

The amount of waste heat from industry and power plants is expected to almost double by 1980. Present alternatives for cooling heated discharges are direct discharge of heated 'once-through' water into rivers and lakes, wet-mechanical-draft cooling towers, natural-draft hyperbolic cooling towers, a hybrid combination of natural-draft and mechanical-draft cooling towers, cooling lakes, spray ponds, and air-cooled heat exchangers. The advantages and disadvantages of each alternative are presented with respect to climate, cost, land requirements, efficiency and other factors. Water flow through various types of U.S. power plant condensers is listed for 1959, 1970 and 1980. (Bass-Vanderbilt)
W72-14410

WATER RESOURCES PLANNING STUDIES OKLAHOMA AND ARKANSAS, PHASE II (QUALITY),
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
For primary bibliographic entry see Field 05G.
W72-14432

REGIONAL WATER SUPPLY AND WASTE-WATER DISPOSAL PLAN AND PROGRAM, CAPITAL DISTRICT REGION.
Male (C. T.) and Associates, Schenectady, N. Y.
For primary bibliographic entry see Field 06B.
W72-14445

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.
For primary bibliographic entry see Field 06A.
W72-14447

METHOD FOR DISPOSING OF SLUDGE FROM SEWAGE AND INDUSTRIAL WASTES,
A. S. Goldberg.
U. S. Patent No. 3,561,598, 2 p, 7 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 603, February 9, 1971.

Descriptors: *Patents, *Sludge treatment, Sewage treatment, Industrial wastes, Pollution abatement, *Filtration, *Oxidation, *Waste water treatment.
Identifiers: *Oxidants.

Primary sludge is pumped into dilution tanks where it is reduced to a total solids content of 1 per cent to form a sludge slurry. It is then pumped into an open mixing or reacting tank through a mixing pipe. An oxidant is added - sodium hypochlorite is the preferred material. High speed mixing apparatus as well as piped recirculation equipment enable oxidation of the sludge to occur in less than 10 minutes. The slurry may be pumped to a feed box of a paper-making machine for filtration, drying and rolling. The resulting product has the appearance of paper fiber and may be used in the production of a variety of paper articles. (Sinha-OEIS)
W72-14452

AERATION APPARATUS,
Owens-Illinois, Inc., Toledo, Ohio. (Assignee).
For primary bibliographic entry see Field 05G.
W72-14454

SYSTEM FOR ELECTROCHEMICAL WATER TREATMENT,
Fischer and Porter Co., Warminster, Pa. (Assignee).
N. P. Gehring.
U. S. Patent No. 3,562,137, 10 p, 19 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 725, February 9, 1971.

Descriptors: *Patents, Water purification, Bubbles, Coagulation, *Oxygenation, Equipment, Flotation, Water pollution treatment, Pollution abatement, Separation techniques, Domestic wastes, Industrial wastes, *Waste water treatment, *Electrodialysis, *Membranes, Permeable membranes, Anions, *Chemical precipitation, Electrolysis, Electrochemistry.
Identifiers: *Electrochemical treatment.

Waste water containing dissolved and suspended organic and inorganic matter is fed into one or more negative-ion isolation electrodialysis cells. Each cell includes an anion-permeable membrane surrounding an anode. The cells, arranged serially serve to increase the pH factor causing salts to precipitate, and organic matter is oxidized. Electrodialysis is accompanied by electrolysis, causing hydrogen and oxygen bubbles to form. Coagulation and flotation of suspended and precipitated matter takes place. The output of the positive-ion chamber is supplied to an air-flotation unit or other means to separate the coagulated and suspended solids from the ion treated water. (Sinha-OEIS)
W72-14455

FAIL-SAFE WATER PURIFYING APPARATUS,
Puretest Water Purifying Co. (Assignee).
For primary bibliographic entry see Field 05F.
W72-14456

SEWAGE TREATMENT PLANTS,
Compagnie d'Etudes et de Recherche des Services Operationnels d'Assainissement en France.
J. J. Regent.
U. S. Patent No. 3,563,382, 3 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 1031, February 16, 1971.

Descriptors: *Patents, *Sewage treatment, Water treatment, *Waste water treatment, *Treatment facilities, Equipment, Pollution abatement, Water pollution treatment, Water pollution control, *Control systems.

The sewage treatment plant consists of a primary feeding tank for receiving liquid raw sewage. It has at least one digester with a biologically active filter

bed. A program timer is correlated with the float device and actuates a recirculation valve. The timer is also correlated with the device which controls the operation of the pump. The flow of recirculated effluent is inversely proportional to the flow of raw sewage, which corresponds to the desired operative conditions of the plant. There are a set of sludge areas. (Sinha-OEIS)
W72-14459

PURIFICATION SYSTEM FOR ORGANICALLY CONTAIMINATED WATER,
A. Hellquist, and S. Nordgard.
U. S. Patent No. 3,563,383, 4 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 1031, February 16, 1971.

Descriptors: *Patents, Waste water, *Biological treatment, *Waste water treatment, Equipment, Treatment, Pollution abatement, *Water purification, Water quality, Biological treatment, *Microorganisms, *Organic wastes, Water pollution control, Water pollution treatment.

Waste water moves in continuous contact with a large active area which is designed as one or more screw threads on a rotating roller or in the form of laminate discs lying along helixes on a belt running over rollers. The active areas carry a continuous layer of microbes which consume the biological impurities in the waste water. The active area is located above the water surface during a definite portion of the circulation cycle enabling the microorganisms to obtain the necessary oxygen and to recover from the effects of any toxins present in the waste water. (Sinha-OEIS)
W72-14460

SAND FILTER FOR WATER PURIFICATION,
S. I. Bykov.
U. S. Patent No. 3,563,385, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 883, No 3, p 1032, February 16, 1971.

Descriptors: *Patents, *Water purification, *Waste water treatment, Water treatment, *Filters, *Filtration, Equipment, Sands, Separation techniques, Pollution abatement, Water pollution, Water pollution treatment, Water quality.
Identifiers: *Sand filters.

External channels feed the water to be purified to the outer of two spaced, vertical walls which are water permeable. A water collecting chamber is provided within the inner wall and it communicates with a water collecting manifold arranged in the lower part of the filter. Contaminated water is admitted into the manifold through a pipe. It flows through vertical ducts and openings into space under the perforated grates and into the space filled with sand. After being cleaned of contaminating matter, the water flows through the slots in the walls and enters the collecting chamber. (Sinha-OEIS)
W72-14461

METHOD AND APPARATUS FOR TREATING WASTE-CONTAINING LIQUOR,
Research Corp., (Assignee) New York.
J. W. Klock.
U. S. Patent No. 3,563,888, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 883, No 3, p 1146, February 16, 1971.

Descriptors: *Patents, *Filtration, *Liquid wastes, *Aeration, Biological treatment, Pollution abatement, Water pollution treatment, Equipment, Separation techniques, Waste water treatment.
Identifiers: *Sand-gravel filters.

The liquid is treated by continuously recirculating it through a sand-gravel filter media. A pressurized column of oxygen-containing fluid entrains and lifts the liquid waste through an unobstructed tube and recirculates it downward through the filter. (Sinha-OEIS)
W72-14462

METHOD FOR INCREASING OXYGEN AVAILABILITY IN SEWAGE TREATMENT,
Biospherics Inc., Rockville Md. (assignee).
G. V. Levin.
U. S. Patent No. 3,565,796, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1617, February 23, 1971.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Chlorination, *Oxygenation, Equipment, Treatment, *Aerobic treatment, Microorganisms, Biodegradation, Pollution abatement, Water pollution treatment, *Sewage treatment.

Sewage is introduced into an aeration zone where it is in continuous contact with oxygen containing bubbles. The sewage is admixed with a high capacity oxygen solvent in the aeration zone. The solvent may be selected from the group consisting of glycerol, butanol and ethylene glycol. After leaving the settling zone the clarified liquid undergoes chlorination before passing into the disposal area. (Sinha-OEIS)
W72-14468

APPARATUS AND PROCESS FOR TREATING SEWAGE,
P. J. Gresham.
U. S. Patent No. 3,565,797, 7 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1617, February 23, 1971.

Descriptors: *Patents, *Waste water treatment, *Filtration, *Sewage treatment, Algae, *Aeration, Sedimentation, *Chlorination, Oxidation, Pollution abatement, Water pollution treatment, Water quality, Streams, Lakes, Biochemical oxygen demand, *Oxygenation, *Anaerobic bacteria, Biological treatment.

Sewage is fed into contact with a bed of living filamentous macroscopic algae. The sewage is oxygenated and the growth of anaerobic bacteria is inhibited. The sewage is filtered through the algae bed or screen. Solids are collected on the screens as sludge for separate disposal and the sewage liquid undergoes chlorination before disposal. The sludge is recycled for removal of remaining liquids. (Sinha-OEIS)
W72-14469

WASTE TREATMENT SYSTEM,
D. P. Morisseau, Jr.
U. S. Patent No. 3,567,021, 4 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 158, March 2, 1971.

Descriptors: *Patents, *Waste water treatment, *Liquid wastes, Sewage treatment, Equipment, *Aeration, Pollution abatement, Separation techniques, *Biological treatment, Water pollution treatment.

This system for biologically treating waste water consists of an inner tank having an aeration and mixing chamber. The chamber has a lower influent receiving zone and an upper mixing zone exposed to the atmosphere. In the mixing zone, aeration and recirculation is effected by use of a double impellor, vertical baffles prevent vortex action within the aeration zone. The inner tank is spherical, the outer tank is cylindrical and the lower and upper settling chambers formed between the outer and inner tanks have an intermediate zone of restricted area to provide quiescent zones immediately adjacent to the bottom and top levels of the effluent within. (Sinha-OEIS)
W72-14471

PROCESS AND PLANT FOR TREATING SEWAGE,
Mead Corp., Chillicothe, Ohio. (assignee).
K. C. Ayers, and D. W. McAnaney.
U. S. Patent No. 3,567,629, 3 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 293, March 2, 1971.

Descriptors: *Patents, *Liquid wastes, *Organic wastes, Biodegradation, *Sewage treatment, *Waste water treatment, *Aerobic treatment, *Lagoons, Sumps, Pollution abatement, Water pollution treatment, Treatment facilities, Equipment, Trickling filters.

An aerobic lagoon receives raw waste mixed with effluent from a trickling filter. Waste from the bottom of the lagoon is constantly recirculated through the trickling filter. Purification and increased efficiency of removal of setteable solids from clarified overflow effluent result from the removal of such effluent from quiescent zones within the lagoon. (Sinha-OEIS)
W72-14473

THE ECONOMICS AND USE OF LARGE SCALE ELECTRODIALYSIS PLANTS ON SELECTED TIDAL ESTUARIAL WATERS,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 03A.
W72-14648

NITROGEN REMOVAL FROM WASTE WATERS.
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.

Available from the National Technical Information Service as PB-212 280, $3.00 in paper copy, $0.95 in microfiche. Federal Water Quality Administration Report, October 1970. 32 p, 36 ref, FWQA Project 17010---10/70.

Descriptors: *Nitrogen, *Separation techniques, *Waste water treatment, Ammonia, Nitrates, Nitrites, Amino acids, Biodegradation, Nitrification, Denitrification, Ion exchange, Chlorination, Oxidation, Cost analysis, Technical feasibility, Economic feasibility.
Identifiers: *Ammonia stripping.

Ammonia and nitrates are the principal forms of nitrogen in wastewaters. Ammonia is converted to nitrates by biological oxidation. Because of the reaction it exerts a high BOD in surface waters. Nitrates are reduced to nitrogen gas by bacteria when organic matter exceeds the oxygen supply. Both compounds are algal nutrients but ammonia is much more toxic than nitrates. The best developed method for control of nitrogen compounds is biological oxidation to nitrates followed by denitrification with the aid of methanol. Ammonia stripping at high pH in cooling towers following lime treatment is effective but cannot be used during freezing weather and may suffer from serious scale problems. Selective ion exchange of ammonia with lime regeneration may be practical but the process is still in the pilot stage. Several other processes are being studied. A bibliography of pertinent references is attached. (See also W72-04085)
W72-14650

BACTERIOLOGICAL CONTROL OF PURIFICATION SYSTEMS AND RECEIVING WATERS WITH THE USE OF A MEMBRANE FILTER AND A DIAPHRAGM FILTER, (BAKTERIOLOGISCHE KONTROLLE VON KLARANLAGEN UND VORFLUTERN MITTELS MEMBRANFILTER UND NAHRKARTONSCHEIBEN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
B. Wachs.

n: Methodik der Untersuchung von Abwasser nd Vorfluter, Munchen und Wien, p 69-94, 1971. fig, 13 tab, 27 ref.

Descriptors: *Water purification, *Biocontrol, Bacteria, *Filters, *Filtration, *Membranes, Biological membranes, *Waste water treatment, Water pollution treatment, Enteric bacteria, Coliforms, Pollutant identification, Bioindicators. Identifiers: Receiving waters, Diaphragm filters.

Bacteriological control of sewage treatment plants nd receiving waters was accomplished with the elp of a diaphragm filter. Concentrations of oliform bacteria and enterrococci were investigated in different purified waters. Biological reatment eliminated 90-99% of the bacteria. oliform bacteria are good pollution indicators for stuaries, coastal areas and even at sea as they indicate the influence of domestic waste when hemical methods fail. (Ensign-PAI)
W72-14666

EFFECT OF TOXIC WASTES ON TREATMENT ROCESSES AND WATERCOURSES,
Water Pollution Research Lab., Stevenage (England).
. Jackson, and V. M. Brown.
aper presented at The Institute of Water Pollution Control, Annual Conference, Douglas, Isle of Man, September 16-19, 1969, Conference Paper No 2C. (1969) 14 p, 7 fig, 8 tab, 63 ref.

Descriptors: Water pollution effects, *Biological reatment, *Waste water treatment, *Organic ompounds, *Heavy metals, Sewage bacteria, Aerobic bacteria, Anaerobic bacteria, Methane acteria, Sewage treatment, Sewage effluents, Waste water (Pollution), Water pollution, Water uality, Biodegradation, Environmental sanitation, Industrial wastes, Microbial degradation, Toxicity, Chlorinated hydrocarbon pesticides, Mercury, Copper, Nickel, Zinc, Iron, Lead, Cadmium, Phenols, Dichromate, Manganese, Arsenic ompounds, Aquatic life, Aquatic environment, ish physiology, Detergents.
Identifiers: *Toxic wastes, Silver, Vanadium, yanide, Anionic detergents.

naerobic digestion of sewage sludge is more sentive than aerobic sewage treatment to inhibition y toxic substances, notably chlorinated organic ompounds and heavy metals. Nitrification is the ost sensitive aspect of the aerobic processes, though considerable acclimatization to inhibitors possible. In general, biological treatment ocesses are able to protect watercourses from a ariety of toxic organic compounds, after acclimatization at least, by degrading them; others are moved, to different extents, by volatilization, sorption or precipitation. Quite large proporons of some organic substances, and of some avy metals, are not removed, and pass on to the ceiving watercourse. A limited amount of information is available about the effects of toxic subances on other forms of river life, but their imct on watercourses is usually assessed in terms their toxicity to fish. Data are available on the xicity of many substances to fish, but they are ually limited to determinations of the LC50 in -96 hr, at high concentrations of poison. There is ll great uncertainty about the long term toxic effts of much lower concentrations under natural nditions; recent laboratory results defining the se-response curves for a number of metals and ganic compounds tend to reinforce the caution, at, in some cases, one-third of the 48 hr LC50's ay be too high for safety. (Svensson-Washing-n)
72-14691

SURVEY OF ALTERNATE METHODS FOR OLING CONDENSER DISCHARGE WATER-YSTEM SELECTION, DESIGN, AND OPMIZATION.
natech R/D Co., Cambridge, Mass.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-212 392, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1971, 108 p, 11 fig, 13 tab, 13 ref. EPA Program 16130 DHS 01/71.

Descriptors: *Power plants, *Computer programs, *Heat exchangers, *Water cooling, Water costs, Cost analysis, Design, *Electric power costs, Optimization, *Thermal pollution, Waste water treatment.

A computer program was written to calculate cooling system and power plant cost and to determine the minimum total cost for a given set of parameters. Design equations based on the use of water cooled condensers, cooling towers, open cooling systems, operation of the power plant and the cooling system at various ambient conditions or even operation of the power plant at up to five off-design capacities have been provided for in the computer program, through which the minimum total cost is calculated. (See also W72-06616, W72-06617, and W72-04830) (Smith-Texas)
W72-14724

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 08A.
W72-14751

RESEARCH TO DEVELOP AND DEMONSTRATE A MOBILE PILOT PLANT FOR REMOVAL OF PHOSPHATE FROM WASTEWATERS BY ADSORPTION ON ALUMINA,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
L. L. Ames, Jr.
Available from the National Technical Information Service as PB-212 374, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, June 1971. 31 p., 15 fig, 2 tab, 2 ref. FWQA Program 17010 EER 06/70. Contract 14-12-566.

Descriptors: *Adsorption, *Phosphorus, *Pilot plants, Calcium hydroxide, Filters, Sodium compounds, *Waste water treatment, *Filtration, Operating costs, *Chemical precipitation, Water reuse, Recycling.
Identifiers: *Alumina, Adsorbents, Mobile pilot plants.

Alumina, a phosphorus-selective adsorbent, was used in a tertiary chemical process for phosphorus removal. A mobile pilot plant designed and built on the basis of laboratory results was fitted into a standard forty-foot van trailer. The secondary effluent was passed through a thirty inch multimedia filter bed and stored in an exterior 1500 gallon surge tank. Then the filtered sewage was pumped through one or more of three alumina beds approximately forty inches in depth and three feet in diameter. Phosphorus loading of the alumina columns can be in a downflow or upflow direction with the columns in series or parallel. Phosphorus-free effluent was stored in another tank for use as alumina column wash solution. 800 gallons of 1M NaOH was recirculated to remove absorbed phosphorus in an alumina column taken off the line. Valving and column washing was pH controlled. Ca (OH)2 was added to the NaOH solution in a mixing tank to precipitate phosphorus in the form of hydroxyapatite. The solids were removed in a continuous centrifuge and the Na (OH) returned for reuse. Initial operating costs were approximately 5.8 cents/1000 gallons. (Smith-Texas)
W72-14789

SORPTION CAPACITY ESTIMATION FOR ACTIVATED CARBON PACKED COLUMNS,
Wisconsin Univ., Madison. Water Chemistry Lab.
J. O. Peterson, and G. Lee.
Water Research, Vol. 5, p. 717-721, 1971. 4 fig., 3 ref. FWPCA Grant WP-00371.

Descriptors: Analytical techniques, *Activated carbon, *Rhodamine, *Sorption, Estimating, Columns, Dyes, Model studies, Tracers, Fluorometry, Testing procedures, Wastewater treatment.

Results of laboratory data on sorption of a fluorescent dye onto activated carbon indicate that bench scale studies could provide realistic estimates of sorption rates and capacity in large scale columns. Using Rhodamine B Extra, a pink fluorescent dye in aqueous solution as the sorbate and activated carbon as the sorbent and a fluorometer for both discrete and continuous determination of Rhodamine B concentration, batch sorption experiments were conducted. The dye concentration in the supernate was determined periodically and dye uptake by the carbon computed by difference. Amount of dye which was sorbed as a function of time was determined by reading the counter on the feed burette. Rate and capacity data were thus collected with constant dye concentrations of 100, 250, and 1000 micrograms/l at 25C. A correlation between unfilled sorption capacity and sorption rate and ultimate sorption capacity and dye concentration were developed which should be used to estimate dye concentrations in a larger scale packed column at any point using a model that assumes that a column is composed of finite increments of packing which are subjected to an essentially constant dye concentration under plug flow conditions. (Jones-Wisconsin)
W72-14795

ADSORPTION CHARACTERISTICS OF COALS AND CHARS,
Pennsylvania State Univ., University Park. Dept. of Material Sciences.
S. P. Nandi, and P. L. Walker, Jr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $0.70. Department of the Interior, Office of Coal Research, Research and Development Report No. 61, Interim Report No. 1, 1972. 59 p, 30 fig, 9 tab, 9 ref.

Descriptors: *Coals, *Activated carbon, *Bituminous coal, *Adsorption, *Waste water treatment, Secondary treatment, Pores, Dyes, Economics, Water treatment.
Identifiers: *Chars, Gasification, Amaranth red dye, Metanil yellow dye, Methylene blue dye.

Coals and chars were compared with activated carbon for use in water treatment. The static adsorption of nitrogen at low temperatures and the adsorption of three dye molecules from solution in water at 25C was used to study the internal surface area of the coals, chars, and active carbons available for adsorption. Forty coals varying in rank from anthracite to lignite were studied. High volatile-C (HVC) bituminous coals showed the greatest adsorption capacity. Readily available granular activated carbons had 15 times the capacity of the best coal. Chars were formed by the gasification of coal and had 25% of the adsorption capacity of commercial activated carbons. Although commercial activated carbons have more adsorption capacity and a faster adsorption rate for liquid organic molecules than coals and chars, their cost is considerably more than coals and chars. The greater weight of material to be handled and the variability in adsorption capacity from batch to batch may offset this cost. (Smith-Texas)
W72-14814

A REVIEW OF ON-SITE DOMESTIC SEWAGE TREATMENT PROCESSES AND SYSTEM ALTERNATIVES,
MITRE Corp., McLean, Va.
S. N. Goldstein, and V. D. Wenk.

Available from the National Technical Information Service as PB-209 956, $3.00 in paper copy, $0.95 in microfiche. January 1972. 18 p, 5 fig.

Descriptors: *Domestic wastes, *Aerobic treatment, *Septic tanks, *Cesspools, Leaching, Soil contamination, *Sewage treatment, *Waste water treatment, Anaerobic digestion.
Identifiers: *Incinerator toilets.

Basics of sewage treatment, microorganisms in sewage and aerobic and anaerobic treatment in individual home wastewater systems were reviewed. Systems such as incinerator toilets and aerobic tanks are considered alternatives for home wastewater treatment. Effective utilization of individual systems will depend on the formation of collective bodies for the design, installation, inspection and maintenance of the systems. (Smith-Texas)
W72-14815

ION-EXCHANGE SYSTEM BOASTS MORE PULLING POWER,
Rohm and Haas Co., Philadelphia, Pa.
R. Kunin, and D. G. Downing.
Chemical Engineering, Vol 78, No 14, June 28, 1971, p 67-69. 1 fig, 2 tab.

Descriptors: *Ion exchange, *Acid mine water, *Tertiary treatment, *Sewage effluents, Anion exchange, Resins, Dissolved solids, Brackish water, Total costs, Estimated costs, Performance, *Waste water treatment.
Identifiers: Amberlite IRA-68, Amberlite IRA-93, Desal system.

A new deionization technique, called the Desal process, that is based on two weak electrolyte ion-exchange resins that can be used with waters containing up to 3,000 ppm total dissolved solids was developed by Rohm and Haas Co. Besides the treatment of brackish and acid mine water, Desal has been suggested for tertiary treatment of treated water. In the treatment of an acid mine water, the metals concentration of feedwater was reduced tenfold, from 3,000 to 300 ppm. Results of treatment of acid mine water and chlorinated secondary effluent were presented in tabular form. Either of two weak base anion exchange resins, Amberlite IRA-68 or IRA-93 provide the key to the Desal system. The anion-exchange resin functions in the bicarbonate cycle to treat the acid mine water. The effluent water is aerated and subsequently clarified. The quality is further improved through a mild softening treatment followed by a final filter. The total cost to process a typical acid mine water was estimated at 30 cents/1,000 gal. For tertiary treatment the flow process differs in that before aeration of the water, flocculant treatment is used in conjunction with old brine softening to further reduce the organic content of the water and eliminate a substantial amount of hardness. For the additional removal of NH4 a cation exchange may be used after the coagulation. (Galwardi-Texas)
W72-14816

BIOLOGICAL TREATMENT OF INDUSTRIAL WASTE WATERS,
Water Pollution Research Lab., Stevenage (England).
A. B. Wheatland, and A. M. Bruce.
Paper presented at 3rd Public Health Engineering Conference, Loughborough University of Technology, January 1970. 22 p, 11 fig, 4 tab, 25 ref. Water Pollution Research Laboratory Reprint No. 598.

Descriptors: *Waste water treatment, *Activated sludge, *Trickling filters, *Industrial wastes, Water quality, *Biological treatment, *Oxidation lagoons.
Identifiers: *Contact stabilization, Extended aeration, Anaerobic filters, *Grass plot irrigation.

Industrial wastewaters are commonly treated by biological methods. Depending on the type of waste and the strength of the wastewater, the industrialist has several options available to him: he can discharge the waste water directly to the public sewer; he can treat the waste to a strength acceptable to the public authorities and then discharge to the public sewers; or, he can provide full treatment to the specifications of the river authority and discharge to the river. There are a variety of aerobic treatment methods commonly used. These are activated sludge, biological filters, oxidation ponds, and grass plot irrigation. Variations of some of these methods are contact stabilization and extended aeration. Anaerobic treatments are anaerobic filters and ponds. Factors influencing these processes are discussed. The degree of treatment and the quality of the effluent are presented. (Goessling-Texas)
W72-14818

BOD DETERMINATIONS ON FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. McGhee, R. L. Torrens, and R. J. Smaus.
Water and Sewage Works, Vol 119, No 6, June 1972, p 58-61. 7 fig, 1 tab, 20 ref. OWRR A-022-NEB (2).

Descriptors: *Analytical techniques, *Biochemical oxygen demand, *Pollutant identification, *Cattle, Organic matter, Chemical oxygen demand, Oxygen demand, *Feed lots, *Farm wastes.
Identifiers: *Cattle feedlot runoff, Ultimate BOD.

During laboratory studies of the aerobic treatment of feedlot runoff it was observed that significant reductions in the COD of the waste were not reflected in a similar reduction in BOD as determined by the standard 5-day tests. The rate at which the oxygen demand was exerted, the duration of the BOD test necessary to actually measure the pollution effect of such wastes and the general applicability of the standard BOD test to feedlot wastes were investigated. It was concluded that the standard 5-day BOD determination was not an adequate measure of the pollution potential of feedlot runoff as feedlot runoff contained slowly degradable organic materials which would exert a significant oxygen demand over periods in excess of 20 days. The chemical oxygen demand test was a superior technique although it usually yielded higher results than the actual ultimate BOD. (Galwardi-Texas)
W72-14819

FACTORS AFFECTING OXYGEN TRANSFER IN THE ELECTROLYSIS BOD SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
D. A. Haselhoff.
Master's Thesis, 1971. 145 p, 50 fig, 16 tab, 64 ref.

Descriptors: *Waste identification, *Biochemical oxygen demand, *Analytical techniques, *Electrolysis, Oxygen requirements, Nutrients, *Waste water treatment, Water analysis.
Identifiers: *Oxygen transfer, Oxygen uptake rates, Substrate concentration stirring, Buffers, Seed concentration.

An investigation was conducted to define quantitatively the extent to which various parameters affect oxygen transfer and the electrolysis BOD test. The sole controlling factor in the determination of BOD with the electrolysis system was the maintenance of a sufficient oxygen transfer rate to meet the demands of the sample. Buffer concentration, seed concentration, substrate concentration, and nutrient concentration did not affect the reaction unless the dissolved oxygen concentration became so low that oxygen acted as a limiting nutrient. Stirring of the sample such that a 2-3 inch vortex occurred in the sample bottle insured that the reaction was independent of the stirring rate as long as the oxygen uptake rate did not exceed about 12 mg/l/hr. Samples with uptake rates greater than 12 mg/l/hr should be diluted. Buffer concentration above 0.005 M had no effect on the BOD or the shape of the BOD curve. Substrate utilization rate controlled the reaction when substrate concentration was greater than about 1,200 mg/l BOD. (Galwardi-Texas)
W72-14820

STATE OF THE ART OF TEXTILE WASTE TREATMENT.
Clemson Univ., S. C. Dept. of Textiles.

Copy available from GPO Sup Doc EP2.10:12090 ECS, $2.50; microfiche from NTIS as PB-212 359, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, February 1971, 348 p, 23 fig, 41 tab, 58 ref. EPA Program 12090 ECS 02/71.

Descriptors: *Textiles, *Dye, *Industrial wastes, *Cost comparisons, Fibers, *Waste water treatment, Waste treatment, *Reviews, *Pulp wastes, Treatment facilities, Water reuse, Sludge disposal, Pollution abatement, Reverse osmosis, Electrolysis.
Identifiers: *Desizing.

Waste treatment methods and practices used in the textile industry have been studied. The literature was reviewed and an annotated bibliography prepared to supplement the information obtained from people working in the textile processing industry, designing waste treatment plants, and enforcing state and federal regulations on waters discharged to streams and natural reservoirs. Information was given on: characteristics of textile waste, waste treatment techniques, treatment methods in use, effects of textile wastes on receiving waters, the cost of waste treatment operations, and state and federal regulations governing discharge waters. More research is needed on desizing, removal of dyes from textile wastes electrolytic treatment of textile waste, space requirements of waste treatment plants, reverse osmosis, sludge handling and disposal, water reuse in textile plants, total carbon analysis, mixing of textile and domestic waste, and pilot plants. A cooperative pollution abatement organization for the textile industry should be formed. (Smith-Texas)
W72-14827

AIR OXIDATION OF ORGANIC COMPOUNDS IN AQUEOUS SYSTEMS,
Connecticut Univ., Storrs. Inst. of Water Resources.
D. W. Sundstrom.
Available from the National Technical Information Service as PB-212 360, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 5 p, 1 fig. OWWR A-019-CONN (2).

Descriptors: *Oxidation, *Liquid wastes, *Waste disposal, *Waste treatment, Organic compounds, Mass transfer, Dissolved oxygen, Temperature, Carbon, Plastics, Pressure.
Identifiers: *Wet oxidation, *Air oxidation, *Rotating disc geometry, *Nylon 66, Surface reaction kinetics, Nitric acid.

Wet oxidation is a newer technique for disposal of aqueous wastes by air oxidation under pressure. The rates of oxidation of several solid organic compounds were studied over a range of conditions. Experiments were conducted in a versatile reactor system, which would be operated as a batch, semi-batch or flow reactor. The solid reactants, in the form of cylindrical discs, were attached to the shaft of a variable speed drive. With a rotating disc geometry, the kinetics of the surface reaction can be separated from mass transfer effects. Solid carbon and graphite were largely u

eactive at temperatures up to 600 degrees F; a neasurable reaction rate was obtained only in olutions containing nitric acid. The wet oxidation f several solid plastics was also explored with the otating disc reactor. In particular, nylon 66 was xidized over a range of temperatures, pressures, nd disc rotational speeds. A rate expression was leveloped relating the nylon degradation to dis-olved oxygen concentration and reaction tem-erature.
W72-14836

WATER QUALITY CONTROL WITH SYNTHETIC POLYMERIC FLOCCULANTS: EFFECT OF METAL IONS ON FLOCCULATION OF BIOCOLLOIDS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05G.
W72-14840

WASTES GENERATED IN THE MANUFACTURE OF SAUERKRAUT,
New York State Agricultural Experiment Station, Geneva.
Y. D. Hang, D. L. Downing, J. R. Stamer, and D. F. Splittstoesser.
Journal of Milk Food Technology, Vol 35, No 7, p 432-435, July 1972. 4 tab, 12 ref.

Descriptors: *Brines, *Waste treatment, Solid wastes, *Waste water treatment, Industrial wastes, Liquid wastes, Effluents.
Identifiers: *Sauerkraut, *Cabbage processing, Sauerkraut manufacturing.

Two sauerkraut factories were surveyed to obtain quantitative data on the wastes generated. Solid wastes due to trimming were over 35 tons per 100 tons of raw cabbage processed and the 'early brine' and 'late brine' total represented about 29% of the salted, shredded cabbage. Other waste effluents included vat soak water, vat wash water, and can cooling water. Approximately 345 gal. of waste effluents were discharged per ton of cabbage processed; the BOD ranged from about 11 to 13 lb. per ton. The brine has enough nutrients for optimal biological stabilization. (Smith-Texas)
W72-14847

COMPUTER SIMULATION OF ACTIVATED SLUDGE PLANT OPERATION,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
R. G. Lacroix, and D. E. Bloodgood.
Journal Water Pollution Control Federation, Vol 44, No 9, p 1778-1788, September 1972. 1 fig, 7 tab, 4 ref.

Descriptors: *Activated sludge, Mathematical models, *Municipal wastes, *Waste water treatment, Model studies, *Computer models, *Simulation analysis.
Identifiers: *Sensitivity analysis, Waste treatment plant operation.

A computer model was formulated to represent the operations of an activated sludge wastewater treatment plant using data accumulated from existing plants. The analysis and computer simulation of the system was facilitated by partitioning the activated sludge system into two parts: (1) aeration and (2) sedimentation tanks. Although mathematical simulation can be used to describe the effect of different factors, such as flow, BOD, suspended solids, temperature, sludge age, and rate of recirculation, on several significant parameters (mixed liquor suspended solids, return sludge suspended solids, amount of sludge produced) involved in the functioning of an activated sludge plant, no single mathematical simulation exists for all activated sludge plants. The simulation method allows for a more economical means of investigation without actual field trials. (Smith-Texas)
W72-14850

PRELIMINARY INVESTIGATIONAL REQUIREMENTS-PETROCHEMICAL AND REFINERY WASTE TREATMENT FACILITIES.
Engineering-Science, Inc./Texas, Austin.

Copy available from GPO Sup Doc EP2.10:12020 EID 03/71 $1.50; microfiche from NTIS as PB-212 369, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1971. 173 p, 38 fig, 28 tab, 112 ref. EPA Program 12020 EID 03/71.

Descriptors: *Waste water treatment, *Water pollution control, *Pollution abatement, *Pollutant identification, *Industrial wastes, Water quality control, Sludge, Sewage treatment, Biochemical oxygen demand, Heavy metals, Organic loading, *Treatment facilities, Design.
Identifiers: *Treatability study, *Waste water characterization.

Case studies indicate that locating, analyzing, and properly interpreting the nature of pollutional sources within a petrochemical or refinery complex is the basis from which a treatability study can be developed. Each of the waste waters including normal process and utility effluent, contaminated storm runoff, ballast water discharge, and other related sources of waste water, must be properly characterized with respect to their organic and inorganic constituents. The treatability study must be programmed to yield definitive information concerning pollutional removal rates, anticipated levels of residual or non-removable constituents, and treatment process requirements. The overall project of evaluating the treatability of a waste water is predicated on the assimilation of sufficient information from which the optimal selection of treatment processes can be made. (See also W72-03299) (Smith-Texas)
W72-14852

TREATMENT OF INDUSTRIAL WASTES AT REGIONAL FACILITIES,
Rollins-Purle, Inc., Wilmington, Del.
H. A. Alsentzer.
Chemical Engineering Progress, Vol 68, No 8, August 1972, p 73-75.

Descriptors: *Waste water treatment, *Industrial wastes, *Incineration, *Pollution abatement, *Treatment facilities, Delaware, Waste treatment.
Identifiers: *Treatment costs.

With improved enforcement of pollution laws, regional waste treatment plants will provide the means of dealing with 'hard' pollutants. Rollins-Purle, Inc., has built three regional waste treatment plants that handle materials with maximum pollution potential such as chlorinated hydrocarbons, etchants, pesticides, plating, and pickling baths, high BOD and COD aqueous organic solutions, and tank bottoms from petroleum refineries. Current prices charged for treatment vary from as low as $0.075/gal. for a single pass biological treatment to as high as $0.70/gal. for the handling, incineration, and scrubbing of dangerous complex organic materials. (Smith-Texas)
W72-14854

INVESTIGATIONS ON THE PURIFICATION OF INDUSTRIAL WASTES FROM DETERGENTS BY HYPERFILTRATION,
Technical Univ. of Szczecin (Poland). Inst. of Chemical Engineering.
J. Kepinski, and N. Chulubek.
International Chemical Engineering, Vol 12, No 3, July 1972, p 499-501. 1 fig, 10 ref.

Descriptors: *Detergents, *Industrial wastes, *Separation techniques, *Reverse osmosis, *Waste water treatment, Filtration, Mathematical studies, Laboratory tests.

Hyperfiltration (reverse osmosis) was used to separate detergents from water solutions and dye-containing solutions. The system was designed mathematically and resulted in the removal of 98% detergent from water solution and 85% from the dye-containing solutions. (Smith-Texas)
W72-14856

THE 'UNOX' SYSTEM-OXYGEN AERATION IN THE ACTIVATED SLUDGE PROCESS,
Union Carbide Corp., Tonawanda, N.Y. Linde Div.
E. A. Wilcox, and J. R. McWhirter.
Journal of the American Oil Chemists Society, Vol 48, No 10, October 1971. 7 p, 4 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Oxygen, *Activated sludge, *Aeration, Biochemical oxygen demand, Efficiencies, Performance, Municipal wastes, Industrial wastes, Pilot plants, Pulp and paper industry, Suspended solids, *New York.
Identifiers: Oxygen aeration, Petrochemical wastes, *Batavia (N.Y.).

The use of enriched oxygen in a simple and economical multistage gas liquid contacting device allowed the oxygen to be transferred to waste water at increased rates with significant decreases in power requirements over those required when using air as the oxygen supply media. The elimination of the mass transfer restriction allowed operation at solids levels of 4500-7000 mg/l while maintaining a dissolved oxygen level of 8-10 mg/l in the mixed liquor. Retention times for the process can be correspondingly decreased to 1-2 hours. A highly flocculant sludge was obtained which has excellent settling and dewatering characteristics and was produced in less quantities than normally produced by a conventional air activated sludge process. The process was demonstrated in a 2.5 MGD activated sludge plant at Batavia, New York in which consistent BOD and suspended solids removals in excess of 90% were obtained. Pilot plant programs in municipal waste applications along with applications in mixed petrochemical wastes and pulp and paper wastes were planned. (Galwardi-Texas)
W72-14858

CHARACTERISTICS OF YEASTS ISOLATED FROM PHENOL- AND CATECHOL-ADAPTED ACTIVATED SLUDGE,
Indian Inst. of Science, Bangalore. Microbiology and Pharmacology Lab.
B. Rao Venkata, and J. V. Bhat.
Antonie Van Leeuwenhoek; Journal of Microbiology and Serology, Vol 37, p 303-312, 1971. 3 fig, 4 tab, 31 ref.

Descriptors: *Activated sludge, *Phenols, *Yeasts, *Waste water treatment, Fungi.
Identifiers: *Candida tropicalis, *Trichosporon cutaneum.

Activated sludge was slowly adapted to phenolic compounds, namely phenol and catechol, and resulted in the enrichment of two species of yeasts. Both of the yeasts, Candida tropicalis and Trichosporon cutaneum, were able to grow on a variety of aromatic compounds and utilized phenol and catechol at a high rate. It is suggested that activated sludge of this type should be used to remove phenols from waste water. (Smith-Texas)
W72-14860

WASTE WATER RENOVATION IN CONNECTICUT SOILS,
Connecticut Agricultural Experimental Station, New Haven.
D. E. Hill.
Journal of Environmental Quality, Vol 1, No 2, April-June, 1972, p 163-167, 3 fig, 3 tab, 20 ref.

Descriptors: *Soil tests, *Soil horizons, *Soil investigations, *Leachate, Soil types, *Waste water

treatment, Water quality, Sewage effluents, Phosphates, Nitrates, Acidic soils, *Connecticut.

Six diverse Connecticut soils were used to determine waste water renovation potential by ion removal. For two years 2.54 cm (1 in) of a synthetic sewage effluent containing cations of Na+, Ca2+, K+, and Mg2+ and anions of C1-, NO3-, SO2-4 and PO3-4 was applied semiweekly to undisturbed cores, 30 cm diameter and 100 cm deep. Virtually all PO4 was removed from the effluent by the A horizon of the acid soils. All soils except the sandy Merrimac soil and the calcereous Stockbridge soil removed greater than 85% K, 75% Ca and Mg, but less than 10% Na. Although all SO4 passed through the acid soils after 1 year, there was partial removal of sulphate during the first year. There was no removal of nitrate or chloride from the start. After 2 years of testing, the results indicate that the longevity of the soil systems studied will vary between 10 and 13 years. Since permeability and ion removal capacity vary, each soil must be examined to determine safe loading rates. (Smith-Texas)
W72-14863

A STUDY OF SELECTED ECONOMIC AND ENVIRONMENTAL ASPECTS OF INDIVIDUAL HOME WASTE WATER TREATMENT SYSTEMS,
MITRE Corp., McLean, Va.
S. N. Goldstein, V. D. Wenk, M. C. Fowler, and S. S. Poh.
Available from the National Technical Information Service as PB-209 962, $6.75 in paper copy. Report M 72-45, March 1972. 265 p, 7 fig, 98 tab, 18 ref. EPA Project 1320. Contract F-19628-71-C-0002.

Descriptors: *Septic tanks, *Domestic wastes, *Aerobic treatment, Economics, Waste disposal, Sewage treatment, Economic efficiency, *Waste water treatment.

The full potential of individual home waste water treatment systems is not being realized because current system design, installation, and operational practices all of which have not changed substantially from past practices, do not reflect what is known about sewage-soil interactions. It is suggested that a controlled demonstration program will resolve important technological and institutional uncertainties. The reintroduction of individual home waste water treatment systems where applicable would result in a decrease of over $3 billion in the total cost of providing treatment to the new individual home population in the 1970-1990 period. (Smith-Texas)
W72-14864

IRRIGATION AND FERTILIZATION WITH WASTEWATER,
Idaho Univ., Moscow. Dept. of Civil Engineering; and Idaho Univ., Moscow. Dept. of Hydrogeology.
For primary bibliographic entry see Field 03F.
W72-14878

WATER BROUGHT TO HIGHWAY REST AREA THE 'HARD' WAY.
For primary bibliographic entry see Field 04B.
W72-14886

OMAHA'S PLATTE RIVER WATER TREATMENT PLANT,
Omaha Metropolitan Utilities District, Nebr.
A. Goodenkauf, and H. Hessler.
Public Works, Vol. 103, No. 7, p 70-72, July 1972. 2 photo.

Descriptors: *Water treatment, *City planning, *Water supply, *Management, Research and development, Decision making, Design, Long-term planning, *Nebraska, *Treatment facilities. Identifiers: *Omaha (Neb), *Platte River, Split treatment method.

The 1968 completion of the Platte River Water Treatment Plant has assured that the city of Omaha, Nebraska will have an adequate water supply through 1980. Forward looking research, the acceptance of the research, decisions to proceed, and the actual design and construction have saved Omaha from a water crisis. Omaha has taken advantage of its situation on the Platte River. Some details are provided on the water treatment plant. There are 37 wells, 12 of which can use either gas engines or electric motors for pump drives. The pipe line from the well fields is divided as it enters the treatment section. This part of the plant is actually two separate and independent plants under one roof. Each half, having a capacity of 30 mgd, consists of three treatment basins, which can be operated in series, in parallel, or nearly any other combination. This arrangement permits two different procedures to be utilized at the same time for purposes of comparison. The chemicals which are primarily used are: lime, alum, and chlorine. The most efficient treatment to date is the split treatment method in which approximately half of the raw water is softened by lime, then blended with raw water which has been treated with potassium permanganate. The plant has eight filters, four on each half. All of the water produced in the plant is pumped into the city water system by one of four high service pumps. If a temporary power shortage should occur, the natural gas engines in the well field and in the high service can pump water. (Strachan-Chicago)
W72-14887

RECYCLING: A PAPER COMPANY'S APPROACH.

Limnos, Vol. 4, No. 2, p 15-17, Summer 1971. 4 photo.

Descriptors: *Recycling, *Reclamation, *Reclaimed water, *Water reuse, Waste disposal, Cooling water, Solvents, Water pollution control, Industries.
Identifiers: *Riverside Paper Corporation (Wis), *Polysolv, Paper making.

The Riverside Paper Corporation in Wisconsin is using a new patented process to convert waste milk cartons, waxed paper cups, poly-coated food packages, and ice cream cartons into fine, water-marked writing and printing paper. The Polysolv, a pulp wood fiber reclaiming system, permits 100% recovery and use of waste which might otherwise be incinerated or used as landfill. It reuses its cooling water over and over again, and the solvents are recovered, cleaned, and recirculated within the completely enclosed, pollution free system. Even the process byproducts - the residual waxes, adhesives, and plastics removed from the food board - are converted into a poly-wax fuel which helps to power the entire papermaking operation. (Strachan-Chicago)
W72-14888

PHYSICAL-CHEMICAL TECHNIQUES FOR TREATMENT OF RAW WASTEWATERS,
CH2M-Hill, Reston, Va.
G. L. Culp, and A. J. Shuckrow.
Public Works, Vol. 103, No. 7, p 56-60, July 1972. 1 tab, 5 fig, 12 ref.

Descriptors: *Waste water treatment, *Physical control, *Chemical analysis, *Biological treatment, Carbon, Performance, Costs, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: *Physical-chemical techniques.

Several of the approaches being recently investigated for application of physical-chemical unit processes to raw wastewaters are reviewed. These approaches have the common factors of chemical coagulation for efficient removal of suspended solids and/or phosphorus and use of activated carbon for removal of soluble organics with both granular and powdered activated carbons being investigated. Studies in Rocky River, Ohio; Cleveland, Ohio; Washington, D.C.; Salt Lake City, Utah; and Albany, New York are discussed. Such recent studies indicate that physical-chemical treatment of raw wastewaters offers performance advantages over biological treatment. Substantial savings in space and costs are predicted. The reactivation and reuse of granular carbon has been proven on a plant scale while techniques for regeneration of powdered carbon are still in the development stage. Not all organics found in municipal wastewaters are absorbable on carbon. The limitation on BOD and COD removal will depend on the quantities of these nonabsorbable materials present in a given wastewater. Generally, 90%-95% BOD and COD removal can be achieved. In most cases, biological treatment followed by physical-chemical treatment including carbon absorption will produce a higher degree of BOD and COD removal than physical-chemical treatment alone. Removals of 95-98% phosphorus and 99% suspended solids can be readily achieved with physical-treatment alone. Preliminary cost estimates indicate that efficient physical-chemical treatment, including phosphorus removal, can be achieved at a total cost of $0.18-$0.26/1000 gallons. (Strachan-Chicago)
W72-14890

AN ADVANCED WASTEWATER TREATMENT PLANT CAN PROVIDE REVENUE,
J. C. Hild.
Public Works, Vol 103, No 7, p 49-50, July 1972. 4 photo.

Descriptors: *Waste water treatment, *Water supply, *Economics, *Costs, Tertiary treatment, Funding, Monitoring, Water quality control.
Identifiers: *Montgomery County Fresh Water Supply District No. 2 (Texas).

The Montgomery County Fresh Water Supply District No. 2 (Texas) has found a way to insure wastewater treatment to meet tomorrow's need by installing a large but advanced plant and selling the excess capacity to neighboring districts. The plant started operation in October, 1971. It is the first tertiary treatment plant built in Texas. The secondary stage employs the contact-stabilization modification of the activated sludge process which provides mzximum treatment in a minimum area. The tertiary step involves gravity filtration through layers of anthracite and sand. The plant is a factory-built field-erected system. Within two months of the commencement of the plant's operation, there were buyers for 700,000 gpd of the plants 1 mgd capacity. This sale produced $308,000 of revenue which will go a long way towards defraying the cost of $400,000 for equipment, land, engineering, and legal fees, and the $800,000 towards 9.2 miles of trunk lines. Other funds have come from a $600,000 Environmental Protection Agency grant and from the District's $165,000 bond sale at an unusually high municipal rate of eight percent. Monitoring of the effluent which is claimed to be the cleanest wastewater effluent in Texas, is accomplished by instrumentation of key parameters of plant operation. (Strachan-Chicago)
W72-14897

RECONDITIONING OF FOOD PROCESSING BRINES.
National Canners Association, Berkeley, Calif. Western Research Lab.

Copy available from GPO Sup Doc, $0.75 microfiche from NTIS as PB-212 394, $0.95. Environmental Protection Agency Water Pollution Control Research Series, March 1971. 76 p, 5 fig, 26 tab, 6 ref. EPA Program 12060 EHU 03/71.

Descriptors: *Brines, *Canneries, *Activated carbon, *Reclaimed water, *Brine disposal, Industrial waste, *Waste water treatment, Capital costs, Cost comparison, Waste treatment.
Identifiers: *Olive brines.

Activated carbon was used to treat storage brines and processing waters obtained from the production of canned ripe olives and glass packed green olives. Reconditioned brines were evaluated for reuse potential. Freshly harvested olives can be stored for commercially significant periods in reconditioned storage brines. Olives stored in reconditioned brine were of good quality. There was no detectable effect on final product quality with the reuse of reconditioned brines of lower salt content. When capital costs are amortized over 10 years for a cannery storing 5,000 tons of olives annually, estimates for commercial application of activated carbon treatment of storage brines show a cost per ton of olives stored of activated carbon treatment of storage brines show a cost per ton of olives stored of $3.64. Ten olive canneries sending spent carbon to a centrally located reactivation facility would have a cost of $1.28 per ton of olives stored. (Smith-Texas)
W72-14919

LEAD-DEADWOOD SANITARY DISTRICT NUMBER 1, SOUTH DAKOTA (FINAL ENVIRONMENTAL STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.

Available from the National Technical Information Service as PB-204 669-F, $3.00 in paper copy. March 15, 1972. 116 p, 6 fig, 2 map, 2 tab.

Descriptors: *South Dakota, *Environmental effects, *Waste treatment, *Waste water (Pollution), Sewage treatment, Aeration, Oxidation, Ultimate disposal, Municipal wastes, Industrial wastes, Mine wastes, Sewage, Sewage bacteria, Streams, Stream improvement, Water pollution treatment, Rivers, Groundwater, Wells, Water pollution control, Water quality control, Treatment facilities, Stream flow, Benefits.
Identifiers: *Environmental Impact Statements, *Lead-Deadwood (S Dak).

The proposed project will combine all municipal and industrial wastes from Lead and Deadwood, South Dakota, in one interceptor pipeline and convey the waste to a tailings-stabilization pond at Centennial Prairie for treatment by detention and bacterial action. A regional waste treatment pond, capable of 13,300 acre-feet of volume storage will be constructed to contain tailing storage for 20 years. The flow in Whitewood Creek, presently a mixture of raw sewage and industrial waste, will be transformed into a clear running stream. This improvement will also be evident in the Belle Fourche River, the Cheyenne River, and ultimately the Cheyenne Arm of Oahe Reservoir. The groundwater quality along the entire length of the affected streams is also expected to be improved. Some wells and springs immediately down valley from the project could experience a reduction of groundwater flow. The potential exists for groundwater contamination if the tailings-stabilization pond is not properly sealed to contain toxic wastes. Approximately 600 acres of land will ultimately be removed from agricultural use. Various alternatives considered were found less feasible than the proposed project. (Ellis-Florida)
W72-14924

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AFB FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.

Available from the National Technical Information Service as PB-207 733-D, $3.00 in paper copy. Report AF-ES-72-8D, March 1972. 122 p, 9 fig, 2 map, 8 tab, 10 append.

Descriptors: *Florida, *Environmental effects, *Waste water treatment, *Water quality control, Treatment facilities, Leases, Septic tanks, Industrial waste, Domestic wastes, Wildlife habitats, Land use, Air pollution, Water quality, Waste treatment, Lagoons, Wildlife ecosystems, Political aspects, Benefits, Costs, Feasibility, Federal government, Municipal wastes, Local governments.
Identifiers: *Environmental Impact Statements, *Tyndall AFB (Fla).

The proposed project involves the outlease of 150 acres of land on Tyndall Air Force Base, Florida, in the area of Military Point to Bay County, Florida. The land will be used for the construction and operation of secondary wastewater treatment facilities for four municipalities and two industries. Under the proposed treatment plan the water quality of St. Andrew Bay will be improved since the current primary treatment system will be bolstered by the addition of a secondary treatment capability. Land use by the proposed facility will eliminate wildlife habitation as long as the facility exists. The displacement of wildlife from the site and the presence of an industrial facility will have some disruptive effect on the ecosystem of the surrounding area, but it will be minor. It appears that the proposed action will have no significant adverse effect on air or water quality. The alternatives considered include location at other sites within Bay County, location on the International Paper Company plant site, a separate regional system for domestic waste with a treatment facility at some other site within the county, and use of other treatment processes. (Ellis-Florida)
W72-14928

EVOLVING SOCIAL ATTITUDES ON POLLUTION CONTROL,
Cincinnati Univ., Ohio. Environmental Health Engineering.
For primary bibliographic entry see Field 05G.
W72-14936

WATER TREATMENT APPARATUS,
Societe d'Etudes Chimiques pour l'Industrie et l'Agriculture, Paris (France).
For primary bibliographic entry see Field 05F.
W72-14967

TREATMENT OF SEWAGE,
South African Inventions Development Corp. (assignee).
P. G. J. Meiring, and P. H. Huisman.
U. S. Patent No. 3,579,439, 2 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 886, No 3, p 594, May 18, 1971.

Descriptors: *Patents, Treatment, *Sewage treatment, *Activated sludge, *Aeration, *Waste water treatment, Pollution abatement, Water pollution, *Nitrates, *Nitrogen, *Biochemical oxygen demand.

Raw sewage is mixed with activated sludge by agitation. A portion of the contents of the agitated substances is led into a separate settling zone where settled sludge is removed. The remainder of the substance in the agitation zone is directed to an aeration zone. The nitrogen content of the final effluent is controlled. (Sinha-OEIS)
W72-14968

SEWAGE TREATMENT SYSTEM,
Tesco Chemicals, Inc., Atlanta, Ga. (assignee).
W. E. Bradley, Jr.
U. S. Patent No. 3,579,440, 3 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 886, No 3, p 595, May 18, 1971.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aerobic treatment, *Chlorine, *Biological treatment, Equipment, Pollution abatement, Water pollution, Water pollution treatment.

Waste water is treated in two stages: an aerobic biological decomposition stage, and a purifying stage. Wastewater is ducted into the biological decomposing chamber and eventually ducted into a second chamber where chlorine is mixed with the waste water and after a retention period is allowed to flow into a field or towards a stream. (Sinha-OEIS)
W72-14969

COMBINED WASTE TREATMENT AND GROWTH CHAMBER PROCESS,
Microphor, Inc., Willite, Calif. (assignee).
R. E. Burton.
U. S. Patent No. 3,577,678, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 159, May 4, 1971.

Descriptors: *Patents, *Liquid waste treatment, *Aerobic conditions, Carbon dioxide, Oxygen, Greenhouses, *Photosynthesis, Plant growth, *Waste water treatment, Pollution abatement, Water pollution, Water pollution treatment.
Identifiers: *Aerobic microorganisms.

A liquid waste treatment system and a growth chamber (a conventional greenhouse) are combined for commercial growth of valuable plants. Carbon dioxide-enriched air formed as a byproduct of the activities of aerobic microorganisms and the evaporating water in the liquid waste treatment system are introduced into the growth chamber where the carbon dioxide and water vapor are converted to oxygen during photosynthesis. The oxygen-enriched air is recycled from the growth chamber to the waste treatment system. (Sinha-OEIS)
W72-14972

WATER TREATMENT,
Pennwalt Corp., Warminster, Pa. (assignee).
For primary bibliographic entry see Field 05F.
W72-14973

PROCESS FOR PURIFICATION OF OIL PRODUCTION WASTE WATER,
Signal Companies. (assignee).
J. Duffy.
U. S. Patent No. 3,576,738, 3 p, 3 fig, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 885, No 4, p 814, April 27, 1971.

Descriptors: *Patents, *Oil wastes, Oily water, Oil industry, Equipment, Treatment, Oceans, Sea water, *Waste water treatment, Industrial wastes, *Oil pollution, Pollution abatement, Water pollution, Water pollution treatment, *Hydrogen sulfide, Sulfides.
Identifiers: *Chemical treatment.

Sulfide removal is combined with the flotation oil clean-up process by injecting an oxidation catalyst, i.e., a soluble nickel compound, into the waste water during aeration and providing sufficient additional air into the pump discharge to cause rapid oxidation of the hydrogen sulfide in the flotation cell separation. Three examples are cited. It is recommended that at least 0.05 standard cubic feet of air per barrel and about 0.5 to 1.0 ppm of the soluble nickel compound be introduced to cause catalytic oxidation of the sulfide to elemental sulfur. (Sinha-OEIS)
W72-14977

METHOD AND APPARATUS FOR SEWAGE TREATMENT,
J. R. Kaelin.

U. S. Patent No. 3,573,203, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1392, March 30, 1971.

Descriptors: *Patents, *Sewage treatment, *Aeration, *Waste water treatment, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Activated sludge.

A single tank is used for the treatment process. A rotatable aeration wheel floating in the sewage is intermittently operated and shut down to allow aeration and circulation to alternate with a settling period. After the sludge settles to the bottom, the clarified liquid is withdrawn from the upper portion of the tank and the sludge may be separately treated. (Sinha-OEIS)
W72-14978

APPARATUS FOR SURFACE AERATION AND CIRCULATION OF LIQUID,
J. R. Kaelin.
U. S. Patent No. 3,576,316, 5 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 885, No 4, p 717, April 27, 1971.

Descriptors: *Patents, Sewage treatment, *Waste water treatment, Equipment, *Rotors, *Aeration, Water pollution, Water pollution treatment, Pollution abatement.

A rotor is partially submerged in the sewage and is able to rotate about a central vertical axis. The liquid sewage rises through various openings and rises in the central passageway. Centrifugal force develops in the flow passageway and the liquid is discharged into the tank and circulates carrying oxygen with it. A hollow space around the rotor is filled with a light-weight synthetic foam material. The buoyancy of the rotor creates a force which acts in opposition to the weight of the rotor. (Sinha-OEIS)
W72-14979

WASTE WATER TREATMENT,
Betz Labs., Inc., Trevose, Pa.
P. J. Gaughan, C. A. Noll, and J. K. Brown.
U. S. Patent No 3,575,853, 9 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 595, April 20, 1971.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Pollution abatement, *Flocculation, *Filtration, Acidification, Metals, Alkalinity, Water pollution, Water pollution treatment.

Waste water is acidified and passed through a unit containing a bed of metal particles. It is then moved into a mixing tank before being directed into a flocculating tank where the water is brought to an alkaline pH. Insoluble precipitates are formed and these are separated from the solution by deposition followed by filtration. Seventeen examples are reported. (Sinha-OEIS)
W72-14981

METHOD FOR TREATING WASTE WATER CONTAINING DISSOLVED PHOSPHATES,
American Colloid Co., Skokie, Ill. (assignee).
J. Hughes.
U. S. Patent No 3,575,852, 3 p, 2 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 595, April 20, 1971.

Descriptors: *Patents, *Phosphates, *Sewage treatment, *Detergents, Water pollution, Water pollution treatment, *Municipal wastes, *Domestic wastes, Separation techniques, Pollution abatement, *Waste water treatment.

Phosphates are removed from sewage waste water by using a mixture of lime and a cation exchange material having an exchange capacity at least 20 milli-equivalents per 100 grams of cation exchange material. The amount of lime (CaO) or (Ca (OH)2) (between 50% to 90% by weight), is based on the amount of cation exchange material and lime. The phosphate is precipitated as insoluble phosphate salts. The cation exchange material is an aluminosilicate clay mineral, preferably montmorillonite. The montmorillonite has replaceable calcium ions. (Sinha-OEIS)
W72-14982

METHOD AND APPARATUS FOR TREATING WASTE MATERIALS,
FMC Corp., San Jose, Calif. (assignee).
R. Davidson, F. F. Sako, W. G. Palmer, and R. A. Fisher.
U. S. Patent No 3,575,850, 4 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 594, April 20, 1971.

Descriptors: *Patents, *Aeration, *Filtration, Equipment, *Waste water treatment, Pollution abatement, Water pollution, Water pollution treatment.

The apparatus includes an aeration tank, a perforated drum mounted for at least partial submergence in the liquid sewage, a screen (filter) on which solids accumulate, a device to remove the solids from the screen, and an outlet for discharge of the clarified liquid. (Sinha-OEIS)
W72-14983

BIOLOGICAL TREATMENT OF WASTEWATER,
W. N. Torpey.
U. S. Patent No 3,575,849, 6 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 885, No 3, p 594, April 20, 1971.

Descriptors: *Patents, *Biological treatment, *Aerobic treatment, *Waste water treatment, Pollution abatement, Equipment, Separation techniques, Water pollution, Water pollution treatment, Slime, Sludge, Biochemical oxygen demand.

Biological slimes are grown on the surface of rotating discs by alternately immersing them in the wastewater for bioextraction of nutrients and exposing them to the atmosphere for absorption of oxygen. The solids (slime) settle through the subjacent zone and settle to the bottom of the tank and can be easily removed. (Sinha-OEIS)
W72-14984

PROCESS FOR PURIFYING WATER CONTAINING OIL AND SOLIDS,
D. K. Beavon.
U. S. Patent No 3,574,329, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 885, No 2, p 244, April 13, 1971.

Descriptors: *Patents, *Water purification, *Oily wastes, *Oily water, Equipment, *Waste water treatment, Oil pollution, Pollution abatement, *Aeration, Ponds, *Filtration, Water pollution, Water pollution treatment.
Gravity separation.

Water containing oil and solids is passed through a granular filter media fine enough to trap solids and leave the oil and water mixture to separate into oil and water layers. The entrained solids are removed from the filter by backwashing with water. The water recovered from the gravity separation and the backwash is returned to the system for use or oxidized biologically in a surface aeration pond before disposal. (Sinha-OEIS)
W72-14987

AERATION TANK FOR WASTE TREATMENT,
Mitsubishi Kokoki Kaisha Ltd., (Japan). (assignee).
K. Kurosawa, and M. Nakashio.
U. S. Patent No. 3,574,331, 4 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office Vol 885, No 2, p 244, April 13, 1971.

Descriptors: *Patents, *Waste water treatment *Aeration, *Settling basins, Oxygen, Water treatment, Pollution abatement, Equipment, *Waste treatment.
Identifiers: Settling tanks.

The throughput of an aeration unit can be increased if the initial contact between gaseous oxygen and the waste material is made at hydrostatic pressures of not much less than 9 p.s.i.g. as is possible in this open, vertically elongated aeration tank. The tank has an effective height of more than 6 meters between the supply level at which the oxygen-bearing gas normally enters the tank and the upper liquid level in the tank. The aeration tank is connected by a conduit to a settling tank, so that gas-treated waste material may be transferred to the settling tank. (Sinha-OEIS)
W72-14988

PROCESS OF CLARIFYING A LIQUID USING SCORCHED NEWSPRINT,
Environmental Sciences, Inc., Berkeley Heights, N.J. (assignee)
S. Boorujy.
U. S. Patent No 3,574,098, 2 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 885, No 1, p 185, April 6, 1971.

Descriptors: *Patents, *Tertiary treatment, *Waste water treatment, *Filtration, *Sewage treatment, *Aerobic treatment, Aeration, Pollution abatement, Equipment, Separation techniques, Water pollution, Water pollution treatment, Biochemical oxygen demand.
Identifiers: *Newsprint, *Newspaper.

Waste newsprint is processed for use in cleaning sewer water having biological oxygen demand. The finely-ground, de-oiled newsprint scorched to a brown color is added to the waste water. The mixture is passed through a filter medium. The filter medium is vented to the atmosphere. The pressure of the water in the tank causes penetration of the filter media and central core, and the clarified water enters a discharge funnel from which it may be disposed into a river or stream. (Sinha-OEIS)
W72-14990

PROCESS FOR REDUCTION OF WATER POLLUTION DUE TO DOMESTIC AND INDUSTRIAL WASTES,
Fort Howard Paper Co., Greenbay, Wis. (assignee).
J. T. Sobota, and D. F. Pagel.
U. S. Patent No 3,573,202, 4 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1391, March 30, 1971.

Descriptors: *Patents, *Pulp wastes, *Pulp and paper industry, Pollution abatement, *Biological treatment, *Lime, Activated sludge, *Aeration, Water pollution, Water pollution treatment, *Waste water treatment, Biochemical oxygen demand.
Identifiers: *Chemical treatment.

The process is divided into two stages to produce modified primary-secondary sludge which has a consistency of 20-25% solids and a liquid effluent from the secondary stage which is 85-95% free of pollutants resulting in a 7 to 20 fold decrease in pollutants. Lime and stabilized secondary sludge are added to the wastes to form an aqueous mixture. The mixture is held in a retention basin long enough to separate the mixture. The supernatant is withdrawn for deposit in an aeration basin where it forms an activated sludge mixture. The activated sludge is introduced into a secondary basin where separation produces a clear supernatant and bacterial slime. The resulting clear supernatant is

have a BOD load 85-95% lower than the primary supernatant. (SinhalOEIS)
W72-14992

FLOATING AERATOR,
Richards of Rockford, Inc., Ill. (assignee).
R. B. Ravitts.
U. S. Patent No 3,572,658, 4 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1270, March 30, 1971.

Descriptors: *Patents, *Aeration, *Aerobic treatment, *Waste water treatment, Water treatment, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Ponds.

The floating aerator is designed for use in a waste treatment pond. It serves to scrub and oxidize the water by drawing the water upward and slinging it into the surrounding atmosphere for contact with the air before falling back to the surface of the pond. Extending vertically through the center of the float is a cylindrical opening into which is telescoped an upright tabular throat defining a passage for the flow of water. The bottom of the throat is submerged and its upper end is open and reaches above the float so as to discharge the water into the atmosphere. (Sinha-OEIS)
W72-14993

UNDERWATER STORAGE TANK,
Secretary of the Interior, Washington, D.C.
W. J. Bandy, Jr., W. K. E. Morris, and G. M. Stainbrook.
U. S. Patent No 3,572,506, 5 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 884, No 5, p 1233, March 30, 1971.

Descriptors: *Patents, *Storage tanks, *Storm water, Storage, Sewage, Sewers, Pollution abatement, Underwater, *Waste water treatment, Odor control.

A hollow framed storage tank which can be anchored on the bottom of a body of water is connected to a sewage system. The tank has vent valves for the escape of gases which may evolve from the sewage. The pipes of the metal framework include jets which are connected to a source of liquid under pressure which can be used for flushing the tank. The invention relates in general to the temporary underwater storage of liquids such as sewage which would otherwise overflow the sewer system during storms. (Sinha-OEIS)
W72-14994

APPARATUS FOR TREATING MUDDY WATER,
Kurita Water Industries Ltd., Yokohama (Japan); and Takenaka Komuten Co. Ltd., Yokohama (Japan). (assignees).
For primary bibliographic entry see Field 05F.
W72-14995

METHOD OF TREATING WASTE MATTER,
Tekmar Corp., New York. (assignee).
J. M. Valdespino.
U. S. Patent No 3,567,633, 3 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 884, No 1, p 294, March 2, 1971.

Descriptors: *Patents, Solid wastes, *Waste treatment, *Liquid wastes, Chlorine, Separation techniques, Equipment, Pollution abatement, *Neutralization, *Bacteria, Water pollution, Water pollution treatment, *Waste water treatment.

The method includes the steps of first separating the solid waste from the liquid waste and treating each independently. The solid waste is incinerated. The liquid waste is introduced into an auxiliary tank and treated with a neutralizing agent to destroy bacteria. Chlorine is suggested as the neutralizing agent. To discharge the liquid waste, air under pressure is forced through an air line into the sump and the build-up of air pressure within the sump will close a check valve to prevent the escape of air pressure through the drain. The built up pressure will force the liquid downward into a discharge pipe. (Sinha-OEIS)
W72-14997

5E. Ultimate Disposal of Wastes

REST AREA WASTEWATER DISPOSAL,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14382

ECONOMICS OF HATCHERY SALMON DISPOSAL IN OREGON,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06C.
W72-14423

HYDROGEOLOGIC FACTORS IN PROBLEMS OF CONTAMINATION IN ARID LANDS,
Nevada Univ., Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 05B.
W72-14508

CURRENT VELOCITIES IN THE VICINITY OF THE GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT'S IONA ISLAND OUTFALL - 1968,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 05B.
W72-14657

INDUSTRIAL FEASIBILITY OF MANMADE ISLANDS CONSTRUCTED FROM THE OFFSHORE DISPOSAL OF DREDGED SPOIL,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 05C.
W72-14662

AIR OXIDATION OF ORGANIC COMPOUNDS IN AQUEOUS SYSTEMS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 05D.
W72-14836

WASTE TREATMENT AT A SYNTHETIC DRUG FACTORY IN INDIA,
Central Public Health Engineering Research Inst., Nagpur (India).
G. J. Mohanrao, P. V. R. Subrahmanyam, S. B. Deshmukh, and S. Saroja.
Journal, Water Pollution Control Federation, Vol 42, No 8, August 1970, p 1530-1543. 7 fig, 9 tab, 11 ref.

Descriptors: *Waste water treatment, *Neutralization, *Chemical treatment, *Biological treatment, Bioassay, Waste treatment, Effluents.
Identifiers: Drug factory, *Hyderabad (India), *Synthetic drugs.

This is the case history of an investigation to determine the best method or methods to use in dealing with the waste effluent from a synthetic drug factory in Hyderabad, India. The plant was divided into several units on the basis of waste effluent type from each unit. Treatment of part of the wastes entailed neutralization of the effluent and discharging into sewers. Chemical treatment, and biological treatment were used for the remaining portion. (Smith-Texas)
W72-14848

5F. Water Treatment and Quality Alteration

MICROBIOLOGY-DETECTION AND OCCURRENCE OF VIRUSES,
National Environmental Research Center, Cincinnati, Ohio.
G. Berg.
Journal Water Pollution Control Federation, Vol. 44, No. 6, p 1193-1198, June 1972. 50 ref.

Descriptors: *Methodology, *Viruses, *Pollutant identification, *Coliforms, Water pollution sources, Bioindicators, E. coli, Shellfish, *Filtration, Isolation, Sewage, Microorganisms, Laboratory equipment, Public health, Bacteriophage, Waste water (Pollution), Effluents, Efficiencies, Water pollution.
Identifiers: *Virus removal, Mercenaria mercenaria, Poliovirus, Echovirus, Reovirus, Coxsackievirus, Membrane filtration, Membrane filters, Blue-green algal viruses, Enterovirus.

A literature review is presented which deals with the methods of viral removal from large volumes of water, wastes, and shellfish. Of all the methods employed for viral removal, filtration techniques have been most extensively studied. Membrane filtration techniques involve the use of cellulose-nitrate membrane filters, adsorption onto collodion membranes, aluminum hydroxide-cellulose nitrate filters and alginate membranes. Some of the viruses isolated by these techniques are polioviruses, echoviruses, coxsackieviruses, and coliphage T3. (Long-Battelle)
W72-14305

SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05G.
W72-14377

REGIONAL WATER SUPPLY AND WASTEWATER DISPOSAL PLAN AND PROGRAM, CAPITAL DISTRICT REGION.
Male (C. T.) and Associates, Schenectady, N. Y.
For primary bibliographic entry see Field 06B.
W72-14445

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.
For primary bibliographic entry see Field 06A.
W72-14447

FAIL-SAFE WATER PURIFYING APPARATUS,
Puretest Water Purifying Co. (Assignee).
R. W. Hippen.
U. S. Patent No. 3,652,520, 4 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 799, February 9, 1971.

Descriptors: *Patents, *Water purification, *Water treatment, Pollution abatement, Equipment, *Bacteria, *Ultraviolet radiation, Light, *Microorganisms.

An elongated tubular electric lamp provides a source of ultraviolet illumination. A transparent protective filiform cylinder surrounds the lamp. A wiper keeps the equipment clean. (Sinha-OEIS)
W72-14456

SAND FILTER FOR WATER PURIFICATION,
For primary bibliographic entry see Field 05D.
W72-14461

WATER TREATMENT FACILITIES, FOSS RESERVOIR, CUSTER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Fort Worth, Tex. Region VI.

Available from the National Technical Information Service as PB-204 460F. $3.00 in paper copy, $0.95 in microfiche. March 29, 1972. 77 p, 1 map, 5 tab.

Descriptors: *Environmental effects, *Water treatment, *Treatment facilities, *Turbidity, Waste water disposal, Waste water (Pollution), Water supply, Water demand, Water quality, Water quality control, Flow augmentation, Demineralization, Desalination, Pre-treatment (Water), Desalination wastes, Environmental engineering, Water pollution sources, Fish, Waterfowl, Water resources development, Water management (Applied), Water utilization, Oklahoma.
Identifiers: *Environmental Impact Statements, Custer County (Okla), Washita River, *Foss Reservoir (Okla).

The project consists of the construction of a water treatment plant to remove turbidity by chemical clarification and minerals by a demineralization process located at the Foss Reservoir, Oklahoma. An assured source of good quality water would be provided by the project. Furthermore the quality of water in the reservoir would be expected to improve due to withdrawal of water from the reservoir. Wastewater from the plant would increase the flow in the Washita River below the dam. Increased flow will benefit fish and waterfowl habitats, recreational potential, and will also eliminate stagnation. Total dissolved solids in the river downstream from the plant would increase due to the discharge of wastewater. However, it would appear that the benefits due to increased flow would substantially outweigh the detrimental effects of the dissolved solids. The quality of the river water would only be slightly affected by the releases from the desalination plant. Alternatives considered include construction of pipelines to supply water, construction of dams, drilling of wells or no action at all. Brief comments from other agencies are included. (Brackins-Florida)
W72-14563

BACTERIOLOGICAL CONTROL OF PURIFICATION SYSTEMS AND RECEIVING WATERS WITH THE USE OF A MEMBRANE FILTER AND A DIAPHRAGM FILTER, (BAKTERIOLOGISCHE KONTROLLE VON KLARANLAGEN UND VORFLUTERN MITTELS MEMBRANFILTER UND NAHRKARTONSCHEIBEN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
For primary bibliographic entry see Field 05D.
W72-14666

A METHOD OF DEMINERALIZATION USING STRONGLY ION EXCHANGE RESINS,
New Mexico State Univ., University Park. Engineering Experiment Station.
For primary bibliographic entry see Field 03A.
W72-14679

ADSORPTION CHARACTERISTICS OF COALS AND CHARS,
Pennsylvania State Univ., University Park. Dept. of Material Sciences.
For primary bibliographic entry see Field 05D.
W72-14814

WATER TREATMENT APPARATUS,
Societe d'Etudes Chimiques pour l'Industrie et l'Agriculture, Paris (France).
R. Jurion, and A. Leblanche.
U. S. Patent No. 3,578,005, 5 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 886, No 2, p 255, May 11, 1971.

Descriptors: *Patents, *Bromine, *Bactericides, *Algicides, *Water treatment, Water purification, Water quality, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Wastewater treatment.

A mixing device for a water treatment apparatus is described in which liquid bromine is prepared for introduction into the water to be treated. The device comprises at least one storage vessel for containing the liquid bromine and a dilution vessel connected to it. Control valves are used to regulate flow between the vessels and finally into the water to be treated. (Sinha-OEIS)
W72-14967

WATER TREATMENT,
Pennwalt Corp., Warminster, Pa. (assignee).
F. W. Keith, Jr., E. M. Jones, and J. R. Townsend, Jr.
U. S. Patent No. 3,577,341, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 100, May 4, 1971.

Descriptors: *Patents, *Water treatment, *Pollution abatement, Water pollution treatment, Sedimentation separation techniques, Water quality, Lime, Carbon, Chlorine, *Flocculants, Waste water treatment.
Identifiers: *Chemical additives, Potassium permanganate, Aluminum sulfate, Ferric sulfate, Sodium hydroxide, Soda ash.

Raw water is mixed with one or more additives and then fed to a settling zone where sedimented material is separated from the water. The separated water is passed through a filtration zone. The sedimented material is centrifugally concentrated for disposal in compact form. The filtered water may be recycled or led out of the system as required. (Sinha-OEIS)
W72-14973

APPARATUS FOR TREATING MUDDY WATER,
Kurita Water Industries Ltd., Yokohama (Japan); and Takenaka Komuten Co. Ltd., Yokohama (Japan). (assignees).
M. Endo, T. Kawasaki, M. Miura, Y. Ikuta, and M. Suzuki.
U. S. Patent No 3,570,670, 4 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 884, No 3, p 895, March 16, 1971.

Descriptors: *Patents, *Mud, *Dewatering, Separation techniques, Equipment, Pollution abatement, Drainage engineering, *Water treatment, Waste water treatment.

Muddy water is treated by processing through a vibrating screen, a separating tank, a hydraulic cyclone, a hopper and a mixer. The solid matter is cemented into massive lumps to be transported for disposal. (Sinha-OEIS)
W72-14995

SPECIALIZED HOLOGEN GENERATOR FOR PURIFICATION OF WATER,
National Aeronautics and Space Administration, Washington, D.C.
R. A. Bruce.
U. S. Patent No 3,574,084, 3 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 885, No 1, p 181, April 6, 1971.

Descriptors: *Patents, *Water purification, *Water treatment, *Halogens, Copper compounds, *Chlorine.
Identifiers: Copper chloride.

Purified water is obtained by providing a vessel having an electrolyte chamber, an anodic chamber and a water treatment chamber. A saturated solution of an electrolyte, such as copper chloride, is provided in the electrolyte chamber with a cathode immersed in this solution. An additional undissolved quantity of the solid electrolyte is added to the saturated solution of electrolyte. The anodic chamber is separated from the electrolyte chamber only by a hydrophilic membrane and the water treatment chamber is separated from the anodic chamber only by a hydrophobic membrane. When voltage is applied copper will be plated out at the cathode and chlorine at the anode. The chlorine passes through the hydrophobic membrane and into the water treatment chamber. (Sinha-OEIS)
W72-14998

5G. Water Quality Control

ECONOMIC VALUE OF WATER IN A SYSTEMS CONTEXT,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 06B.
W72-14236

THE ECONOMIC VALUE OF WATER: CONCEPTS AND EMPIRICAL ESTIMATES,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W72-14237

HEARINGS--PUBLIC WORKS FOR WATER POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATIONS FOR FISCAL YEAR 1973--PARTS 1-5.

Hearings--Subcomm of the Comm. on Appropriations, U.S. Senate, 92d Cong, 2d Sess, 1972. parts, 7 vol.

Descriptors: *Federal budget, *Water resources *Legislation, *Water pollution control, Environment, Waste water disposal, Transportation, Harbors, Flood control, Water supply, Grants, River basin commissions, Rivers, Thermal power, Tennessee Valley Authority, National Water Commission, Political aspects, Federal government, Electric power production, Water resources development, Environmental effects.
Identifiers: *Department of the Interior, *Atomic Energy Commission, *Corps of Engineers, Water Resources Council.

Included are the budgetary requests of various governmental agencies and departments for fiscal year 1973 relating to water, pollution control, and power development. The Army Corps of Engineers requested a record sum for civil works programs. Those programs include water resource planning and transportation as well as waste water management, ports and harbors, and flood control. Testimony on each of the numerous crop projects their purpose, need, impact, and cost is included. The Department of the Interior request showed an increase in water resources development activities. Hearings were conducted on the requests of the Water Resources Council, the Bureau of Reclamation, the National Water Commission, the Tennessee Valley Authority, the Delaware River Basin Commission, the Susquehanna River Basin Commission, and others. The Atomic Energy Commission request included an increase in lake and freshwater sciences research programs calling for additional emphasis on thermal studies. Also included are voluminous prepared statements of numerous witnesses concerning budget requests for various water resource projects throughout the Nation. (Ellis-Florida)
W72-14251

POWERPLANT SITING AND ENVIRONMENTAL PROTECTION, PART 2.
For primary bibliographic entry see Field 06G.
W72-14252

GATEWAY AREA PROPOSALS.
For primary bibliographic entry see Field 06G.
W72-14253

VERMONT WHEY POLLUTION ABATEMENT AUTHORITY LAW.

Vt. Pub. Acts No. 83 (1971).

Descriptors: *Vermont, *Legislation, *Industrial wastes, *Pollution abatement, Water pollution control, Waste disposal, Water law, Legal aspects, Watercourses (Legal aspects), State governments, Administrative agencies, Administration, Regulation, Control, Financing, Government finance, Eminent domain, Water quality, Water quality control, Water pollution sources, Waste treatment, Condemnation, Bond issues.
Identifiers: *Whey pollution.

Pollution of the waters of Vermont resulting from discharges of fluid whey and wash waters by cheese processors endangers public health. This act grants to a single state agency, the Vermont Whey Pollution Abatement Authority, the necessary powers in order to abate this pollution. The Authority has the power to issue bonds to finance the construction of projects designed for use as plants to process fluid and concentrated whey and wash water. The authority may charge and collect rents, fees and charges for the use of the project or its services or facilities. The act includes provisions dealing with the issuance of bonds and notes. In order to carry out the policy of this act the authority has the power of eminent domain. The authority may also enter into contracts for management and operation of a project. Provisions for examinations and monitoring enable the authority to enter upon such lands, waters or premises as may be necessary, convenient or desirable for the purpose of making soundings, borings and examinations. (Brackins-Florida)
W72-14255

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.
For primary bibliographic entry see Field 03F.
W72-14256

NTRODUCTION OF A BILL TO AMEND THE 'EDERAL WATER POLLUTION CONTROL ACT.
'or primary bibliographic entry see Field 06E.
W72-14258

'EDERAL WATER POLLUTION CONTROL ACT AMENDMENTS (DIGEST OF BILL).
'or primary bibliographic entry see Field 06E.
W72-14259

'AVIGATION OF THE KANSAS RIVER, AWRENCE TO THE MOUTH (DRAFT EN-IRONMENTAL IMPACT STATEMENT).
rmy Engineer District, Kansas City, Mo.
or primary bibliographic entry see Field 04A.
'72-14260

MALL BOAT HARBOR, PORTSMOUTH TATE PARK, OHIO, OHIO RIVER (FINAL EN-IRONMENTAL IMPACT STATEMENT).
rmy Engineer District, Huntington, W. Va.
or primary bibliographic entry see Field 04A.
'72-14261

SAN LEANDRO CREEK SMALL FLOOD CONTROL PROJECT, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08D.
W72-14262

SCITUATE HARBOR, SCITUATE MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14263

MAINTENANCE DREDGING, SCITUATE HARBOR, MASSACHUSETTS (DRAFT ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14264

DIKED DISPOSAL AREA PROGRAM, ONTONAGON HARBOR, ONTONAGON, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from the National Technical Information Service as PB-205 586-D. $3.00 in paper copy. November 24, 1971. 16 p, 1 plate, 4 tab, 2 append.

Descriptors: *Michigan, *Environmental effects, *Spoil banks, *Water quality control, Dredging, Water pollution sources, Water pollution effects, Turbidity, Odor, Aesthetics, Groundwater movement, Groundwater, Harbor dikes, Disposal, Lake Superior, Operation and maintenance.
Identifiers: *Environmental impact statement, *Ontonagon Harbor (Mich).

The project involves construction of a system of sand dikes west of the entrance to Ontonagon Harbor, Michigan, in order to contain polluted dredge spoil. The dikes will be less than 14 feet above mean low water, but high enough to prevent overtopping. The lakeward side of the dikes would be riprapped to prevent erosion. A settling basin will be provided to accomodate effluent water prior to discharge back into the harbor. Water quality defects will be detected by testing and treatment when necessary. Environmental inpacts include: prevention of polluted spoil contamination in open water of Lake Superior, raising the 20 acre disposal area level by 9 feet over a 10 year course of project life, some harbor turbidity during construction, and some temporary odor and unsightliness. Creation of the disposal sites would have no adverse effect on the groundwater or eco-system since the area is practically biologically sterile. Groundwater movement from the area is lakeward so any seepage would not impair groundwater quality. Alternatives include: continued in-lake disposal, cessation of maintenance dredging, alternative disposal sites, treatment of polluted soil, and modification of current methods and equipment to reduce water and polluted soil contact. (Grant-Florida)
W72-14270

DIKED DISPOSAL AREA PROGRAM, ASHLAND HARBOR, ASHLAND, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from th National Technical Information Service as PB-205 587-D. $3.00 in paper copy. November 24, 1971. 16 p, 1 map, 2 tab, 2 append.

Descriptors: *Wisconsin, *Lake Superior, *Spoil banks, *Environmental effects, Dredging, Channel improvement, Turbidity, Odor, Aesthetics, Eutrophication, Lake beds, Water pollution sources, Water pollution, Disposal, Harbors, Operation and maintenance, Dikes, Recreation, Vegetation effects, Bank erosion.
Identifiers: *Environmental impact statement, *Ashland Harbor (Wis.), *Dredge spoil.

The project involves the construction of a diked disposal area for containing polluted dredge spoil in Ashland Harbor, Wisconsin. The harbor is located on the south shore of Lake Superior. The site will cover approximately six acres. Dikes will be 14 feet above mean low water, but high enough to prevent overtopping. Outer banks will be riprapped to prevent erosion. A settling basin will accommodate effluent water discharged back into the harbor. Environmental effects of the project include: elimination of polluted spoil contamination in the open waters of Lake Superior, eventual raising of the level of the disposal area by 11 feet with loss of vegetation and recreational value of the area, loss of the covered marsh area, and improved lake water quality. Unavoidable adverse effects include: temporary turbidity, odor, and unsightliness; increased eutrophication of the lake bed in the disposal area; and loss of the limited recreation value of the site until vegetation is reestablished. Alternatives include: continued in-lake disposal, cessation of maintenance dredging, alternate disposal sites, treatment of spoil, delayed action pending pollution abatement in the area, and modification of methods and equipment to reduce water and soil contact. (Grant-Florida)
W72-14271

BLACK ROCK CHANNEL AND TONAWANDA HARBOR, NEW YORK (OPERATION AND MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 792-D. $3.00 in paper copy. November 1971. 11 p, 2 map, 1 dwg.

Descriptors: *New York, *Lake Erie, *Dredging, *Environmental effects, Channel improvement, Locks, Maintenance, Operation and maintenance, Canals, Water pollution sources, Water pollution, Spoil banks, Eutrophication, Downstream, Turbidity, Sedimentation, Disposal, Harbors.
Identifiers: *Environmental impact statement, *Tonawanda Harbor (New York), Dredge spoil.

The project under consideration is the periodic maintenance of channels and structures in the deep-draft navigation project for Black Rock Channel and Tonawanda Harbor, New York. Several structures in the project also require maintenance. Hopper dredges remove approximately 100,000 cubic yards of material annually. Spoil is placed in the spoil areas for Buffalo Harbor maintenance. Material from the canal between the lock and Buffalo Harbor is more polluted and is placed in a special area. Material from below the lock is dumped in an open-water area in Lake Erie. Environmental impacts of this maintenance include: some noise and dust during construction, short-term turbidity and sedimentation, and some increased pollution and eutrophication in the lake from nutrients in spoil deposits. Efforts have been made to reduce water pollution by use of the contained disposal area. The only adverse effect of open lake dumping is the removal of the polluted spoil from downstream areas to Lake Erie where there is already a severe pollution problem. There is no alternative to maintenance and lock operation. An alternative to lake disposal of spoil is construction of permanent disposal areas. Funds are available for this construction. (Grant-Florida)
W72-14272

ROCHESTER HARBOR, MONROE COUNTY, NEW YORK (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 796-D. $3.00 in paper copy. November 19, 1971. 11 p, 2 map, 1 illus, 1 dwg.

Descriptors: *New York, *Dredging, *Channel improvement, *Harbors, Rivers and Harbors Act, Channel morphology, Spoil banks, Lake Ontario, Navigation, Water pollution sources, Water pollution effects, Water quality, Sedimentation, Turbidity, Dissolved oxygen.
Identifiers: *Environmental impact statement, *Rochester Harbor, N.Y.

The work under consideration is the periodic maintenance of completed structures and channels in the deep-draft navigation project for the Rochester, New York harbor. Project features requiring maintenance are parallel piers as the mouth of the Genesee River, and dredged areas. 360,000 cubic yards of material are dredged annually and dumped into Lake Ontario in an area one and a half miles from shore. Environmental impacts resulting from this work include: noise and dust during the construction period, short term turbidity and sedimentation during dredging and dumping, some water quality impairment from sediment, and possible adverse effects to fish from algae and plant growth stimulated by increased oxygenation of spoil material. The only adverse effect is the fact that polluted material from the spoil is placed in Lake Ontario at a faster rate than it would naturally occur. The only feasible alternative is to dispose of spoil in an enclosed area. Funds are available for constructing such an area, and an environmental statement will be prepared. Maps showing alternative disposal sites are included. (Grant-Florida)
W72-14273

NEW BEDFORD AND FAIRHAVEN HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14277

CONFERENCE IN THE MATTER OF POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES--INDIANA-MICHIGAN-NEW YORK-OHIO-PENNSYLVANIA: VOLUMES 1 AND 2.
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14282

BENTHIC FAUNAL RECOVERY IN A SWEDISH FJORD FOLLOWING THE CLOSURE OF A SULPHITE PULP MILL,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
For primary bibliographic entry see Field 05C.
W72-14337

SUBSURFACE WATER TEMPERATURES OF THE COLUMBIA RIVER AT PRESCOTT, OREGON (RIVER MILE 72), 1968-69,
National Marine Fisheries Service, Seattle, Wash. Biological Lab.
G. R. Snyder, and R. J. McConnell.
Available from NTIS, Springfield, Va., 22151, as COM-71-00638. Price $3.00 paper copy; $0.95 microfiche. Data Report 53, February 1971. 9 p, 1 fig, 6 tab.

Descriptors: *Water temperature, *Basic data collections, *Columbia River, *Oregon, Pre-impoundment, Electric powerplants, Environmental effects, Ecology, Fish management, Forecasting, Thermal pollution, Water quality control.
Identifiers: *Prescott (Oreg).

Water temperature data from January 1968 through December 1969 are presented to aid in the evaluation of the effects of impending industrial encroachment on the existing fisheries of the lower Columbia River. Two thermal nuclear electric plants have been proposed by public and private utilities for installation on the lower Columbia River in this decade. Existing (preplant) temperature records are needed to establish and predict the changes that will take place in water temperature as a result of plant operations and the effect temperature increases will have on the aquatic ecology of the river. (Woodard-USGS)
W72-14357

HYDROLOGY OF WESTERN COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W72-14359

THE 1969 UPPER MISSISSIPPI RIVER DREDGE SPOIL SURVEY FROM HASTINGS, MINNESOTA TO CAIRO, ILLINOIS,
Missouri Dept. of Conservation, Jefferson City.
J. W. Robinson.
Available from NTIS, Springfield, Va. 22151, as COM 72-10044, Price $3.00 paper copy; 95 cents microfiche. Upper Mississippi River Conservation Committee, Fish Technical Section, December 1970. 157 p, 4 plate, 153 map.

Descriptors: *Dredging, *Spoil banks, *Environmental effects, *Ecology, *Mississippi River, *Sludge disposal, Navigation, Wildlife, Protection, Fish Conservation, Planning, Water quality control, Engineering.

The deposition of dredge spoil can cause changes in river environment to the detriment of fish and wildlife. Recommendations for dredge spoil disposal are made for the Upper Mississippi River from Mile O (junction with Ohio River) to mile 819 (above Hastings, Minnesota). General recommendations include: 1. Deposit spoil on some of the existing islands having a low value for timber and wildlife habitat. 2. Consider the construction of sand islands in the wide, flat lower ends of some pools. The principal advantages of such islands would be (1) reduction of wave action, (2) provisions of areas for wildlife, (3) better definition of the navigational channel, and (4) creation of additional recreation areas. 3. Develop sand beaches at state, county and municipal parks bordering the river. 4. Provide fill for proposed public access and parking areas sponsored by Federal and State programs. 5. Creat dikes in large shallow water areas for waterfowl and aquatic fur animal management. 6. Provide fill in lowland areas of little wildlife value adjacent to communities wishing to have additional space for industrial expansion or other purposes. (Woodard-USGS)
W72-14374

SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON,
Texas Univ., Austin. Center for Research in Water Resources.
E. G. Fruh, and F. D. Masch.
Available from the National Technical Information Service as PB-212 167, $3.00 in paper copy, $0.95 in microfiche. Technical Report CRWR-91, EHE 72-15, May 1972, 142 p., 39 fig, 29 tab, 39 ref. OWRR B-040-TEX (5).

Descriptors: *Water quality control, *Withdrawal, *Mathematical model, *Nutrients, Nitrogen, Velocity, Discharge measurement, Computer programs, *Texas, Temperature, Light, Mixing.
Identifiers: *Selective withdrawals, Bohen-Grace model, *Lake Livingston (Tex).

A methodology by which production could be made of the water quality released from relatively shallow but stratified Texas impoundments was developed. The Bohen-Grace model was satisfactory in predicting the thickness of the withdrawal zone and the magnitude of the velocity profile. Flow discharge profiles were estimated from the velocity profiles generated by the Bohen-Grace model. By measuring the water quality profile in the impoundment pool, predictions could be made for the water quality in the release. The methodology was evaluated by comparison of predicted and observed water quality for the releases from Lake Livingston under various reservoir operating conditions. Also, the water quality characteristics which were of significant importance to warrant a reservoir operating program based on selective withdrawal were determined. A three year field study with primary emphasis on nutrients was undertaken as Lake Livingston filled. Nitrogen was found to be the limiting nutrient while other environmental variables such as temperature, light, mixing and river inflow rate did not appear to control phytoplankton growth. Algal growth potential bioassays were also conducted. (Galwardi-Texas)
W72-14377

STUDIES ON OYSTER CULTIVATION IN THE DRAINAGE BASIN OF OSTEND (BELGIUM) DURING 1969,
Institut Royal des Sciences Naturelles de Belgique, (Belgium).
For primary bibliographic entry see Field 04A.
W72-14378

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-14392

SOME ENVIRONMENTAL FACTORS TO BE CONSIDERED IN THE DESIGN OF THERMAL POWER PLANTS IN THE NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
E. O. Salo.
The Trend in Engineering, Vol 21, No 4, p 3-7, 32, October 1969. 6 fig, 8 ref.

Descriptors: *Thermal pollution, *Thermal powerplants, *Ecology, Intakes, Outlets, Pacific Northwest U.S., Fouling, Cooling water, Chlorination, Temperature, Velocity, Heated water, Radioactive wastes, Slime.
Identifiers: Travel time.

Recent literature describing the environmental effects of existing thermal powerplants on the Pacific coast is reviewed, with considerations of intake and discharge design, velocity control, travel time, and the size and extent of influence of the heated water discharges and the discharge of low level radioactive wastes. The velocity of water from the intake through the condenser is usually 7-8 fps. Since the condenser tubes are 30-60 ft in length, the heating of water takes place in 4-9 sec. Water is heated about 15 to 25F at maximum generation load, and then is discharged at a rate that varies from 4-8 fps. For economic reasons and maintenance purposes, shoreline intakes are preferred by some companies. These allow for screening of large areas to decrease the intake velocities and facilitate cleaning of screens. A recent projection showed that the maximum effect of all 16972 Mw of power plant capacity in California tidal waters would be that a total of 5.86 square miles of surface water would be raised 2F above normal and a total of 0.41 square miles would be included in the 10rise isotherm. Fouling organisms and their control are discussed. (Upadhyaya-Vanderbilt)
W72-14394

COOLING TOWER PLUME RISE,
General Electric Co., Schenectady, N.Y. Energy and Environmental Programs.
D. H. Brown, and H. J. Sneck.
Proceedings of the American Power Conference, Vol 33, p 546-553, 1971. 5 fig, 2 tab, 7 ref.

Descriptors: *Cooling towers, *Buoyancy, *Air, *Heat transfer, *Temperature, Air entrainment, Air temperature, Heat, Momentum transfer, Model studies, Air pollution, Nuclear powerplants, Density stratification, *Thermal pollution.
Identifiers: *Plume rise, *Air buoyancy, Adiabatic lapse rate, Isentropic rise, Modeling criteria, Atmospheric inversion, Buoyant plumes.

From the parametric evaluation of plume rise with fixed initial conditions into a ground level atmospheric inversion it is found that both zero buoyancy altitude and maximum rise altitude are greatest when the entire thermal exhaust is concentrated in a single plume and not sub-divided into several plumes. The zero buoyancy plume rise is increased when the source has the greatest diameter and the least upward velocity. These plumes can be modeled in an atmospheric research facility. The means of integrating the basic relations from Morton, Taylor and Turner are presented as a more direct engineering approach than the extended consideration of forced plumes by Morton in actual applications; direct integration is mandated by the variation of atmospheric temperature gradient with altitude as well as consideration of condensation effects as in Morton. (Oleszkiewicz-Vanderbilt)
W72-14396

CHARACTERISTICS, CLASSIFICATION AND INCIDENCE OF PLUMES FROM LARGE NATURAL-DRAFT COOLING TOWERS,
Metropolitan Edison Co., Reading, Pa. Three Mile Island Nuclear Station.
G. F. Bierman, G. A. Kunder, J. F. Sebald, and R. F. Visbisky.
Proceedings of the American Power Conference, Volume 33, p 535-545, 1971. 4 fig, 6 ref.

Descriptors: *Cooling towers, *Density, *Air pollution, Evaporation, Buoyancy, Clouds, Meteorology, Statistics, Nuclear powerplants, Cooling water, Fallout, Analysis, *Thermal pollution.
Identifiers: *Plume rise, *Inversion, *Plume classification, *Natural draft towers, *Drift, Ground level meteorology, Plume penetration, Salt fallout.

It has been deduced that plume penetration of inversions and/or plume rise is in direct proportion to the diameter of the plume discharge section of evaporative cooling towers. The new tentative standard for cooling tower drift quantity of 0.03 percent of cooling water flow is a major improvement in relation to reducing the possible effects of salt fallout on the local ecology. The plume classification technique developed in conjunction with the Keystone and Three Mile Island studies has been useful in describing plume type, incidence, and characteristics. The Keystone studies indicate that there is a reasonable possibility of predicting, from published weather data, the nature and frequency of natural draft cooling tower plumes of the Category 1 type. Estimates of the nature and frequency of cooling tower plumes of the Category 2 type can be made from the incidence of inclement, low overcast weather based on published weather reports associated with the area under consideration. (Oleszkiewicz-Vanderbilt)
W72-14397

THERMAL DISCHARGES - AN OVERVIEW,
Bargent and Lundy, Chicago, Ill.
T. D. Kolflat.
Proceedings of the American Power Conference, Volume 33, p 412-426, 1971. 5 fig, 52 ref.

Descriptors: *Thermal powerplants, *Heat, *Environmental effects, *Legislation, *Cooling, *Cooling towers, Optimization, Performance, Cooling water, Costs, Beneficial use, Evaporation, *Thermal pollution, Heating, Heat transfer, Fossil fuels, Bibliographies.
Identifiers: *Heat rejection, *Heat utilization, Thermal steam cycle, Thermal efficiency, Central generation station, Natural draft, Forced draft, Dry air coolers, Cooling lakes, Surface cooling, Cooling cycles.

An overview of thermal discharges resulting from electric power generation has been presented, dealing with the source of the heat, the impact on the environment, beneficial uses of heat, related legislation, cooling devices, and cooling system arrangements and costs. The following conclusions were made: the highly developed thermal steam cycle is an efficient heat machine with a relatively small heat discharge per unit of generation and will be the major source for electrical demands. Total heat rejection to the environment from all prime movers could be reduced if a greater proportion of power generation were reallocated to the thermal steam cycle from other less efficient heat engines. Projected magnitudes of total heat rejection to the environment from all electric generation in the future are small compared with natural heat contributions, such as solar energy. For surface cooling less water surface area is affected with higher temperature thermal discharges. Optimization studies should be made of entire systems to ensure the most economic selection. The use of comparative cost generalizations of different cooling systems is extremely hazardous. Each specific installation should be analyzed by experienced personnel having direct and current exposure to the subject. (Oleszkiewicz-Vanderbilt)
W72-14399

ASSESSING TEMPERATURE EFFECTS WITH BIOLOGY,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Biological and Chemical Section.
For primary bibliographic entry see Field 05C.
W72-14401

COOLING WATER STRUCTURES FOR FITZPATRICK NUCLEAR PLANT,
Stone and Webster Engineering Corp., Boston, Mass.
R. W. Gunwaldsen, B. Brodfield, and G. E. Hecker.
Journal of the Power division, Proceedings of ASCE, Vol. 97, No. P04, Proc. Paper 8572, p 767-781, December 1971. 7 fig, 10 ref.

Descriptors: *Nuclear powerplants, *Discharge (Water), *Cooling water, *Lakes, *Model studies, Temperature, Structural design, On-site investigations, Intakes structure, Thermal powerplants, Hydraulic models, Discharge measurement, *New York, Thermal pollution.
Identifiers: *Thermal-hydraulic model, *Fitz-Patrick powerplant (NY), Discharge structure, Measuring stations, Diffuser nozzles.

To comply with New York State temperature criteria, the condenser cooling water of the James A. FitzPatrick Nuclear Power Plant, located on Lake Ontario, will be discharged through a submerged diffuser. The discharge structure will be located in an average water depth of 30 ft and will consist of six pairs of nozzles, each 2.5 ft in diameter connected by a riser to a tunnel excavated in bedrock under the lake bottom. The cooling water intake will be sector shaped and located shoreward of the line of nozzles. The design of intake and discharge structures are based on hydraulic model studies. Data for the model studies were obtained from surveys in the lake aimed at defining natural wind induced currents and temperature distributions. (Oleszkiewicz-Vanderbilt)
W72-14403

PREDICTING QUALITY EFFECTS OF PUMPED STORAGE,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 05C.
W72-14405

INFORMATION SOURCES ON WATER QUALITY INCLUDING THERMAL POLLUTION.

Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol. 98, No. SA3, p 569-578, June 1972. 3 ref.

Descriptors: *Water quality, *Thermal pollution, *Information retrieval, *Publications, Abstracts, Documentation, Bibliographies, Reports, Sanitary Engineering, Water pollution, Indexing.

The Thermal Pollution Committee of ASCE's Sanitary Engineering Division has made an in-depth investigation of the new literature on thermal pollution, of methods for efficient retrieval, and of the forms in which the data are available. A number of competent information retrieval systems and abstracting services have been established. Comprehensive coverage of retrieval systems containing information on thermal pollution is presented in this report. These data include location of the retrieval, how they can be used, approximate costs, the format in which data are made available, and whom to contact. Sources include a list of retrieval systems, Water Resources Scientific Information Center, National Technical Information Service, Smithsonian Institute's Science Information Exchange, National Aeronautics and Space Administration, Atomic Energy Commission, National Referral Center of the Library of Congress, Tennessee Valley Authority, Department of Army Waterways Experiment Station, American Water Resources Association, Engineering Societies Library, Engineering Index, Inc., and Edison Electric Institute. (Eagle-Vanderbilt)
W72-14406

ENERGY USE IN CALIFORNIA: IMPLICATIONS FOR THE ENVIRONMENT,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 05C.
W72-14408

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 06D.
W72-14411

WATER CONSUMPTION STUDY FOR NAVAJO PLANT,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
P. Leung, and R. E. Moore.
Journal of the Power Division, Proceedings of ASCE, Vol. 97, No. P04, Proc. Paper 8564, p 749-766, December 1971. 5 fig, 7 tab, 5 ref.

Descriptors: *Cooling towers, *Powerplants, *Water consumption, *Arizona, Evaporation, Heat balance, Power, Water rights, Weather data, Condensers, Thermal electric powerplant, *Thermal pollution, Water pollution control.
Identifiers: *Navajo powerplant (Ariz), Lake Powell, Heat dissipation, Make-up water.

As suitable sites for very large steam-electric generating plants along natural waterways become more scarce, the use of cooling towers for purposes of cooling plant waste heat will increase. Water quantities available for withdrawal and consumption will also become limited, especially as electric production increases and the number of plants and their sizes increase. As the Navajo plant site near Page, Arizona, the water source is

Lake Powell, which is more than adequate for the proposed generating station. However, there is a limitation on the amount of water that can be withdrawn for the Navajo plant; this limitation is determined by the water rights that can be obtained. This paper analyzes these problems, presents an analytical heat-and-mass balance method for accurately determining the evaporative losses for cooling towers, reviews the influential effects of plant site atmospheric conditions on cooling tower evaporative losses, and presents other factors affecting water consumption, such as type of plant (nuclear or fossil), unit size, steam conditions, and plant loading characteristics. (Oleszkiewicz-Vanderbilt)
W72-14413

EFFECTS OF POLLUTION CONTROL ON THE FIRM,
RAND Corp., Santa Monica, Calif.
D. P. Tihansky.
Available from the National Technical Information Service as AD-737 681, $3.00 in paper copy, $0.95 in microfiche. October 1971. 13 p, 2 tab, 15 ref.

Descriptors: *Pollutants, *Pollution abatement, *Regulation, *Economic impact, Industrial wastes, Waste treatment, Costs, Benefits, Profit, Cost-benefit analysis.

The imposition of legal constraints on waste emissions has forced American industries to more than double their outlays for air and water quality control over the past five years. Future prospects of more stringent regulations imply that a doubling of present expenditures within the next five years is not improbable. The impact of environmental quality regulations on the financial position of a firm is a function of treatment costs, in-plant benefits, and external economies. While treatment costs may reduce profits, generally the cost of waste abatement and disposal is low relative to other production costs. Water treatment expenses, for example, commonly run about 2.5 percent of total capital investment. Furthermore, the treatment cost impact is mitigated by the benefits accruing to the firm. These benefits include cleaner working conditions, higher labor efficiency and productivity, fewer losses of income from absenteeism, reduced maintenance of buildings and yards, better visibility in the vicinity of the plant, and improved public and employee relations. Once these benefits are included in the cost-benefit calculus, the impact of pollution control regulations may not be as adverse as is commonly believed. (Settle-Wisconsin)
W72-14420

PHOSPHATES, HEAVY METALS, AND DDT: POLLUTION CONTROL COSTS AND IMPLICATIONS,
J. F. Brown, Jr.
In: Man's Impact on Terrestrial and Oceanic Ecosystems. MIT Press, Cambridge, Massachusetts. 1971. Chapter 32, p 489-498. 6 ref.

Descriptors: *Phosphates, *Heavy metals, *DDT, *Pollution abatement, Pollutants, Environmental effects, Eutrophication, Costs, Water pollution control.

Phosphate discharges into waterways have resulted in serious eutrophication of many lakes and rivers. The techniques available for controlling this problem include (1) reducing agricultural phosphate emissions through better agricultural management practices, (2) applying phosphate-removal technology to industrial discharges, (3) reducing or eliminating the phosphates in detergents, and (4) removing phosphate from sewage. The major cost of implementing these policies would be in the price of detergents. The heavy metals that pose problems for the aquatic environment include mercury, lead, nickel, cadmium, manganese, chromium, copper, and zinc. The technology for removing these metals is readily available. However, it must be applied as close to the point of origin as possible because of the dilutions involved. DDT presents a problem because it has translocated to lakes and oceans, accumulated in the biological food chain, and reduced the populations of many species of plankton, crustaceans, mollusks, fish, and birds. The strategies available for reducing DDT pollution include (1) minimizing its use, (2) improving application equipment, (3) improving the formulation, (4) using a nonpersistent substitute, (5) using nonchemical methods of pest control, and (6) eradicating the pest. (Settle-Wisconsin)
W72-14424

EFFECTIVE POLLUTION CONTROL IN INDUSTRIALIZED COUNTRIES: INTERNATIONAL ECONOMIC DISINCENTIVES, POLICY RESPONSES, AND THE GATT,
Colorado Univ., Boulder.
F. L. Kirgis, Jr.
Michigan Law Review, Vol 70, No 5, p 859-918, April, 1972. 4 fig.

Descriptors: *Pollution abatement, *Taxes, *Legal aspects, Environmental effects, Economic efficiency.
Identifiers: *International trade, *Consumption tax, *Economic disincentives, Production tax, Policies.

Effective pollution control will probably increase prices. In the absence of comparable pollution control by most or all of a nation's trading partners, these price increases are likely to result in reduced domestic output, a decrease in employment in the affected industries, and a worsening of the balance of payments position. Analysis of the substantive rules of the General Agreement on Tariffs and Trade (GATT) indicates that the consumption tax is the one permissible pollution-control device, despite the fact that the tax directly affects trade. However, uncoordinated consumption measures among polluting countries could amount to formidable nontariff trade barriers. Consequently, the economic argument for effective multinational coordination of pollution control efforts in the developed countries is stronger than has been generally realized. In the absence of effective coordination, GATT provides some rules and procedures that can be used to try to find a balance among liberal trade policies, national full-employment objectives, and pollution-control imperatives. Without multinational cooperation, however, the GATT provisions seem unlikely to deter environmentally-concerned countries from adapting new trade measures. Such measures could, in turn, lead to a new era of protectionism and economic instability. (Settle-Wisconsin)
W72-14426

WATER RESOURCES PLANNING STUDIES OKLAHOMA AND ARKANSAS, PHASE II (QUALITY),
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
D. F. Kincannon, W. Kao, and E. L. Stover.
Available from the National Technical Information Service as PB-212 276, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute Technical Completion Report, August 1971, 148 p, 24 fig, 5 tab. OWRR B-006-OKLA (6).

Descriptors: *Water quality, *Management, *Regional analysis, *River basin development, *Mathematical models, Design flow, Computer programs, Biochemical oxygen demand, Optimization, Organic loading, Linear programming, Oklahoma, Arkansas, Forecasting, Decision making.
Identifiers: *Arkansas River, Johnson SB distribution function, Low flow forecasting, *Zone treatment, Streeter-Phelps equation.

A mathematical model for decision making in water quality management of the Arkansas River was developed. The model centered around a zoned-optimization model which required a uniform treatment level for groups of waste waters only within grouped zones and which minimized the overall treatment. Results from low flow studies showed that the Johnson SB distribution function yielded better information for the purpose of making design flow selections. In extending the application of the zone treatment principle for regional water quality management, the feasibility of three zoning criteria were investigated. These three criteria were sub-basin, weight of influent BOD and BOD-flow ratio. A regional water quality management model involving the interrelationship of organic waste discharged, the stream assimilative capacity and the dissolved oxygen in the stream was formulated into a linear structure with an application of the Streeter-Phelps equation. The total BOD removal within the basin in pounds per day, was selected as the optimization objective. It was shown that the 'sub-basin', and 'BOD-flow ratio' were two good zoning criteria. (Galwardi-Texas)
W72-14432

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
G. W. Carey, L. Zobler, M. R. Greenberg, and R. M. Hordon.
Available from the National Technical Information Service as PB-212 253, $6.75 in paper copy, $0.95 in microfiche. Center for Urban Policy Research, Rutgers University, New Brunswick, N.J., 1972. 214 p, 36 fig, 50 tab, 119 ref, 4 append. OWRR C-1629 (No 3147) (1).

Descriptors: *Monitoring, *Data collections, *Cities, *Management, *Regional analysis, Urbanization, Water policy, *Simulation analysis, *Model studies, Data storage and retrieval, *Water quality standards, Treatment facilities, New York.
Identifiers: *New York-New Jersey Metropolitan Region, *Long Island, New York Harbor, *Industrial coefficients of waste water, Small area population projections, *Water surveillance, *Metropolitan water resources management.

The water surveillance network of supply and waste disposal systems of the New York Metropolitan Region was examined in detail. The structure, operation, data storage and exchange were found to be inadequate for the integrated management of the region's water resources. The viability of the urban water regime is totally dependent on chlorination technology, but the monitoring system plays a negligible role. Recommendations were made for the improvement of the surveillance net. From the best data subsets a pollution simulation model was developed and tested, using several parameters of urbanization as independent variables, population growth, percent impermeable surface, industrial waste coefficients. The results of the simulation of future behavior indicate that the policy of favoring large regional sewage plants is questionable and that there may be an ecologic ceiling to further development if water quality is to be maintained. (See also W69-06201)
W72-14437

PROCEEDINGS OF CONFERENCE ON INLAND LAKE RENEWAL AND SHORELAND MANAGEMENT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
G. Hollenstein, S. M. Born, T. Wirth, E. Bruck, and J. O. Peterson.
Available from the National Technical Information Service as PB-212 278, $3.00 in paper copy $0.95 in microfiche. Water Resources Research Center, Bulletin 53, June 1972. 35 p. OWRR A-999-MINN (25).

Descriptors: *Lakes, *Management, *Shores, Wisconsin, Minnesota, Eutrophication, Agencies, Ordinances, Water quality, Ecosystems, Nutrients, Dittoral zone, Dredging, Urban runoff, Legislation, Water pollution control.
Identifiers: *Lake renewal, *Shoreland management, *Lake demonstration project, Lake improvement associations, Weed harvesting, Winter kill, Lakeshore properties.

The program of the Conference included an introduction and overview of the program of the Inland Lake Demonstration and Shoreland Management Project of Wisconsin. Reports were presented on selected lake renewal activities, selected shoreland management and development activities and shoreland management educational programs. Projects were described involving chemical inactivation of nutrients, nutrient exclusion/dilutional pumping, rehabilitation of a small flowage, urban runoff, characterization private controls for recreational land development, shoreland development, and lake rehabilitation legislation and programs. The progress of Minnesota's shoreland program and activities in lake demonstration projects was described. Alum was used successfully for chemical inactivation of nutrient in an overfertilized small lake in Wisconsin. Dilutional pumping resulted in some success in reducing the phosphorus content of another lake. Plastic sheeting, in combination with sand and gravel blankets on the bed of a millpond, was used to control aquatic plants. With regard to water-oriented recreational developments, it was suggested that an automatic property owners association can provide a mechanism for maintaining and managing the common open space and facilities to which individual lake lot owners have common rights. A nation-wide survey disclosed that explicit statutes saying that a local unit of government or State agency is authorized to project, manage, or rehabilitate lakes are rare. (Walton-Minnesota)
W72-14439

DAILY AND SEASONAL DRIFT OF ORGANISMS IN A WARMWATER STREAM,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02I.
W72-14440

GROUND WATER INFILTRATION AND INTERNAL SEALING OF SANITARY SEWERS.
Montgomery County Sanitary Dept., Dayton, Ohio.

Copy available from GPO Sup Doc EP2.10.11020DHQ06/72, $0.75; microfiche from NTIS as PB-212 267, $0.95. Environmental Protection Agency Water Pollution Control Research Series, June 1972. 71 p, 19 fig, 1 tab. EPA Program No. 11020DHQ 06/72.

Descriptors: *Water pollution control, *Sewers, *Sewerage, *Joints (Connections), *Leakage, *Infiltration, Inflow, Seepage, Infiltration rates, Pipe flow, Storm water, Storm runoff, Groundwater movement, Ohio, Peak discharge, On-site investigations, Inspection.
Identifiers: *Montgomery County (Ohio), Sealing sanitary sewers, Illicit sewer connections, Televised sewer inspection.

A program for pollution abatement was undertaken by the Montgomery County Sanitary Engineering Department in Southwest Ohio to study the effects of infiltration reduction by joint sealing and to study closed circuit television techniques. Water pollution from municipal wastewater treatment plants would be reduced if peak flows from rainfall could be reduced. This study evaluates the effects of remedial repairs to joints by use of pressure grouting of small main line sewers. A minimal measurable amount of quantity flow reduction was attributed to the sewer sealing program. Infiltration from extraneous storm water, illegal connections, and basement underdrains seem to outweigh the contribution due to leaky joints to such a degree that reduction due to joint sealing was obscured. The study does show the significance of internal television system as an inspection and maintenance tool. This information on costs, operation, and procedure is of value to anyone interested in this field. (Poertner)
W72-14441

THE TEXAS WATER QUALITY ACT.
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 06E.
W72-14443

INDUSTRIAL WASTEWATER DISCHARGES.
New York State Dept. of Health, Albany. Div. of Pure Water.
For primary bibliographic entry see Field 05A.
W72-14444

METHOD AND APPARATUS FOR CONTAINING WELL POLLUTANTS,
C. G. Riester.
U. S. Patent No. 3,561,220, 2 p, 6 fig; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 507, February 9, 1971.

Descriptors: *Patents, Oil spills, *Oil wastes, *Oil wells, *Pollution abatement, Separation techniques, Equipment, Water pollution control, Oil pollution, Water pollution treatment.

Offshore well pollutants are contained by an annular submerged caisson which is placed to surround an offshore well point. The caisson has an annular axially expansible water impermeable member secured at its lower end to the top of the caisson and extending to the waterline to form a liquid barrier around the well point. If oil or other contaminants spill into the water they can be pumped or clam-shelled into a barge or other vessel alongside the caisson. (Sinha-OEIS)
W72-14451

OIL SLICK DISPERSION APPARATUS,
W. H. McNeely.
U. S. Patent No. 3,561,601, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 2, p. 604, February 9, 1971.

Descriptors: *Patents, *Dispersion, *Oil pollution, *Oil spills, Oil wastes, Water pollution control, Water pollution treatment, Pollution abatement, Equipment.
Identifiers: *Chemical disperants.

A boat is driven in a predetermined path through the oil slick, the bow wave of the boat separating and concentrating the oil along the sides of the boat. A chemical dispersant, mixed in a controlled ratio with water, is ejected under high pressure from nozzles mounted near the bow. The nozzle action sweeps the dispersant across the oil in a side path on both sides of the boat. At each pass of the boat a wide swath is cut through the oil. This permits rapid dispersion of an oil slick over a large area with minimum contamination of the water. (Sinha-OEIS)
W72-14453

AERATION APPARATUS,
Owens-Illinois, Inc., Toledo, Ohio. (Assignee).
S. F. Galeano.

Descriptors: *Patents, *Aeration, Equipment, Water treatment, *Pollution abatement, Water pollution control, Water pollution treatment.

The floating self-propelled water aerating unit contains a power driven rotor mounted so that it rotates about a horizontal axis. Particles of water are forced out of and away from the water surface. A flat baffle plate is mounted at 45 degrees with the surface of the water and extends above and below the water as it intercepts the water particles in motion. As the turbulence is created large quantities of air are transferred into the water. (Sinha-OEIS)
W72-14454

INFLATABLE FLOATING BOOMS,
M. F. Smith, and R. M. Blair.
U. S. Patent No. 3,563,036, 4 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 946, February 16, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Oil wastes, *Skimming, *Flotsam, *Pollution abatement, Water pollution control, Water pollution treatment, Equipment, Separation techniques.
Identifiers: *Booms (Floating).

An elongated thin flexible fin is combined with a longitudinally spaced complex of individually inflatable buoyant floatation pockets. Automatic inflation of successive pockets occurs upon unfolding deployment of the booms. Compressed gas charge cylinders are triggered by the unfolding process and provide the inflation pressure. The equipment in deflated condition may be air dropped at the required oil spill site. (Sinha-OEIS)
W72-14457

METHOD OF REMOVING FLOATING CONTAMINANTS FROM STREAMS,
F. B. Thomas.
U. S. Patent No. 3,563,380, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 3, p. 1030, February 16, 1971.

Descriptors: *Patents, *Oil pollution, Oil wastes, Oily waster, *Flotsam, *Skimming, Barriers, *Pollution abatement, Water pollution control, Water pollution treatment, Equipment, Separation techniques.

A floating barricade is positioned at an angle to a flowing stream extending across it. It collects contaminants flowing with the stream. The contaminants, oil, grease, and other floating materials are directed towards a particular section and may be removed manually or otherwise skimmed from the surface. (Sinha-OEIS)
W72-14458

PURIFICATION SYSTEM FOR ORGANICALLY CONTAIMINATED WATER,
For primary bibliographic entry see Field 05D.
W72-14460

FLEXIBLE FLOATING BOOMS,
M. F. Smith.
U. S. Patent No. 3,564,852, 3 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 883, No 4, p 1390, February 23, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Separation techniques, Water pollution control, Water pollution treatment, Pollution abatement.
Identifiers: *Booms (Floating).

A high strength steel reinforcing cable is anchored along one side of a polymer fin closely adjacent to the undersides of longitudinally separated buoyant floats. The fin lengths are greater than the corresponding cable lengths. The excess fin length facilitates flexing of the resulting boom structure in all directions. The boom conforms to the troughs and crests of steep choppy waves. It is employed to enclose and confine a body of floating oil on the surface of the water. (Sinha-OEIS)
W72-14463

OIL WATER SEPARATION SYSTEM FOR TANKERS,
Esso Research and Engineering Co., Linden, N.J. (assignee).
J. J. Sheehy, and P. A. Sait.
U. S. Patent No. 3,565,252, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1492, February 23, 1971.

Descriptors: *Patents, *Pumps, *Oil wastes, *Oily water, *Oil pollution, Equipment, Pollution abatement, Water pollution control, Water pollution treatment, Separation techniques.
Identifiers: Oil tankers, *Oil-water separation.

A high capacity pump and a low capacity pump remove water which has settled to the bottom of the tank. One pump is used for decanting, the other is deactivated by an oil/water interface sensor thereby reducing the risk of discharging contaminated water during decanting. Two oil water separators are used. The second operates on a coalescing principle whereby very fine droplets of oil remaining in the effluent will be removed so that water passing out will be below a given oil water concentration. (Sinha-OEIS)
W72-14465

FLOATING BARRIER FOR WATER POLLUTANTS,
C. Cavalieri.
U. S. Patent No. 3,565,257, 2 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 883, No. 4, p 1493, February 23, 1971.

Descriptors: *Patents, *Flotsam, *Oil wastes, *Barriers, *Liquid wastes, Water quality, Water pollution treatment, Water pollution control, Pollution abatement, Separation techniques, Equipment, *Absorption.

The floating barrier consists of a central rope of polypropylene fiber with a layer of polystyrene surrounding it. There is a second layer of a mixture of polypropylene granulor polystyrene. The mixture is contained within a netting of polypropylene fiber. The barrier has substantial ability to absorb polluting liquids suspended in the water, such as oil, or other fluids that have a specific gravity less than water. (Sinha-OEIS)
W72-14466

OIL LEAKAGE BARRIER,
E. E. Headrick.
U. S. Patent No. 3,567, 019, 4 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 884, No. 1, p 158, March 2, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Barriers, Water pollution control, Water quality, Water pollution treatment, Pollution abatement, Separation techniques.

An elongated hollow and flexible structure consists of two chambers. The ends of the structure are secured to define a boundary of predetermined area. A buoyant distention is created in the first chamber. The structure floats with a transverse section extending below the surface and a portion extends a predetermined distance above the surface. The structure rises and falls with the ebb and flow of the waves and confines the substance such as oil. By attaching a bag or container to the exterior of the structure, the weather and wave action can be used to 'pump' the oil into a container for storage for later retrieval. (Sinha-OEIS)
W72-14470

UNDERGROUND WASTE MANAGEMENT AND ENVIRONMENTAL IMPLICATIONS - A SYMPOSIUM.
American Association of Petroleum Geologists, Inc., Midland, Tex.
American Association of Petroleum Geologists Bulletin, Vol. 55, No. 11, p 2078-2098, November 1971.

Descriptors: *Waste disposal, *Injection wells, *Radioactive waste disposal, Industrial wastes, *Underground waste disposal, Environmental engineering, *Abstracts.

A general outline is presented of a symposium on underground waste disposal held in Houston. Thirty-five speakers were assembled from private practice, universities, industry, and governmental agencies to present their findings, and abstracts of all their papers are given. (Campbell-NWWA)
W72-14480

RUBBER FIBER WELL SEAL.
For primary bibliographic entry see Field 08B.
W72-14499

BACTERIOLOGICAL AND CHEMICAL FACTORS IN INDUCED INFILTRATION,
F. H. Klaer, Jr.
Ground Water, Vol 1, No 1, p 38-43, January, 1963. 8 ref.

Descriptors: *Logging (Recording), Water wells, Drilling, *Water quality, Saline water, Aquifer characteristics, *Conductivity.
Identifiers: Temperature survey, *Sample logs, Brown water.

The lowering of ground-water levels by pumping from horizontal or vertical wells near a surface stream may cause water to move from the stream into the water-bearing materials by the process known as induced infiltration. In such cases, the natural deposits of sand and gravel serve as large natural filter beds effectively removing or reducing turbidity, organic material and pathogenic bacteria. This paper discusses the general processes by which such removal is accomplished as well as the significance of certain changes in chemical characteristics of the water as it passes from a surface source to an underground point of collection. By a better understanding of the processes involved, the bacteriological and chemical quantities of infiltrated water supplies can be improved. (Campbell-NWWA)
W72-14504

TECHNIQUES OF EVALUATING EFFECTS OF WATER ON DRAINAGE STRUCTURES IN ALABAMA,
Geological Survey of Alabama, Montgomery. Water Resources Div.
For primary bibliographic entry see Field 08G.
W72-14522

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
R. E. Frenette.
Technical Report 34, December 1971. 221 p, 7 fig, 12 tab, 4 append, 203 ref. OWRR C-1196 (1963) (1).

Descriptors: *Great Lakes, *Water quality control, *Water pollution, *Waste treatment, *Planning, Decision making, Effluents, Eutrophication, Discharge (Water), Sewage, Sewage treatment, Waste water treatment, Industrial wastes, Municipal wastes, Thermal pollution, Domestic wastes, Harbors, Waste identification, Project planning, Project purposes, International commissions.

A strategy is presented for developing a water quality management plan for the Great Lakes. The plan would encompass a wide range of activities from preservation to restoration of water quality. The strategy is developed through a traditional planning framework including problem identification and description, value and goal development, alternative identification and evaluation, and ultimate choice. Five classes of discharge that must be controlled are standard metropolitan statistical area discharges; water-using industries; combined-sewers; ports, harbors and marinas; and electric power generating plants. The efforts which the United States government should take are emphasized, however, the Canadian viewpoint is considered. The strategy is designed to meet the water pollution reduction goals of the Great Lakes while permitting the satisfaction of human wants and needs. Complete freedom from institutional constraints should be maintained in order to design optimal water quality control plans that apply the full range of science and technology, economies of scale, and management. (Grant-Florida)
W72-14544

PRIVATE COMPENSATION FOR INJURIES SUSTAINED BY THE DISCHARGE OF OIL FROM VESSELS ON THE NAVIGABLE WATERS OF THE UNITED STATES,
Miami Univ., Fla. Sea Grant Institutional Program.
T. R. Post.
Available from the National Technical Information Service as COM-72-10364, $4.85 in paper copy, $0.95 in microfiche. Sea Grant Technical Bulletin, No 22, January 1972. 79 p, 1 tab, 206 ref.

Descriptors: *Oil pollution, *Oil spills, *Compensation, *Legal review, Judicial decisions, Water law, Legal aspects, Watercourses (Legal aspects), United States, Water pollution sources, Oil wastes, Federal government, State governments, Oil industry, Ships, Oceans, Legislation, Constitutional law, Water pollution effects, Negligence, Navigable waters, Federal jurisdiction, Law enforcement.
Identifiers: *Coastal waters, Sovereign immunity, Absolute liability.

This study examines the methods by which private persons may seek compensation for damage they sustain from the discharge of oil from vessels on the navigable waters of the United States. The sources and consequences of such discharges are discussed. Fault, strict liability, and absolute liability are noted as different standards of liability. Procedural aspects are covered, including jurisdiction, choice of a forum and sovereign immunity. The availability of compensation is discussed based on tort liability; federal anti-pollution statutes, including the Water Quality Improvement Act and the Refuse Act; state anti-pollution statutes; and international conventions. Several proposals to enhance the availability of compensation to persons injured by oil discharges are discussed. Additional state statutes offer little hope because of constitutional restrictions. A judicial declaration that transporting oil at sea in bulk is an ultrahazardous activity is one alternative. Another alternative is the establishment of a federal relief fund to compensate parties injured by an oil discharge. (Brackins-Florida)
W72-14545

SCL SPONSORED 'EXCURSION' INTO FORESTRY, ECOLOGY, AND NATURAL RESOURCES IN SOUTH CAROLINA,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14547

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 06G.
W72-14548

OIL POLLUTION PROBLEMS ARISING OUT OF EXPLOITATION OF THE CONTINENTAL SHELF: THE SANTA BARBARA DISASTER,
D. J. Walmsley.
San Diego Law Review, Vol 9, No 3, p 514-568, 1972. 253 ref.

Descriptors: *California, *Oil spills, *Well regulations, *Legal aspects, Judicial decisions, Law of the sea, Common law, Constitutional law, Legal review, Continental shelf, Environmental effects, Water pollution, Water pollution sources, Social aspects, Damages, Economic impact, Oceans, Pacific Ocean, Federal jurisdiction, State jurisdiction.

The 1969 Santa Barbara channel oil well 'blow-out' is a good illustration of the inadequacy of both governmental control of off-shore drilling and the legal system's conflict resolution capacity. Three lawsuits that grew out of the blow-out and the alternative theories of liability are analyzed. A suit by the state of California against the United States was grounded in negligence under the Tort Claims Act. In the suit by California against Union Oil a state jurisdictional problem arose since the drilling occurred on the continental shelf. Five separate theories of liability were advanced in the case including strict liability for escaping substances and violation of state law. The final case was a private class action against Union Oil based on strict liability and negligence. A separate discussion is presented on the question of damages. Modern statutory pollution law, case law, and international conventions relating to pollution control are outlined. The blow-out demonstrates the need for a legal mechanism for internalizing the external economic and social costs of off-shore oil drilling. (Grant-Florida)
W72-14550

EXEMPTIONS FROM NEPA REQUIREMENTS SOUGHT FOR NUCLEAR PLANTS, POLLUTION PERMITS,
For primary bibliographic entry see Field 06E.
W72-14551

WATER POLLUTION--PENALTY.
For primary bibliographic entry see Field 06E.
W72-14554

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.
For primary bibliographic entry see Field 06B.
W72-14556

INTERNATIONAL COOPERATION IN THE HUMAN ENVIRONMENT THROUGH THE UNITED NATIONS.
For primary bibliographic entry see Field 06E.
W72-14557

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 06G.
W72-14558

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14561

WATER TREATMENT FACILITIES, FOSS RESERVOIR, CUSTER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Fort Worth, Tex. Region VI.
For primary bibliographic entry see Field 05F.
W72-14563

TRAINING DIKE AND BREAKWATER, EVERETT HARBOR, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14566

ALTERNATE DISPOSAL METHOD FOR DETROIT AND ROUGE RIVERS, WAYNE COUNTY, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.

Available from the National Technical Information Service as PB-206 559D. $3.00 in paper copy, $0.95 in microfiche. January 10, 1972. 25 p, 3 plate, 2 tab, 4 ref.

Descriptors: *Spoil banks, *Michigan, *Environmental effects, *Waste disposal, *Facilities, Dikes, Disposal, Environmental engineering, Administrative decisions, Water pollution, Dredging, Sediment control, Channel improvement, Project planning, Alternate planning, Lake Erie, Lake Huron.
Identifiers: *Environmental Impact Statements, *Detroit River (Mich), Rouge River (Mich).

The project involves construction of a contained disposal facility at Pointe Mouillee, Wayne County, Michigan, for polluted dredge spoil from the lower Detroit and Rouge Rivers. It is estimated that a combined annual total of 165,000 cubic yards of dredge spoil will be dumped. The facility includes an access channel, turning basin, mooring area, and pumpout station and will accommodate disposal for the two rivers for 10 years. Containment of the polluted dredge spoil will eliminate open lake dumping and remove a source of pollution from the open waters. Ultimate development of the site will provide a recreational facility for the people of southeastern Michigan. Adverse environmental effects include converting the area from open water and marsh land to dry land by filling the proposed 508 acre site, prohibiting boating in the area, and the noise from the operation. Additionally surface waters within the enclosure may become stagnant. There is danger of possible spills in transporting dredged materials, and the project will involve a loss of 365 acres of waterfowl habitat. Alternatives include resuming open lake dumping, discontinuing dredging, and alternative disposal sites. (Widman-Florida)
W72-14568

LINCOLN LAKE, EMBARRAS RIVER, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-14569

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14571

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14572

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.
For primary bibliographic entry see Field 08A.
W72-14575

CATTLE FEEDERS MUST COMPLY WITH ANTI-POLLUTION LAWS,
For primary bibliographic entry see Field 06E.
W72-14579

THE USE OF WASTE HEAT IN AGRICULTURE,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 03F.
W72-14584

A CURRENT PROBLEM IN THE ENVIRONMENTAL CRISIS, MERCURY POLLUTION, AND ITS LEGAL IMPLICATIONS,
Washington Univ., St. Louis, Mo. Center for Biology of Natural Systems.
For primary bibliographic entry see Field 06G.
W72-14631

RELATIONSHIPS BETWEEN SUPPLIES AND PROJECTED DEMANDS FOR WATER IN A SIX-COUNTY URBANIZING REGION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14639

A WATER QUALITY MODEL FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05B.
W72-14641

DISPERSION OF POLLUTANTS IN THE COASTAL WATERS OF THE SOUTHEASTERN UNITED STATES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05B.
W72-14651

MARSELLE-FOS: THE EQUIPMENT FOR A SEA SHORE; THE STABILITY TO PRESERVE, (MARSEILLE-FOS: L'EQUIPMENT D'UNE FACADE MARITIME; LES EQUILIBRES A PRE-SERVER),
Port Autonome de Marseille (France).
M. Pechere.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 3 p.

Descriptors: *Coasts, *Littoral, *Planning, *Area redevelopment, Industries, Urbanization, Tourism, Parks, Recreation facilities, Conservation, *Pollution abatement, Water pollution control.
Identifiers: *Port Marseille-Fos (France).

The littoral zone of the Port Marseille-Fos area is discussed. Prevention of damage to the shore is being considered as a part of the development plans for the area. In spite of the area becoming an important industrial site, plans are being laid for urbanization and tourism with natural parks and lakes in the hopes that such a design will aid in the prevention of pollution. (Ensign-PAI)
W72-14652

THE METHOD OF SEDIMENTATION OF HYDROCARBONS USED AT THE TIME OF THE 'TORREY CANYON' DISASTER: THE

NAUTEX HYDROPHOBE, (LA METHODE DE SEDIMENTATION,
Societe OMYA (France).
B. Vandon.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome II, 10 p, 6 fig.

Descriptors: *Oil spills, *Organic compounds, Water pollution effects, Sedimentation, *Physiocochemical properties, Hydrobiology, Ecology, Environmental effects, Water pollution control.
Identifiers: *Sedimentation method, Nautex Hydrophobe, 'Torrey Canyon'.

The sedimentation method used to remove oil spilled by the 'Torrey Canyon' is described with consideration of the possibilities of applying it to other areas. The physico-chemical and hydrobiological characteristics necessary for sedimentation agents used in the Nautex Hydrophope method are discussed. The effects on the ecology of the marine environment from the hydrocarbons spilled and from the use of the Nautex Hydrophobe removal method are considered. (Ensign-PAI)
W72-14653

VITAL CONDITIONS FOR THE ORGANIZATION OF A THALASSOTHERAPIE CENTER TO FACILITATE INDUSTRIAL MANAGEMENT OF THE LITTORAL, (CONDITIONS INDISPENSABLES POUR L'ORGANISATION D'UN CENTRE DE THALASSOTHERAPIE EN FONCTION DE L'AMENAGEMENT INDUSTRIEL DU LITTORAL),
Federation Internationale de Thalassotherapie.
For primary bibliographic entry see Field 05C.
W72-14654

THE ELIMINATION OF THE HYDROCARBONS IN THE SEA, (ELIMINATION DES HYDROCARBURES EN MER),
Centre National de'Etudes pour la Protection des Aliments, Materiaux et Etres Vivants.
P. Fusey.
In: Colloque International Sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome II, p 1-3.

Descriptors: *Oil pollution, Oily water, *Organic compounds, Cleaning, *Emulsions, *Surfactants, *Biodegradation, Environmental effects, Harbors, Beaches, Water pollution treatment, Water pollution control.
Identifiers: 'Le Sefoil', Molasses, Phosphomic acid, Terreous alcalino phosphate.

The removal of oil from the sea by Le Sefoil, a mixture of molasses, phosphoric acid and terreous alcalino phosphate is described. Le Sefoil, easily tolerated by marine organisms in concentrations of 120-300 ppm, combines with oil forming a stable emulsion that is biodegradable. It has no long term effects and is very efficient for use on beaches, cliffs and in harbors but is difficult to apply in the open ocean. A similar product in powder form is also discussed. (Ensign-PAI)
W72-14655

CURRENT VELOCITIES IN THE VICINITY OF THE GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT'S IONA ISLAND OUTFALL - 1968,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 05B.
W72-14657

THE SHELL 'OIL-SINKER METHOD',
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
M. M. Tadema, and Jongbloet.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I, 15 p, 16 fig.

Descriptors: *Oil wastes, *Oil pollution, *Oil spills, *Wetting, *Sands, *Surfactants, Water pollution control, Disasters.
Identifiers: *Oil Sinker Method, North Sea.

An oil sinking method that uses a wetting agent combined with sand dredged from the sea is presented. The Shell 'Oil-Sinker' Method was tested on Kuwait crude oil spilled in the North Sea. Approximately 95% of the oil sank immediately behind the dredger and came to rest over a 50 m stretch of the sea bed in waters about 25 m deep. Some oil reappeared on the surface but was very light and shifted with the wind. Fish catch and nets showed signs of oil contact, however, after rinsing the fish lost the odor and taste of oil. Birds seemed totally unaffected. The oil/sand mixture on the bottom was in the form of a fluffy loose layer which in a short time was completely mixed and covered with sand. At no time was the jettisoned oil found on the beaches. The method is recommended for disastrous cases of oil pollution but not for small-scale spills. (Ensign-PAI)
W72-14660

RISKS OF RADIOACTIVE POLLUTION OF THE OCEANS,
California Univ. Medical Center, San Francisco. Radioactivity Research Center.
Jerold M. Lowenstein.
In: Colloque International sur l'Exploitation des Oceans, Bordeaux, France, March 1971. Theme I, Tome I. 6 p.

Descriptors: *Water quality standards, *Radioactive wastes, *Nuclear explosions, Testing, *Fallout, *Nuclear powerplants, Ships, Radioactivity effects, Ecology, Public health, Safety factors, Regulation, Water pollution control.

Though radioactive pollution has been decreasing for the past 10 years, due to the cesation of atmospheric atomic weapon testing by the U.S. and U.S.S.R., the trend is about to be reversed as other nations resume nuclear weapon testing and as the numbers of nuclear plants and nuclear ships increase. The controversy as to the 'safe' concentration levels of these materials is debated. Standards and controls are discussed and the effects on ocean ecology and human health when these standards are not high and controls not rigorously enforced are assessed. (Ensign-PAI)
W72-14661

INDUSTRIAL FEASIBILITY OF MANMADE ISLANDS CONSTRUCTED FROM THE OFFSHORE DISPOSAL OF DREDGED SPOIL,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 05C.
W72-14662

WATER POLLUTION BY SEWAGE FROM WATER CRAFT,
Washington, Univ., Seattle. Coll. of Engineering.
For primary bibliographic entry see Field 05B.
W72-14663

DISCOLORATION OF ALGAL BLOOMS AND SEAWEEDS (VEGETATIONSFARBUNGEN UND WASSERBLUTEN),
Oesterreichische Gesellschaft fuer Meteorologie, Vienna (Austria).
For primary bibliographic entry see Field 05C.
W72-14673

WATER QUALITY VERSUS RESIDENTIAL DEVELOPMENT: POLITICAL AND ADMINISTRATIVE ASPECTS OF WATER QUALITY MAINTENANCE IN PERRY AND CLINTON RESERVOIRS,
Kansas Water Resources Research Inst., Manhattan.
S. M. Wyman.
Available from the National Technical Information Service as PB-212 269, $3.00 in paper copy, $0.95 in microfiche. Contribution No 107, July 1972. 108 p, 14 tab, 2 append. OWRR Project A-037-KAN (1).

Descriptors: *Reservoirs, *Attitudes, Water quality control, *Decision-making, *Kansas, Water demand.
Identifiers: *Residential development, Public policy, *Perry Reservoir, *Clinton Reservoir.

Given their proximity to major population centers in Kansas, reservoirs in the eastern portion of the state are attracting considerable residential development. This development has the potential to devalue the factors that lead to its creation. This includes the possibility of a decline in water quality. There are many decisions that will be made concerning the maintenance of water quality in these areas. A large proportion of these decisions will be made in the public sector, and others, while private in nature, will have important ramifications for a diversified public. The most important decisions will be made at the local level by county and special district officials, developers, and buyers. The federal and state governments will play secondary roles. While individuals buying property in the areas studied expressed a concern with water quality maintenance, there are little evidence to suggest this would be converted into policy or even serve as demand inputs into the policy formation process. Dissatisfaction with water quality will more likely lead to an exodus than to political activity. This is facilitated by the number of reservoirs in the state and the continuing construction activity of the Corps of Engineers. Therefore, a development ethos such as expressed by many developers and local officials is likely to be self-defeating if adequate provisions are not made early in the development process for water quality maintenance.
W72-14675

MODELING AND OPTIMIZATION OF THERMAL POLLUTION CONTROL SYSTEMS,
Kansas Water Resources Research Inst., Manhattan.
C. L. Hwang.
Available from the National Technical Information Service as PB-212 270, $3.00 in paper copy, $0.95 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No 103. 35 p, 7 fig, 4 tab, 23 ref, append. OWRR A-038-KAN (1).

Descriptors: *Thermal pollution, *Water quality control, *Optimization, *Model studies, *Control systems, Powerplants, Dynamic programming, Water quality standards, Water temperature, Biochemical oxygen demand, Dissolved oxygen.
Identifiers: *Water quality models, *Feedback control, Optimal control.

The literature on dynamic mathematical models of water quality in streams and the temperature effect on DO and BOD concentrations is reviewed. A method of optimal control is applied to the determination of an optimal cooling water discharge policy of a power plant. Such a policy permits a plant to operate at the highest possible efficiency without violating a preassigned stream quality criterion. The spatial distribution of temperature and its temporal change and their effects on the BOD and DO distributions in a stream are simultaneously determined. The development of optimal feedback control theory through the continuous dynamic programming and continuous maximum principle is reviewed. The development initially deals with linear systems and is then ex-

tended to nonlinear systems and distributed parameter systems. The management of a complex water quality control system is studied. The related water quality standards are (1) the maximum allowable stream temperature, (2) the allowable rise in stream temperature, and (3) DO concentration. The determination of minimum - cost control policies for a basin (a multi-stage system) which receives the thermal waste from power plants and the organic waste of BOD discharges is investigated by applying the generalized reduced gradient method.
W72-14676

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH, REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
For primary bibliographic entry see Field 05C.
W72-14698

IMPACTS OF OIL ON THE GULF COAST,
Louisiana Wild Life and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 05C.
W72-14702

THE VORTEX PRINCIPLE: A METHOD FOR CONCENTRATING MATERIALS FROM A LIQUID PHASE,
Naval Research Lab., Washington, D.C.
A. Stamulis.
Available from NTIS, Springfield, Va. 22151, as AD-738 802, Price $3.00 Paper copy; $0.95 microfiche. Memorandum Report 2401, February 1972. 22 p, 3 fig, 11 ref.

Descriptors: Water pollution treatment, *Oil spills, *Laboratory tests, *Analytical techniques, *Vortices, Rotational flow, Model studies, Surface waters, Oceans, Lakes, *Separation techniques.
Identifiers: *Vortexing, *Oil spill recovery.

A material less dense than water can be concentrated in a central pocket to form a vortex if the material is immiscible and unreactive with water. The vortexing technique was used in laboratory-scale experiments involving several liquids and solids in water to determine if this technique can be extended to concentrating oil spills in oceans, seas, and lakes. Simulation of complete open-water testing was hampered by the presence of a wall effect in the containers used for the laboratory experiments. Initial parameters such as speed, impeller type, impeller size, shaft diameter, shaft length, tank size and shape, are interrelated and must be determined for each individual water-oil combination. Substances like oil can be recovered by vortexing with a minimum of emulsification and can easily be separated from water. Oil films of varying thicknesses can be successfully vortexed with or without the use of a wetting agent. (Woodard-USGS)
W72-14734

POLLUTION CONTROL IN INDIANA,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14754

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATER ALONG THE LOUISIANA COAST (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, New Orleans, La.
Available from the National Technical Information Service as PB-208 188-D, $3.00 in paper copy, $0.95 in microfiche. February 1972. 81 p, 2 map, 29 ref.

Descriptors: *Environmental effects, *Gulf of Mexico, *Louisiana, *Resources development, Data collections, Permits, Oil pollution, Oil spills, Gases, Navigable waters, Bays, Salts, Sulfur, Sands, Clays, Drilling, Disposal, Turbidity, Water pollution sources, Benefits, Costs, Feasibility, Oil wells, Dredging.
Identifiers: *Environmental Impact Statements, Coastal waters.

The report contains the available data and criteria to be considered in determining the environmental impact involved in the issuance or denial of permits to explore for oil or gas or develop production of such resources or other mineral resources in navigable waters along the Louisiana coast, including state-owned water bottoms in the Gulf of Mexico and bays, lakes and sounds directly connected thereto. The possible effects of the development of such resources as oil, salt, sulfur, stone, sand and gravel, and clay are evaluated. Pollution from such sources as petroleum spillage and gas leakage may stem from collision damages, common natural disasters, subsidences causable by withdrawals of gas, equipment failures and seismic disturbances. Other sources include temporary turbidity during exploration and development, dredging, disposal of drill and mud cuttings, and altered salinity and circulation of marsh areas. Proposed action includes the continued issuance of permits subject to applicable regulations; the denial of drilling permits for drilling in such areas as navigation channels and fairways; and issuance of permits on an individually evaluated basis for inshore areas having water cover depth less than six feet. (Ellis-Florida)
W72-14756

JACKSONVILLE HARBOR, FLORIDA (SECTION I). NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-14760

MANITOWOC HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W72-14761

MAINTENANCE OF THE WESTCHESTER CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-14762

TESORO TANK FARM AND BARGE SLIP, JUNEAU, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-14763

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08D.
W72-14772

DOCUMENTS FOR THE U.N. CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, JUNE 5-16, 1972--PART III.
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14773

STOCKHOLM CONFERENCE ON THE HUMAN ENVIRONMENT,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14774

DEPT. OF PUBLIC HEALTH V. CUMBERLAND CATTLE CO. (POLLUTION OF WATER SOURCE BY DAIRY FARM OPERATIONS).
For primary bibliographic entry see Field 06E.
W72-14776

THE ENVIRONMENTALIST AND RADIOACTIVE WASTE,
Lake Forest Coll., Ill. Industrial Management Inst.
J. B. Moore.
Chicago-Kent Law Review, Vol. 49, p 55-80, 1972. 140 ref.

Descriptors: *Radioactive wastes, *Environmental effects, *Radioactivity, *Water quality control, Aquifers, Judicial decisions, Administrative agencies, Radioactive waste disposal, Regulation, Standards, Radioactivity effects, Federal government, Disposal, Public health, Legal aspects, Legal review, Water pollution sources, Nuclear wastes, Administrative decisions.
Identifiers: Atomic Energy Commission.

The hazards created by the use of atomic energy, primarily in the creation of electric power, are put into some perspective. Consideration is given to radioactive pollution and its effects. The production and disposal of radioactive wastes, including disposal into lakes and rivers are discussed. In this regard the possible radioactive pollution of aquifers by these disposal methods is considered. The Atomic Energy Commission (AEC) is responsible for managing the military use of atomic energy, developing and expanding peaceful uses, and assuring public health and safety from the dangers of atomic radiation. The task of environmentalists in influencing the AEC is very difficult. Four key decisions involving the AEC are discussed, including (1) the first contested licensing procedure; (2) the first challenge to radiation standards; (3) the first federal case to dispute the AEC's right to preempt the setting of radiation standards; and (4) the first interpretation, relative to the AEC, of the environmental control acts. A fifth case, settled out of court, demonstrates methods of forcing more rigid safety standards than those of the AEC on nuclear-power companies. Many people believe the standards of the AEC have been overly lax. Environmentalists must continue to be watchdogs over the AEC, its standards and its decisions. (Widman-Florida)
W72-14779

THE TENNESSEE WATER QUALITY CONTROL ACT OF 1971,
Florida Univ., Gainesville. Coll. of Law.
F. E. Maloney.
Vanderbilt Law Review, Vol. 25, p. 331-366, 1972. 32 ref.

Descriptors: *Water law, *Public rights, *Legislation, *Water quality control, *Tennessee, Water pollution control, Administrative agencies, Judicial decisions, State governments, Permits, State jurisdiction, Water resources planning, Long-range planning, Legal aspects, Legal review, Law enforcement, Regulation, Permits, Constitutional law.
Identifiers: *Public trust doctrine, Injunctions.

The text of the Tennessee Water Quality Control Act of 1971 and commentary upon the Act are presented. A study was undertaken at the request of the Tennessee legislature. The Act incorporates the public trust doctrine, a concept which seeks to

revitalize water law by imposing a duty both on state authorities and on private citizens to protect the rest of the trust for all citizens. The Act's definition of pollution is designed to include all harmful alterations of the properties of Tennessee's waters. The Act creates the Water Quality Control Board which exercises responsibility for the planning and coordination of a statewide pollution control program. The Commissioner of Public Health is in charge of enforcement of the Act. The permit system is used as the foundation for the regulatory provisions of the statute. Under the permit system, any alteration of water quality is prohibited except as permitted by the Commissioner under regulations promulgated by the Board. The Act establishes a means by which damages may be recovered by the state for pollution of state waters, and establishes various means for criminal and injunctive enforcement of its provisions. (Waldron-Florida)
W72-14781

THE PATHOLOGY OF LAKE ERIE,
Q. Dadisman.
The Nation, Vol. 214, p. 492-496, April 17, 1972. 1 plate.

Descriptors: *Lake Erie, *Eutrophication, *Chemical wastes, *Political aspects, Lakes, Great Lakes, Algal blooms, Aging (Biological), Lake stages, Mesotrophy, Oligotrophy, Water pollution sources, Water pollution effects, Mercury, Sewage disposal, Phosphates, Phosphorus, Chemical wastes, Limnology, International Joint Commission, Canada, Federal Government, State Governments.
Identifiers: *Mercury pollution, *Environmental Protection Agency.

Although most reports indicate that Lake Erie is 'dead', a recent study shows that the Lake in not dead and could be revived in one generation. One serious problem is the input of phosphorus into the Lake. Scientists believe that if this input were reduced a quick improvement in the condition of the Lake could be expected. Other problems include the large amounts of mercury discharged by chloralkali plants near Detroit and the discharges of sewage all along the coast. One of several factors preventing improvement of the Lake's condition is the lack of an institutional mechanism for cooperation between the United States and Canada. This can be traced to three conditions in America: inferior American technology in sewage and pollution treatment, the U.S. hesitance to eliminate the phosphate content of household detergents, and the political inability of the U.S. to act quickly. As a result, phosphates and other pollutants continue to enter Lake Erie with little hope remaining for the Lake. The U.S. bureaucracy, in particular the Environmental Protection Agency, fails to recognize that stricter pollution control standards are needed in the Great Lakes than for the ocean. (Nielsen-Florida)
W72-14782

SHOWDOWN ON DELAWARE BAY,
S. Lindsay.
Saturday Review, Vol. 55, p. 34-39, March 18, 1972. 3 photo, 1 map.

Descriptors: *Delaware, *Legislation, *Oil pollution, *Shore protection, Coasts, Coastal marshes, Wetlands, State Governments, Docks, Beaches, Estuaries, Salt marshes, Oil industry, Storage tanks, Beaches, Water pollution, Ships, Water pollution sources, State jurisdiction, Political aspects, Delaware River, Oil spills.
Identifiers: *Coastal waters.

Delaware Governor Russell W. Peterson discusses the background of the Delaware Coastal Zone Act of 1971 and analyzes some of its provisions. Delaware Bay is one of three spots in the U.S. deep enough to accommodate the new supertankers. Consequently, heavy manufacturing industries have been attracted to the area. The Delaware Coastal Zone Act bars such industries from locating in a two-mile-wide strip along the state's 115-mile coastline. It specifically bans oil refineries, petrochemical complexes, and basic steel and paper mills. It also prohibits construction of marine terminals for transshipment of liquid and solid bulk materials in the bay. Heavy water traffic in the bay area has raised fears of collisions and possible oil spills. The increased delivery of oil would attract more oil refineries. It was feared that storage of supplies of coal, iron ore and petroleum would lead to development of heavy industries in the area, introducing pollutants into the air and water. The Act is an attempt to protect coastal bays, beaches and wetlands. (Nielsen-Florida)
W72-14783

REVIEW OF THE LEGAL ASPECTS OF INTERNATIONAL WATER POLLUTION CONTROL,
S. O. Ezediaro.
Howard Law Journal, Vol. 17, p. 69-90, 1971. 101 ref.

Descriptors: *International waters, *Water pollution control, *Oil wastes, *International law, Water law, Law of the sea, International Joint Commission, Federal government, Nuclear wastes, Radioactive waste disposal, Ships, Legal review, Legal aspects, Jurisdiction, Political aspects, Social aspects, Oceans, Treaties, Legislation, Governments, Water pollution sources.

Actions carried out by international organs and national governments in the field of water pollution control are examined. Steps have been taken to control pollution of the sea, primarily in areas of oil and nuclear pollution. Some of the international legal principles involved are reviewed. The organs representing international community concern for oil and radioactive pollution are the International Maritime Consultative Organization (IMCO) and the International Atomic Energy Agency (IAEA) respectively. The duties of these two agencies should be enlarged to include the control of the other sources of pollution. The problem of ocean disposal is discussed including the technical difficulties of preventing pollution, legal controls, and alternative means of massive waste disposal. Also included is a discussion of various pieces of legislation concerning the control of pollution and waste disposal. Many problems of the legal control of pollution remain unresolved, but there are some encouraging signs in the area of oil and nuclear pollution. There is a need to resolve the dispute over national jurisdiction and to create a broad gauged view of international problem resolution. (Waldron-Florida)
W72-14784

WATER QUALITY CONTROL WITH SYNTHETIC POLYMERIC FLOCCULANTS: EFFECT OF METAL IONS ON FLOCCULATION OF BIOCOLLOIDS,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. K. Dixon, and R. C. Tilton.
Available from the National Technical Information Service as PB-212 364, $3.00 in paper copy, $0.95 in microfiche. Completion Report 1972. 9 p. OWRR A-031-CONN (2).

Descriptors: *Flocculation, *Algae, *Silica, *E. coli, *Ions, *Wastewater treatment, *Polymers, Cations, Anions, Chlorella, Filtration, Electrophoresis, Tracers.
Identifiers: *Multivalent metallic cations, *Polyacrylamide, *Polyethylenemine, *Polystyrene sulfonate, Chlorella ellipsoidia.

Effect of the addition of multivalent metallic cations up to 0.02M on the rate of flocculation of pure algal cultures of Chlorella ellipsoidia by synthetic polymeric cationic polyethyleneimines (PEI) was found to be negligible. A hundredfold variation in the Mg (++) concentration present in nutrient used during the growth of these algae also had no effect on efficiency of flocculation of the algae by the PEI polymers. Addition of non-ionic polyacrylamide to the PEI polymers to the bacteria, E. coli, had no effect on their good performance. Addition of anionic polystyrene sulfonate polymers, which were ineffective alone, to PEI polymers decreased the flocculation performance of the latter for E. coli. Effects of the multivalent metallic cations and/or the use of anionic-cationic polymer mixtures for flocculating the complex dispersions present in commercial operations are often successful. The results on the simple algal and bacteria systems apparently cannot be translated into some guiding principles useful during the flocculation of the more complex commercial systems. On the other hand, the results of previous studies on flocculation of E. coli, algae and silica with radioactive tagged PEI polymers should be quite useful for application to commercial operations.
W72-14840

CORROSION POTENTIAL OF NTA IN DETERGENT FORMULATIONS.
Battelle Columbus Labs., Ohio.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-212 393, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1971. 94 p, 41 fig, 28 tab, 23 ref. EPA Program 16080 GPF 04/71.

Descriptors: *Corrosion, *Detergents, *Phosphates, *Nitrilotriacetic acid, Pollutants, Eutrophication, Plumbing, Stainless steel, Metals.
Identifiers: *Sodium tripolyphosphate, Laundering equipment.

Coupon-weight loss and linear polarization studies were employed to investigate the corrosion potential of nitrilotriacetic acid (NTA) which is a substitute for sodium tripolyphosphate (STPP) in detergents. Solutions of 0.06, 0.12, and 0.18 weight percent using 15- and 150-ppm water hardness and temperatures of 130 and 160F represented laundering conditions used by the average housewife. Types 304 and 420 stainless steel and 201 Nickel were very corrosion resistant (0.01 to 0.15 mil per year), 260 Brass, electrolytic copper and 1100 Aluminum were moderately resistant (0.2 to 3 mils per year) and die-cast zinc, 1020 carbon steel and chemical lead poorly corrosion resistant at rates of 2 to 60 mils per year. NTA detergents could increase metal ion pickup at a sewage plant by a factor between 1 and 7. (Smith-Texas)
W72-14851

PRELIMINARY INVESTIGATIONAL REQUIREMENTS-PETROCHEMICAL AND REFINERY WASTE TREATMENT FACILITIES.
Engineering-Science, Inc./Texas, Austin.
For primary bibliographic entry see Field 05D.
W72-14852

SOIL AND WATER RESEARCH TO MANAGE THE ENVIRONMENT,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
J. Van Schilfgaarde.
Journal of Soil and Water Conservation, Vol. 27, No. 2, p 50-51, March-April, 1972.

Descriptors: *Research and development, Agriculture, *Soil conservation, *Water conservation, *Environment, *Quality control, Waste disposal, City planning, Industries.

The Soil and Water Conservation Research Division of the Agricultural Research Service (ARS) is discussed in terms of its program objectives which have changed to meet demands for information re-

lated to environmental quality. ARS considers its duty is to provide as much pertinent data and as many guidelines as possible to enable continued prudent management of these resources. Two types of situations are examined: (1) agricultural activities which may adversely affect the environment and (2) how agricultural resources and knowledge can be used effectively to reduce problems unrelated to agriculture. In some ways, agricultural practices contribute to environmental degradation. However, agricultural resources and technologies can enhance environmental quality. Agricultural scientists and conservationists must face the challenge of environmental problems. It must be recognized that problems which exist in agriculture have to be solved. They must explore ways and means of using their knowledge of natural processes to help solve the waste problems of cities and industry. (StrachanChicago)
W72-14891

MAN AND HIS ENVIRONMENT: THE ISSUES IN PERSPECTIVE,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14892

OIL EXTRACTION, URBAN ENVIRONMENT, AND CITY PLANNING,
University of Southern California, Los Angeles.
M. C. Branch.
Journal of the American Institute of Planners, Vol 38, No 3, p 140-153, May 1972. 2 map, 25 fig, 20 ref.

Descriptors: *Oil pollution, *Environment, *City planning, *Regulation, *Control, Economic feasibility, Protection.
Identifiers: *Policy making, *Los Angeles (Calif), Requirements, Preventive provisions.

Oil exploration and production have taken place in Los Angeles for seventy-five years. Regulation of these activities has developed over the years without making it economically impossible. Today, improved city planning and greater urban environmental protection call for additional policies and requirements. This review of Los Angeles' experience is intended to assist the many communities in the world which are or will be faced with problems accompanying urban oil extraction. By studying the Los Angeles experience and modifying it to fit the local situation, cities can establish policies, laws, and regulatory conditions which allow urban oil operations consistent with sound city planning, urban development, and favorable local environment. Minimum requirements should include: (1) largest feasible oil-drilling districts, (2) minimum feasible number of drill sites and other required operating facilities, (3) minimum feasible size of drill sites, (4) conditional use zoning approval, (5) enclosure of property within a decorative wall, (6) other protection of surrounding area, (7) underground transportation of oil, (8) stringent preventive provisions, (9) separate consideration and insurance covering subsidence, (10) prohibition of oil extraction where underground geology indicates that subsidence or contamination of underground water supplies would occur, (11) unitization of oil districts by several oil companies, (12) prohibition of oil operations inimical to city planning, and (13) elimination of marginal wells. (Strachan-Chicago)
W72-14899

LIVING WITH OUT WASTES,
California Univ., Richmond. Sanitary Engineering Research Lab.
P. H. McGauhey.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 17-22.

Descriptors: *Engineering, *Waste disposal, *Pollution abatement, *Environment, *Quality control, Planning, Economic feasibility, Jurisdiction, Research and development, Technology.
Identifiers: *Waste philosophy, Policy making.

Quality as a factor in environment has no meaning except as it relates to some scale of health, happiness, comfort, and aspirations of man that ranges from the intolerable to the sublime. Pollution of the environment is the result of man's activities rather than the activities of nature. The engineer must play an important role in the development and construction of systems for removing pollutants from the gases and liquids discharged by industry, upgrading the quality of municipal and industrial waste waters, disposing of solid wastes on land, and in the development of industrial processes that produce less air, water, and land pollutants. What is needed is the development of systems and processes for returning unwanted materials to the basic resources on which industry and commerce thrive, thus reducing to a minimum the volume of wastes that must go into man's environment. Considerable research is being directed to this goal. Technological feasibility and imaginative engineering will not be enough. If man is to control the quality of his environment, he is going to have to accept regional jurisdictional systems of unprecedented nature, revise his concept of economic feasibility upward, and surrender much of his natural heritage of waste philosophy. (Strachan-Chicago)
W72-14901

A CITIZEN'S COMMENTS ON CONSERVATION,
Colorado House of Representatives, Denver.
For primary bibliographic entry see Field 06G.
W72-14903

NEW BIOLOGICAL AGENT FOR NATURAL SELF-PURIFICATION OF SURFACE WATERS,
Institute of General and Municipal Hygiene, Moscow (USSR).
R. M. Abieva.
Gig Sanit. Vol 36, No 4, p 72-75. 1971.
Identifiers: *Water purification, *Self-purification, *Bdellovibrio bacteriovorus, E. coli, Salmonella typhosa.

Literature is reviewed on the role of Bdellovibrio bacteriovorus in promoting self-purification of bodies of water. Its effect on the pathogenic microorganisms Escherichia coli, Salmonella typhosa, poliovirus and adenoviruses as well as mice is discussed. Bdellovibrio bacteriovorus activity is compared generally to the mechanism of bacteriophage activity.--Copyright 1972, Biological Abstracts, Inc.
W72-14904

WATER QUALITY CONTROL FROM A STATE VIEWPOINT,
Wyoming State Dept. of Public Health, Cheyenne.
A. E. Williamson.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 55-58.

Descriptors: *Water quality control, *State governments, *Wyoming, Water Quality Act, Standards, Classification, Planning, Decision making, Monitoring.
Identifiers: *Policy making, 'Trout standard', Criteria, Stream-by-stream basis, Implementation.

The water quality control program of the State of Wyoming is discussed. The Water Quality Act of 1965 specified that states will adopt water quality standards. The states can choose to establish standards on a broad classification or a stream-by-stream basis. Wyoming has carried out a program of effective water pollution control. It has been carried out without formalized standards, detailed plan of implementation, surveys, or continuous monitoring. The efforts are directed to the selling of the need for waste treatment facilities and getting them constructed. Perhaps the only water quality standard used was that of a 'trout standard'. States using a criteria and classification system of control have had more controversy in the public hearings than states using the specific standards approach. In the development of standards, a basic concept should be to keep the number of parameters to a minimum. The criteria and classification method establishes standards for parameters on many streams where the pollutants do not exist or where they are of no value. One group, and preferably an individual, should be responsible for final decisions on the adequacy, reasonableness, and practicality of the final standard or criteria. It would appear that only a person who is well versed in the state's plans, progress, and development, and who has a definite responsibility, can hope to arrive at standards which are equitable to all. (Strachan-Chicago)
W72-14905

METROPOLITAN GROWTH -- ENCROACHMENT OR ORDERLY PROCESS,
Department of Housing and Urban Development, Washington, D.C. Land and Facilities Development Administration.
A. A. Davis.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 201-208.

Descriptors: *City planning, *Urbanization, *Environment, Quality control, Planning, Coordination, Governments, Comprehensive planning, Regulation, Land development, Flexibility.
Identifiers: *Metropolitan resources management, Implementation.

Urban communities are only another form of environment. Moving toward the central city, the rural fringes merge into the urbanized area in an unbroken continuum. The urban community must be viewed in a larger context of natural and man-made qualities. The fate of the farmer and the suburbanite are closely linked. In education, people are trained in land use and management problems almost exclusively identified with farms and agriculture. It is more useful to view the city as an organism, dependent upon the environment for its well-being. Metropolitan systems are remarkably analogous to those considered in resource development programs. Several suggestions for more effective solution of urban problems are presented. (1) Planning must be made more meaningful. (2) There must be more effective coordination between government agencies to develop and implement comprehensive plans. (3) There must be a focus on total problem solving, not on institutional considerations and hierarchical arrangements. (4) There must be effective public regulation of development. (5) There is a need for more imaginative and flexible means of protecting the quality of the urban environment. (6) There must be discipline to the need for making choices. Only when resource specialists, urban planners, and administrators recognize more fully the need for cooperation between the city, suburb, and small town can improved quality of urban life be achieved. Then, metropolitan growth will be a truly ordered process, meeting the needs of man. (Strachan-Chicago)
W72-14910

BOULDER, COLORADO: A STUDY IN GROWTH,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 03D.
W72-14912

ECONOMIC GROWTH AND ENVIRONMENTAL COSTS,
Coe Coll., Cedar Rapids, Iowa.
For primary bibliographic entry see Field 06G.
W72-14913

ENVIRONMENTAL PLANNING ALONG MONTANA'S BLUE-RIBBON TROUT STREAMS,
Montana State Univ., Bozeman. Water Resources Research Center.
S. S. Frissell.
Available from the National Technical Information Service as PB-212 388, $3.00 in paper copy, $0.95 in microfiche. Montana Water Resources Research Center Completion Report No. 31, (1972) 19 p, 10 tab. OWRR A-047-MONT (1).

Descriptors: Water resources development, *Planning, *Environment, *Land use, *Recreation, *Attitudes, Streams.
Identifiers: Scenic preservation, Stream classification, Environmental corridors, Trout streams.

A stream classification system adopted in 1959 identified seven Montana waterways as 'Class 1--streams of national as well as state-wide significance.' This classification was applied to portions of Rock Creek and the Flathead, Big Hole, Gallatin, Madison, Yellowstone and Missouri Rivers. This study describes the current ownership and land-use patterns along six of these streams (Missouri excluded). Between 45 and 85 per cent of the stream banks are in private ownership. Current land uses are predominately ranching and forested lands. Several situations are identified which could threaten the environmental corridors of the Blue-ribbon streams. Posting of private lands occurred on up to 22 per cent of the lands adjacent to the rivers. Large ranches are being subdivided into small lots. Homes, cabins, resorts and businesses are being developed adjacent to the streams. An investigation of stream user attitudes indicate that a majority are attracted by the natural environment of the stream and are in fact antagonistic toward excessive development. Several alternative solutions to the pending stream preservation problem are identified.
W72-14923

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 08D.
W72-14926

ERIE HARBOR, PENNSYLVANIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-209 049-D, $3.00 in paper copy. April 20, 1972. 4 p, 4 map.

Descriptors: *Pennsylvania, *Lake Erie, *Environmental effects, *Channel improvement, *Dredging, Spoil banks, Maintenance, Navigation, Navigable waters, Sediment, Sediment transport, Deposition (Sediments), Harbors, Water pollution, Water pollution control, Water pollution sources, Sedimentation.
Identifiers: *Environmental Impact Statements, *Erie Harbor (Pa).

The project involves the recurring maintenance of the channels and structures in the deep draft navigation project for Erie Harbor, Pennsylvania. The primary work involves the annual dredging of approximately 300,000 cubic yards of sediment from the channels and dumping the material into Lake Erie. The impact of the dredging is apparent in short-term increases in turbidity and sedimentation, both in the dredging and disposal areas. The disposal area has been located to avoid spawning areas and at a location where currents will not carry suspended material toward water intakes. Disposal of dredged material in the lake transfers polluted material from the harbor into open lake waters. It has proven difficult to make quantitative measures of the adverse effects; however, in view of the degradation of the lake's water resulting from the combined effects of pollutants from many sources, removal rather than relocation of polluted spoil would be desirable. No practical alternatives to the present methods of maintenance have been found. However, as an alternative to lake disposal of spoil, four land sites have been considered for construction of an enclosed area to permanently confine the material. (Ellis-Florida)
W72-14927

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 08A.
W72-14929

DISCHARGING NEW WINE INTO OLD WINESKINS: THE METAMORPHOSIS OF THE RIVERS AND HARBORS ACT OF 1899,
R. L. Potter.
University of Pittsburgh Law Review, Vol. 33, No. 3, p 483-531, 1972. 197 ref.

Descriptors: *Rivers and Harbors Act, *Watercourses (Legal aspects), *Legislation, *Judicial decisions, Water pollution control, Water quality control, Water quality standards, Water law, Legal aspects, Federal government, Industrial wastes, Navigable waters, Waste disposal, Federal Water Pollution Control Act, Pollution abatement, Permits, Navigation, Law enforcement, Federal-state water rights conflicts, Water pollution sources, State governments.
Identifiers: *Refuse Act, *Statutory construction.

Section thirteen of the Rivers and Harbors Act, imprecisely referred to as the Refuse Act, has been rescued from anonymity and has become the new champion in the battle for water quality. The development of the statutory construction placed on the Act is traced with a discussion of its conflict with the Federal Water Pollution Control Act of 1965 and the implementation of the Refuse Act Permit Program for industrial discharges. There follows the legislative history of the Act, starting with the New York Harbor Acts of 1866 and concluding with a careful examination of the legislative proceedings leading up to its enactment. The judicial history of the Act is included, with special emphasis on two leading Supreme Court decisions. Other federal laws relating to water pollution are noted as being incompatible with the 1899 law. A close examination of the legislative history of the 1899 Act leads to the conclusion that the Refuse Act was intended to apply only to refuse which obstructed navigation. If Congress really wants to require a permit for the discharge of all and any substances into navigable waters then such a requirement should be put in the Federal Water Pollution Control Act. (Brackin-Florida)
W72-14935

EVOLVING SOCIAL ATTITUDES ON POLLUTION CONTROL,
Cincinnati Univ., Ohio. Environmental Health Engineering.
E. J. Cleary.
Journal of American Water Works Association, Vol. 64, No. 7, p 405-409, July 1972. 5 p, 4 photo.

Descriptors: *Social values, *Water policy, *Pollution abatement, *Water pollution control, Attitudes, Water pollution, Beneficial use, Legal aspects, Wastes, Public health, Human diseases, Social change, Competing uses, Waste disposal, Water quality control, Water quality, Wastes treatment, Treatment facilities, Grants.
Identifiers: *Zero discharge, Social attitudes (Pollution).

Since 1900 public attitudes toward water pollution have gone through four distinct but overlapping phases, ranging from acceptance of foulness to the current aspirations for pristine purity. At the beginning of this century the primary basis for curbing water pollution was prevention of waterborne disease and minimization of local nuisances. A greater awareness of the public-welfare aspects of water pollution developed from 1920 to 1940, although water pollution was still rationalized as the inevitable penalty of progress. Nevertheless, as a result of the need for public works programs during the depression, progress was made in the construction of sewage-treatment facilities. During the 1940's it was reasoned that the appropriate goal for pollution-control efforts should be that which would offer the greatest benefits in the use of waterways. More recently the positive policy of keeping the waters as clean as possible has equated the beneficial use of water to the maintenance of its highest quality. This 'zero discharge' policy has had its primary impetus from the expansion of federal jurisdiction and spending in pollution-abatement. Recent failures suggest that something may be wrong with our goals and strategy. (Crow-Florida)
W72-14936

TEST TO DETERMINE THE COMBINED EFFECTS OF WAVES AND CURRENTS ON BARRIER MOTIONS AND OIL RETENTION EFFICIENCY IN ROUGH WATER. POINT CONCEPTION, CAL. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.

March 14, 1972. 34 p.

Descriptors: *Environmental effects, *Oil pollution, *Oil, *Testing, Currents (Water), Waves (Water), Effects, Retention, Testing procedures, Sea water, Oceans, Theoretical analysis, Water pollution, Water pollution control, Water pollution sources, Benefits, Costs, Feasibility, Habitats, Ecosystems, Barriers, California.
Identifiers: *Environmental Impact Statements, *Point Conception (Cal), *Oil barrier tests.

The project will involve the conduct of full scale testing of the high seas oil containment barrier, in order to furnish verification of the prototype design. The test will determine the combined effects of waves and currents on barrier motions and oil retention efficiency in rough water. The rough water test with non-toxic, biodegradable soybean oil will describe barrier performance as well as mechanisms of oil failure in 3-5 foot seas. The test will involve an area 5 to 30 miles at sea west of Point Conception, California. The proposed test will establish the validity of experimentally derived theories concerning oil losses by entrainment and drainage failure. Thus future engineering design capability will be enhanced and the requirements for future full scale testing with oil reduced. There is no known impact on ecological systems such as wildlife, fish, and marine life. The selection of test procedures, site, and materials coupled with extensive previous experience minimizes the risk of possible ecological damage. Since there are no known adverse effects from the action proposed, no alternative plan has been suggested. (Ellis-Florida)
W72-14937

WATER QUALITY STANDARDS SUMMARY FOR THE INTERSTATE WATERS OF NEBRASKA.
Environmental Protection Agency, Washington, D.C.; and Nebraska State Dept. of Environmental Control, Lincoln.

March 1972. 36 p, 18 fig, 1 tab, 3 append.

Descriptors: *Water quality standards, *Interstate rivers, *Nebraska, *Water Quality Act, *Water quality control, Water pollution control, State governments, Federal governments, Pollution abatement, Regulation, Municipal wastes, Industrial wastes.

The standards for interstate waters adopted by the State of Nebraska and approved by the U.S. Environmental Protection Agency in June 1971 are presented. The standards consist of three major components: (1) designation of the uses which interstate waters are to serve, (2) specification of narrative and numerical criteria to protect and enhance water quality, and (3) specification of a plan of implementation and enforcement, which includes treatment and control requirements for municipal, industrial and other wastes discharged to or affecting interstate waters. These components are discussed. (Woodard-USGS)
W72-14956

AN ANALYSIS OF THE CONCENTRATIONS OF HEAVY METALS IN MONTEREY HARBOR UTILIZING THE METHODS OF ATOMIC ABSORPTION SPECTROPHOTOMETRY AND POLAROGRAPHY,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-14964

APPARATUS FOR REMOVING FLOATING POLLUTANTS,
D. Usher.
U. S. Patent No. 3,578,171, 4 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 886, No 2, p 296, May 11, 1971.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, *Pollution abatement, Water pollution control, Water pollution treatment, Flotsam.

A self propelled barge carries equipment for the removal of oil or other hazardous floating pollutants from a body of water. It carries a vacuum tank, a combination suction and pressure tank, a buoyant slick bar, a skimmer suspended from the barge and having a flexible conduit connecting with the vacuum tank, and several settling tanks. A power operated air blower is mounted on the deck for moving an area of floating pollutant into the confinement provided by the slick bar. (Sinha-OEIS)
W72-14970

FLOATING BARRIER MEANS,
Pneumatiques, Caoutchouc Manufacture et Plastiques Kleber-Colombes (France). (assignee).
R. E. Ducrocq.
U. S. Patent No. 3,577,879, 4 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 886, No 2, p 225, May 11, 1971.

Descriptors: *Patents, Barriers, *Oil pollution, *Oil spills, Equipment, *Pollution abatement, Water pollution control, Water pollution treatment.

This barrier is composed of a series of floating parts, each of which comprises both an inflatable tube and a flexible skirt. A flexible reinforcing element is located in a channel in the upper portion of the skirt. The barrier is used to limit the spread of a pollutant such as oil and make it possible to recover the oil. (Sinha-OEIS)
W72-14971

METHOD FOR DISPERSING OIL SPILLS ON WATER,
Gulf Research and Development Co., Pittsburgh, Pa. (assignee).
S. C. Paviak, and W. K. Porter.
U. S. Patent No. 3,577,340, 4 p, 6 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 886, No 1, p 99, May 4, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, Water pollution control, Water pollution treatment, *Dispersion, Chemical reactions.
Identifiers: *Chemical treatment, *Oil dispersion.

A novel formulation of alkylphenol ethoxylate is used to cause the dispersion of patches of oil floating on water. Five examples illustrate its successful use. In applying the dispersant, it is convenient to use a suitable sprayer-equipped airplane and utilize the natural wave action to provide the mixing-dispersing effect. In the absence of wave action, agitation may be created by one or more boats passing through the sprayed area. (Sinha-OEIS)
W72-14974

MARINE OIL BOOM,
D. H. Rowland.
U. S. Patent No. 3,576,108, 4 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 885, No 4, p 668, April 27, 1971.

Descriptors: *Patents, *Oil pollution, Oil spills, Equipment, *Pollution abatement, Separation techniques, Water pollution control, Water pollution treatment.
Identifiers: *Oil booms.

Elongated flexible buoyant tubes formed of oil resistant, rubberlike material having an accordion-pleated wall, are connected end to end to form a barrier around an offshore well or extending along a coastline area. The barrier may be anchored in place. (Sinha-OEIS)
W72-14980

PROCESS FOR PURIFYING WATER CONTAINING OIL AND SOLIDS,
For primary bibliographic entry see Field 05D.
W72-14987

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

ECONOMIC VALUE OF WATER IN A SYSTEMS CONTEXT,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 06B.
W72-14236

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Water and Power Control Division.
For primary bibliographic entry see Field 04A.
W72-14384

COMMENTS ON 'NONLINEAR PROGRAMMING APPLIED TO REGIONAL WATER RESOURCES PLANNING' BY G. K. YOUNG AND M. A. PISANO,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
R. T. Milhous.
Water Resources Research, Vol 8, No 4, p 1118-1122, August 1972. 1 fig, 4 tab, 3 ref.

Descriptors: *Water conveyance, *Linear programming, Water resources development, *Planning, *Regional analysis, Optimization, *Marginal costs, *Pipes, Model studies, Operations research, Electrodialysis, Waste treatment.
Identifiers: *Nonlinear programming, *Regional planning, Water transport.

Evidence is presented of how Young and Pisano's nonlinear programming problem can be reformulated as a linear transportation problem, and how the specifications developed prior to the application of the programming technique result in a higher cost solution than results from a minor change in the specifications. The major nonlinearity in the problem solved by Young and Pisano is the cost function for the pipes used to transport water from a source to a demand area. Because the marginal cost curves are nonlinear, a strategy is developed by Milhous to transform the nonlinear total cost equation to a linear marginal cost equation. The marginal costs used in the linear programming are obtained by adding the marginal cost of transporting an additional unit of water to the marginal cost of developing an additional unit at the source. Results of Milhous' review show that (1) the linearization of the problem reduces the solution to a simple transportation tableau that can easily be solved by hand without the use of a computer, and (2) the basic specification of the problem eliminated a solution with a lower cost than the optimal solution given. (See also W70-05701) (Bell-Cornell)
W72-14385

RIVER DEE RESEARCH PROGRAM: 1. OPERATING MULTIPURPOSE RESERVOIR SYSTEMS FOR WATER SUPPLY AND FLOOD ALLEVIATION,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14386

RIVER DEE RESEARCH PROGRAM: 2. A LONG-TERM CONTROL STRATEGY FOR A MULTIPURPOSE RESERVOIR,
Lancaster Univ. Baillrigg (England).
For primary bibliographic entry see Field 04A.
W72-14387

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14388

WATER RESOURCE MANAGEMENT IN NORTHERN MEXICO,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 03F.
W72-14389

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W72-14390

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-14392

THE EVALUATION OF INTANGIBLE BENEFITS OF WATER RESOURCE PROJECTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W72-14422

VACATION HOME LOCATION: A MODEL FOR SIMULATING THE RESIDENTIAL DEVELOPMENT OF RURAL RECREATION AREAS,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 06B.
W72-14425

THE IMPORTANCE OF ECONOMIC FACTORS IN URBAN WATER SUPPLY SYSTEMS,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 06B.
W72-14430

WATER RESOURCES PLANNING STUDIES OKLAHOMA AND ARKANSAS, PHASE II (QUALITY),
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
For primary bibliographic entry see Field 05G.
W72-14432

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.

Descriptors: *Planning, *Sewage treatment, *Sewerage, *Water resources, *Water supply, California, Water demand, Forecasting, Long-term planning, Regional analysis, Water quality, Coordination.
Identifiers: *Regional planning, *San Joaquin (Calif).

To assure adequate water supplies for the future, both short-range and long-range planning must be undertaken and implemented. Eight general policies have been adopted by the Cities and County of San Joaquin Advisory Planning Association. Some of these are: (1) assurance of the adoption of long-range sewerage system management planning for each community, (2) assurance of long-range water supply planning by each community, (3) evaluation of the needs of all persons in the area, and (4) evaluation of the feasibility of consolidation of local sewerage and water systems wherever possible. The Associateion's priorities for the area are three-fold, namely: (1) correction of existing water supply, (2) projects to correct deficiences in water quality or supply due to long-range growth, and (3) projects involving the consolidation of municipal systems to meet long-range demands. (Poertner)
W72-14447

MODELS FOR THE SYNTHESIS OF MONTHLY STREAMFLOWS FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 02E.
W72-14640

A WATER QUALITY MODEL FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05B.
W72-14641

SPACE-TIME ANALYSIS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel.
Paper presented at Symposium on Applied Sensing of Earth Resources in Arizona, Tucson, November 3, 1971, 21 p, 10 fig, 2 tab, 23 ref. OWRR B-007-ARIZ (22).

Descriptors: *Data collections, *Data processing, *Hydrology, *Environment, Decision making, Systems analysis, Forecasting, Mathematical models.
Identifiers: *Space-time analysis, *Data analysis, *Environmental data processing, Data networks, Problem-solving.

Classes of problems in space-time sampling are identified, basic concepts on sampling are presented, and questions are posed about methods of space-time analysis in a modeling, economic and decision framework. Examples are drawn primarily from hydrology and water resources. The last few years have witnessed a substantial growth of interest in environmental data collection and analysis: Data is collected to promote understanding of systems and processes, to aid in decision making, and to solve problems. However, what seemingly is lacking is a more formal mathematical, statistical, economic and decision basis for the analysis of existing data and for the optimal design of new data networks. In order to cope with newer water management problems, more rational planning and operational models have been constructed but their application is compromised by limited available data. Data are increasingly expensive to obtain and oftentimes used inappropriately in that they do not efficiently relate to the needs of the particular study. Therefore, more formal data analysis is needed before diverting sizeable fractions of budgetary resources for increasingly larger-scale observational systems. Space-time sampling of static and dynamic systems is designed to reduce the uncertainty connected with long-term prediction of the environmental processes and short-term operational forecasts. (Bell-Cornell)
W72-14643

UTILIZATION OF AN INPUT-OUTPUT MODEL FOR PREDICTING WATER DEMAND ON A SMALL WATERSHED,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
W. J. Bellows.
Ph D Thesis, August, 1971. 123p, 1 fig, 8 tab, 33 ref, 6 append. OWRR B-004-MASS (6).

Descriptors: *Watershed management, *Input-output analysis, *Economics, *Forecasting, *Data collections, *New England, *Water demand, *Water use, *Industries, Planning, Estimating, Operations research, Model studies, *Massachusetts.
Identifiers: *Millers River watershed, Quabbin reservoir.

Presented is a study that was undertaken to determine the feasibility of studying the economy of a small watershed by means of an input-output model, and to examine the use of the model for estimating water demand for industrial purposes. Because of the importance of import and export trade to a small area economy, primary data collection emphasizing the location of suppliers and customers was chosen to obtain required information; personal interviews yielded best results and were used almost exclusively. The economic structure of the Millers River Watershed in western Massachusetts is examined. The total industrial water intake in the watershed is estimated by using Leontief inverse matrix and water-use coefficients to obtain a matrix of water-use interactions coefficients. The coefficients are then evaluated as to their usefulness in planning water use. Results show that it is possible to compile a transactions table for a small watershed from primary data sources. The tables show a fairly low level of interindustry transactions, however, thus calling into question the value of using input-output analysis for small watershed economics, since its usefulness is greatest when there are many interdependencies and least when there are few. The input-output model has potential as a tool for regional industrial planners. (Bell-Cornell)
W72-14644

THE PRACTICAL APPLICATION OF DYNAMIC PROGRAMMING TO RESERVOIR SYSTEMS WITH PUMPED INPUTS,
Water Research Association, Medmenham (England).
For primary bibliographic entry see Field 04A.
W72-14646

6B. Evaluation Process

POTENTIAL UNITED STATES WATER--SUPPLY DEVELOPMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-14217

ECONOMIC VALUE OF WATER IN A SYSTEMS CONTEXT,
Washington State Univ., Pullman.
W. R. Butcher, N. K. Whittlesey, and J. G. Orsborn.
Available from the National Technical Information Center, Springfield, Va. 22151, as PB-210 357 for $6.00 paper copy. National Water Commission Report No. SBS 72-048, May 1972, 188 p, 15 fig, 33 tab, 36 ref. NWC 71-007.

Descriptors: *Cost-benefit analysis, *Water values, *Value, *Economics marginal benefits, *Evaluation, Water resource development, Irrigation, Recreation, Fish and wildlife, Navigation, Hydro-electric power, Systems analysis.
Identifiers: *Waste assimilation, Yakima River, Columbia River, Susquehanna River.

Decisions about water allocation and investment in water resource developments could be improved by knowledge of the value of water in alternative uses. The interdependent system in which water resources occur and uses take place make it important to consider these water values in a systems context. Systems models provide the most systematic approach to estimating these values but much can be learned through a careful description of effects that each use has not only on quantity of water but also on quality and time or place of availability. Application of systems analysis to the Yakima, Columbia and Susquehanna Rivers illustrates the approach and provides examples of the significance of a systems approach to water valuation. (See also W72-14237) (NWC)
W72-14236

THE ECONOMIC VALUE OF WATER: CONCEPTS AND EMPIRICAL ESTIMATES,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. A. Young, and S. L. Gray.
Available from National Technical Information Service, Springfield, Va. 22151, as PB-210 356 for $9.00 paper copy. National Water Commission Report no. SBS 72-047, March 1972, 347 p, 7 fig, 17 tab, 182 ref. Contract NWC 70-028.

Descriptors: *Cost-benefit analysis, *Water values, *Value, *Economics marginal benefits, *Evaluation, Water resources development, Irrigation, Recreation, Fish and wildlife, Navigation, Hydro-electric power.
Identifiers: *Waste assimilation.

Conceptually valid and empirically sound estimates of water values are essential for rational allocation of water among uses and users over time. The study was divided into two parts. In the first part, a number of issues are examined that must be taken into account in deriving conceptually valid estimates of the values of water. These issues include (1) defining the quantity of water used in both instream and withdrawal uses, (2) assuring comparability of use in terms of time, location and quality, (3) choice of accounting stance, national, regional or individual, and (4) maintaining a distinction between long run and short run values

where water is used for production of consumer goods. The second part of the study involves analysis of water values for various uses with attention to regional differences. This analysis employs the conceptual approach developed initially and considers numerous previous studies from an exhaustive literature review. The water uses considered are municipal, industrial, irrigation, waste assimilation, recreation, fish and wildlife, navigation and hydroelectric production. (See also W72-14236) (NWC)
W72-14237

INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Wendell and Schwann, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14238

A MATHEMATICAL-PROGRAMMING MODEL FOR PLANNING A REGIONAL WATER RESOURCE SYSTEM,
Water Resources Board of England and Wales.
P. G. O'Neill.
Journal of the Institution of Water Engineers, Vol 26, No 1, p 47-71, Feb 1972. 15 p, 3 fig, 8 ref.

Descriptors: *Mathematical models, *Planning, *Water plans, Estimated costs, *Optimum development plans, *Water resources development, Future planning (Projected), Water sources, Water demand, Long-term planning, Water resources, Mathematical analysis, Computer models, Investment, Water utilization, Linear programming, Costs, Computer applications.
Identifiers: Water demand mathematical models, Great Britain, Water resources systems, Foreign studies.

A mixed-integer programing technique is applied to planning the development of water resources for a region over a 30-yr period. The model determines a plan for minimizing the total discounted construction and operation costs, subject to growing demands for water up to the yr 2001, and assuming constant demand thereafter. Sources (reservoirs, groundwater zones, effluent returns, estuarial storage, desalination plants and imports from outside the region) and links (pipelines or tunnels, treatment works, pumping stations, and river channels) are included in the system model. Demands may be either for public supply (excluding costs of the local distribution network) or for direct industrial, commercial, or agricultural use. The model determines capital investment, allocates water flows, and provides information on current costs, and indicates long-run marginal cost trends at each of the notional centers of demand. Acknowledging that input data are subject to uncertainty, nevertheless output data from several runs should be analyzed to gain insight on the development of the regional network. (USBR)
W72-14242

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.
For primary bibliographic entry see Field 03F.
W72-14256

COMMENTS ON 'NONLINEAR PROGRAMMING APPLIED TO REGIONAL WATER RESOURCES PLANNING' BY G. K. YOUNG AND M. A. PISANO,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W72-14385

RIVER DEE RESEARCH PROGRAM: 1. OPERATING MULTIPURPOSE RESERVOIR SYSTEMS FOR WATER SUPPLY AND FLOOD ALLEVIATION,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14386

RIVER DEE RESEARCH PROGRAM: 2. A LONG-TERM CONTROL STRATEGY FOR A MULTIPURPOSE RESERVOIR,
Lancaster Univ. Baillrigg (England).
For primary bibliographic entry see Field 04A.
W72-14387

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14388

WATER RESOURCE MANAGEMENT IN NORTHERN MEXICO,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 03F.
W72-14389

METHODS FOR PREDICTING URBAN DRAINAGE COSTS,
Agriculture Research Service, Boise, Idaho. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W72-14390

USE OF SYSTEMS ANALYSIS IN WATER RESOURCE PLANNING,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
W. K. Johnson.
Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol 98, No HY9, Proceedings paper 9174, p 1543-1556, September 1972. 7 tab, 3 ref.

Descriptors: *Systems analysis, *Planning, *Surveys, Organizations, *Decision making, Social aspects, Management.
Identifiers: *Water resources systems, Systems engineering.

Data, and conclusions based upon that data, are presented on the current use of systems analysis in the actual planning of water resource systems. Information was gathered from federal, state, regional, local, and private organizations, through the use of questionnaires, interviews, and a literature review. The survey poses three basic questions: (1) To what extent is systems analysis being used; (2) what are the main obstacles to its greater use; and (3) how has systems analysis affected decisions during the planning process. Survey results indicate that systems analysis has been used recently in most of the organizations, with preference being given most often to simulation models. The major obstacle to increasing the use of systems techniques for planning seems to be a lack of information being provided for practioners to assist them in assessing the capability and overall value of systems analysis; journals and technical literature need to present more information of the capability, limitations, costs, and availability of systems analysis, with data coming from actual real world applications. Moreover, in-house applied research activity must be increased. Finally, the impact of systems analysis upon the actual decision making processes within the organizations themselves is not clearly ascertained from the survey. (Bell-Cornell)
W72-14391

MEASURING ATTITUDES TOWARD WATER USE PRIORITIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
J. A. Ballweg.
Available from the National Technical Information Service as PB-212 166, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Bulletin No. 50, April 1972. 135 p, 36 tab, 50 ref, 3 append. OWRR A-038-VA (2).

Descriptors: Water resources development, Water users, Water utilization, Attitudes, Priorities, Income, Age, Education, Multiple purpose, *Virginia.
Identifiers: *Likert scales, *Semantic differential scale, Sex, Smith Mountain Lake (Va).

Two techniques are employed to measure attitudes toward dual use of water resources. The study subject is Smith Mountain Lake, located in Southwestern Virginia, which is used both for recreation and hydroelectric generation. The sample population interviewed consisted of 134 males and 173 females from Roanoke, Virginia. The instruments used to evaluate the interviewees' responses were (1) a sixteen-item Likert scale, and (2) a seven-point semantic differential scale. While the composite Likert scale displayed a moderate degree of unidimensionality (.546), the four subscales designed to measure the dimensions of relevance, powerlessness, involvement, and deference failed to demonstrate the expected internal consistency. The semantic differential technique was somewhat more successful. It indicated that the degree of orientation toward water resources was positively correlated with education and income, and negatively correlated with age. Also, men tended to be more resource-oriented than women. The semantic differential scale also tested for power orientation. The study indicates that both the Likert scale and the semantic differential may be of some utility in determining, accurately and systematically, the public's attitudes toward water use priority. A sample interview instrument is included in an appendix. (Settle-Wisconsin)
W72-14417

A PERSPECTIVE ON ECONOMIC IMPACT,
Kentucky Water Resources Inst., Lexington.
L. D. James.
Available from the National Technical Information Service as PB-212 154, $3.00 in paper copy, $0.95 in microfiche. Research Report No. 37, March 1972. 121 p, 1 fig, 2 tab, 56 ref. OWRR A-006-KY (11).

Descriptors: *Reservoirs, *Economic impact, *Estimated benefits, *Project planning, *Economic justification, Flood damage, Recreation, Employment, Income, Property values, Land use, Institutions, Constraints, *Kentucky, *Ohio.

In order to provide water resource managers with a useful planning methodology, the economic impact of five reservoirs or reservoir complexes is studied. The study subjects are (1) West Fork of Mill Creek Reservoir in Hamilton County, Ohio, (2) Dewey Reservoir in Floyd County, Kentucky, (3) Rough River Reservoir in Grayson and Breckenridge Counties, Kentucky, (4) Wolf Creek Dam in Kentucky, and (5) a group of fifteen reservoirs in the Muskingum River basin in South Central Ohio. Analysis of the impact of these reservoirs proceeds by analyzing fourteen specific impact issues. These issues are reservoir effects on local property values, reservoir effects on the economy of the local county, changes in income and employment patterns around large reservoirs, patterns of land use change around reservoirs, reservoir effects on revenues and expenditures of local governments, reservoir recreation benefits, application of marginal economic analysis to reservoir recreation planning, economic value of natural areas for recreational hunting and for stream

fishing, the personal value of real property to its owner, reservoirsassociated income redistribution, demand-oriented reservoir operations, estimation of flood damages, and operation of reservoir systems for flood control. (Settle-Wisconsin)
W72-14418

THE PLAN FOR RECREATION DEVELOPMENT,
National Park Service, Western Regional Office. San Francisco, Calif.
E. F. Bullard.
Available from the National Technical Information Service as PB-207 554-D, $3.00 in paper copy, $0.95 in microfiche. March 1972. 116 p, 21 fig.

Descriptors: *Water resources development, *Recreation, *Lakes, *Planning, Management, Developed waters, Parks, Costs, Estimating, *California.
Identifiers: *Plan objectives, Development, *Lake Berryessa (Calif).

A plan for the development of the Lake Berryessa Basin is presented. It assumes that the purpose for developing Lake Berryessa is to make available to the San Francisco Bay, Sacramento, and Stockton region a water-oriented recreation area, providing the maximum amount of recreational opportunities compatible with conservingthe resources for future generations and complementary to other recreational opportunities within the region. The specific objectives of the plan are to (1) give highest priority to developing facilities that meet the public needs, (2) provide a balanced variety of public recreational opportunities, (3) provide adequate circulation systems to assure full enjoyment of park resources, (4) provide for the public's safety, (5) acquire lands necessary to implement the plan, (6) provide for adequate information dissemination, (7) provide for the needs of the residents of urban impacted areas, (8) develop architectural controls to assure harmonious development, (9) encourage educational programs that will utilize the park facilities, and (10) encourage research programs compatible with the recreation use of the area. Implementation of the plan would probably proceed best under federal management, although state management is not ruled out. Estimates of the cost of plan implementation are provided. (Settle-Wisconsin)
W72-14421

THE EVALUATION OF INTANGIBLE BENEFITS OF WATER RESOURCE PROJECTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
S. E. Gauger.
Massachusetts University, Amherst, Master's Thesis, February, 1972. 130 p, 12 fig, 44 photos, 7 tab, 57 ref, 6 append. OWRR B-017-MASS (1).

Descriptors: *Water resources development, *Intangible benefits, *Evaluation, Photography, Sites, Recreation, Cost-benefit analysis.
Identifiers: *Q-sort methodology, Factor analysis.

Development and application of a conceptual and mathematical approach for analyzing subjective responses to the appearance of the landscape around water resource projects is necessary if intangible benefits are to be included in cost-benefit analysis. One possible approach to analyzing subjective preferences is tested within the structure of the following hypothesis: 'If a photograph is one-half man dominated (evidence of man induced change), and one-half nature dominated (elements of both natural characteristics and man induced change), then people will not pick this case as a most preferred photo.' Data for testing this hypothesis was obtained by having subjects choose among 44 photographs according to Q-sort methodology. Factor analysis was then used to test the hypothesis. It was expected that photos of natural sites and of orderly developed sites would score high. However, people did not seem to equate naturalness with aesthetic appeal. Developed sites were interpreted as aesthetic, provided they were designed to fit in with the natural landscape. This study indicates that through the use of Q-sort methodology and factor analysis actual preferences may be incorporated into cost-benefit analysis. (Settle-Wisconsin)
W72-14422

VACATION HOME LOCATION: A MODEL FOR SIMULATING THE RESIDENTIAL DEVELOPMENT OF RURAL RECREATION AREAS,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
R. J. Burby, III, T. G. Donnelly, and S. F. Weiss.
Presented at: Annual Meeting of the Southern Regional Science Association, April 13-14, 1972, Williamsburg, Virginia. 52 p, 3 fig, 8 tab, 1 append. OWRR B-012-NC (10).

Descriptors: *Reservoirs, *Recreation, *Reservoir operation, Planning, Forecasting, *Simulation analysis, *North Carolina, *Georgia, Land use, *Computer models, Model studies.
Identifiers: *Reservoir management, *Residential development, *Lake Norman (NC), *Lake Sidney Lanier (Geo).

The characteristics of the residential development process in reservoir recreation areas is examined, and a computer model for simulating this process is proposed. Interviews with landowners, developers, and residents in the areas near Lake Norman, North Carolina, and Lake Sidney Lanier, Georgia, suggest that several attractiveness factors may be important in determining the location of residential development. These factors include physical characteristics of the area, accessibility to the reservoir, accessibility to roads and activity centers, institutional characteristics of the area, and changes in accessibility and institutional characteristics. The proposed simulation model is an adaptation of the Chapin-Weiss-Donnelly Probabilistic Model for Residential Growth. The model simulates reservoir area residential location decisions through a randomizing procedure in which households are assigned to sites on the basis of the supply of land available and its attractiveness for recreational and permanent residential use. Test runs of the model for the Lake Norman and Lake Lanier areas indicate that the model may provide planners and policy makers with a powerful tool for evaluating the effects of policy alternatives on reservoir area development patterns and for forecasting the probable location of residential growth. (Settle-Wisconsin)
W72-14425

SOCIAL GOALS IDENTIFICATION: A SURVEY APPROACH,
Utah State Univ., Logan.
D. D. Bracken.
Available from the National Technical Information Service as PB-212 261, $3.00 in paper copy, $0.95 in microfiche. Master of Arts Thesis 1971. 142 p, 1 fig, 3 tab, 55 ref, 3 append. OWRR C-2194 (No 3383) (2).

Descriptors: *Water resources, *Planning, Water resources development, *Social values, Social aspects, *Surveys, Cost benefit analysis.
Identifiers: *Social goals, *Goal set, Social well-being, *Descriptive survey, *Open-ended question, *Semantic differential, *Demographic data, *Cross-tabulation, Microdata, Macrodata, Social reporting, Straw Man, *Environmental security.

The Office of Water Resources Research funded a regional, interdisciplinary project entitled 'Development of Techniques for Estimating the Benefits of Water Resources Development for Achieving National and Regional Social Goals.' The project under the direction of the Technical Committee of the Thirteen Western States Water Resources Research Institutes, had as its first-year objective the definition of national goals and the identification of techniques to measure social variables. The purpose of the research reported in this thesis was to evaluate the public's perception of social goals in an effort to validate the primary goal set (the Straw Man) identified by the Technical Committee. The technique employed to ascertain the completeness of this goal set was survey research utilizing Research Services, Inc., of Denver, Colorado to survey a 600 sample of the universe (Colorado). The results of the survey gave support to the expansion of the goal set to include environmental security. The data also shed light on the interviewed individuals' perceptions of the relative importance of activities in each goal area. The study indicates to the policy maker that the achievement of social goals through resource commitments will be relative to the population being considered.
W72-14428

SOCIAL IMPACT OF THE LIBBY DAM-LINCOLN COUNTY, THE CASE OF ABSENTEE OR EXTRA-LOCAL INFLUENCE,
Montana State Univ., Bozeman. Water Resources Research Center.
H. Tureck.
Available from the National Technical Information Service as PB-212 254, $3.00 in paper copy, $0.95 in microfiche. Montana Water Resources Research Institute, Bozeman, Completion Report No 29, (1972), 90 p. OWRR C-1443 (No 1984) (1).

Descriptors: *Social adjustment, *Social impact, *Social aspects, *Water resources development, *Social participation, Dam construction, *Montana, Rural sociology, Area redevelopment, Community development.
Identifiers: *Libby Dam (Mont), *Kootenai River (Mont).

The study of the impact of a large scale government project reveals that the question of adaptation is paramount. Whether or not the residents liked the dam on the Kootenai River was unconsequential, the dam came anyway and all that the residents could do was to adapt to it. How the residents adapt to that which they cannot control is important. Nestled in the mountains, isolated from urban areas or larger Montana towns, the illusion of self-determination presents itself. It is apparent that physical isolation does not necessarily produce the social isolation that allows for self-determination. Isolation can produce dialetical effects: freedom from outside control or determination by outside controlling forces. For all of its beauty and isolation from the hectic life of the urban centers, the area still is determined to a large extent by these urban centers. The coming of Libby Dam represents an example of this phenomenon. This study serves as an introduction and as a base for subsequent interpretative reports regarding the parameters of local community versus outside control, stability versus non-stability, and other factors that will establish the foundations for future development in this area. (Holje-Montana)
W72-14429

THE IMPORTANCE OF ECONOMIC FACTORS IN URBAN WATER SUPPLY SYSTEMS,
Water Resources Engineers, Inc., Springfield, Va.
G. K. Young, G. F. Tierney, and J. S. Selekof.
Available from the National Technical Information Service as PB-212 275, $3.00 in paper copy, $0.95 in microfiche. Completion Report 1-160, June 1972. 110 p, 23 fig, 30 tab, 75 ref, 2 append. OWRR - C-2139 (3404) (1).

Descriptors: Urban water supply, Economic, *Mathematical models, *Simulation analysis,

*Uncertainty, Water reuse, Recreation, Construction costs, Operation and maintenance, Hydrology, Stochastic processes, Demography, District of Columbia, Model studies, Human population, Water utilization.
Identifiers: *Washington (DC), Demography, Sensitivity, Economic.

The objective of this research is to determine the importance of economic factors on decisions relating to the planning of an urban surface water supply system. Economic factors include: ate of population growth, rate of industrial growth, water use rates, waste water reuse, recreation, costs of construction, operation and maintenance of facilities, interest rate, and costs of using alternative water supplies in the event of local water shortages. A case study involves the urban surface water supply system of the Washington, D.C. metropolitan area. This research centers around the use of a simulation model to determine the economic response of an urban surface water supply system to changes in economic factors and hydrologic data. The economic response of the system is determined through simulation using stochastic hydrology. The initial simulation is the reference response. Each subsequent simulation is preceded by a perturbation of one of the economic parameters about its central value. This procedure permits an analysis of the rate of change of the total economic response with respect to each economic parameter, and hence, the importance of each economic parameter. Variance estimates of economic data are developed and employed to determine the reliability of the results of the analysis. The study shows economic variability to be a major source of planning uncertainty. Demographic forecasts, in particular, are identified as major contributors to uncertainty.
W72-14430

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
For primary bibliographic entry see Field 05G.
W72-14437

REGIONAL WATER SUPPLY AND WASTEWATER DISPOSAL PLAN AND PROGRAM, CAPITAL DISTRICT REGION.
Male (C. T.) and Associates, Schenectady, N. Y.

Capital District Regional Planning Commission, Elnora, New York, CDRPC70-2-01, July 1971. 120 p, 16 fig, 15 tab, 60 ref. HUD N.Y.P. 212.

Descriptors: *Planning, *Waste water disposal, *Water supply, *Sewage treatment, New York, Regional analysis, Comprehensive planning, Urbanization, Hudson River, Sewerage, Coordination.
Identifiers: *Regional planning.

The population of the four-county region for which the Capital District Regional Planning Commission has responsibility is expected to grow from 720,000 (in 1970) to about one million by 1990. This will place an increased demand on the water supply and the sewage treatment systems in the area. Recommendations are presented to promote the health and living standards of the citizens and to encourage the orderly growth of the communities within the planning region. These include: interconnection of county water distribution systems without the construction of new water treatment facilities; construction of new and regional waste treatment plants, coordinated at the county level; and the placement of all treatment plants on major streams to preserve the water quality of the tributaries. The only drawback to county-level systems is that if construction costs rise above approved bids, the counties are required to obtain state approval to proceed. This can cause a significant delay of projects underway. It is recommended that the law be changed. (Poertner)
W72-14445

A WATER QUALITY MANAGEMENT STRATEGY FOR THE GREAT LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-14544

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.

Hearing on S.2465 Before the Subcomm. on Parks and Recreation of the Senate Comm. on Interior and Insular Affairs, 92nd Cong, 1st Sess, November 30, 1972. 234 p, 8 fig, 2 map, 1 photo.

Descriptors: *Legislation, *Water resources development, *Florida, *Land use, *Wildlife habitats, Water conservation, Water management (Applied), Recreation, Eminent domain, Water resources, Surface water, Groundwater resources, Aquifers, Recharge, Saline water intrusion, Federal government, Ecosystems, Water supply, Drainage, Estuaries, Water quality control, Conservation, Fish conservation, Parks, Watersheds (Basins).
Identifiers: *Everglades National Park.

The legislation concerns federal acquisition of land in the Big Cypress swamp area in the Everglades. Private developers have already commenced digging perimeter canals for the purpose of draining the land for development. According to testimony of scientists speaking in favor of the acquisition this drainage will cut off the flow of diffused water to the Everglades National Park causing it to dry up and become useless as a wildlife habitat. There are seventeen species of wildlife in danger of extinction in the area. The Governor of Florida, both Senators and several other public officials spoke in favor of the acquisition. Testifying against federal acquisition of the area were a number of landowners of the area in question who contended there were few valuable wildlife habitats in the area and that the Big Cypress Swamp furnished only about nine per cent of the water for the Park. A number of conservation groups testified in favor of federal acquisition noting also the danger of oil exploration and drilling in the area. Included in the Appendix are a number of technical reports on the wildlife, vegetation and water resources in the area. (Brackins-Florida)
W72-14556

GEOLOGIC HAZARDS AND LAND-USE PLANNING,
H. W. Peirce.
Fieldnotes from the Arizona Bureau of Mines, Vol. 2, No. 3, P. 1-7, 9 September 1972. 1 fig, 4 plates.

Descriptors: *Land use, *Arizona, *Hazards, *Flood plain zoning, *Legal aspects, Runoff, Water rights, Erosion, Zoning, Drainage area.
Identifiers: *Tucson Basin.

The Tucson metropolitan area occupies the Tucson Basin, a valley surrounded by mountain masses. An integrated network of surface drainage configurations include the Santa Cruz River, Pantano Wash, Tanque Verde Wash, and Rillito Creek, with numerous smaller washes transecting the Catalina Foothills which lie along the north boundary of the area under consideration. This mountain block has a potential to transfer large volumes of water to the valley below. This assessment of the Tucson geologic setting suggests that the most hazardous of the operating geologic processes is related to water movement along canyons, washes, rivers, and even city streets. With the growing urbanization of the Tucson Basin, 'hazardous' acreage will tend to be pressured into development. The responsibility for picking and choosing building sites is left to the discretion of individuals as laws regarding lowland development are apparently nonexistent. In the absence of protective zoning laws, it is essential that individuals become aware of the hazards that do exist, and that they can be minimized by proper sensitivity and selectivity. With much riverbottom and floodplain property privately held, overall management is complicated, with development leading to demands for protection after the problem is belatedly perceived. A series of photographs call attention to the various hazards identified. (Paylore-Arizona)
W72-14580

WASHINGTON STATE'S WATER,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 09A.
W72-14618

PLANNING OF REGIONAL WATER RESOURCE SYSTEMS FOR URBAN NEEDS,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 06D.
W72-14638

SPACE-TIME ANALYSIS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W72-14643

MARSELLE-FOS: THE EQUIPMENT FOR A SEA SHORE; THE STABILITY TO PRESERVE, (MARSEILLE-FOS: L'EQUIPMENT D'UNE FACADE MARITIME; LES EQUILIBRES A PRE-SERVER),
Port Autonome de Marseille (France).
For primary bibliographic entry see Field 05G.
W72-14652

WATER QUALITY VERSUS RESIDENTIAL DEVELOPMENT: POLITICAL AND ADMINISTRATIVE ASPECTS OF WATER QUALITY MAINTENANCE IN PERRY AND CLINTON RESERVOIRS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 05G.
W72-14675

A STUDY OF THE COST AND EFFECTS OF IRRIGATION IN THE PLANNING AND IMPLEMENTATION OF THE LAJAS VALLEY AGRICULTURAL DEVELOPMENT PROGRAM,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
I. Aviles Cordero.
Available from the National Technical Information Service as PB-212 271, $3.00 in paper copy, $0.95 in microfiche. May 31, 72. 162 p. 4 maps, 32 tabs, 14 graphs. A-024-PR.

Descriptors: *Flood irrigation, *Furrow irrigation, *Gravity irrigation, *Irrigation systems, *Sprinkler irrigations, *Agriculture, *Development farms, *Farm ponds, *Irrigated land, *Irrigation canals, *Irrigation district, *Irrigation ditches, *Irrigation efficiency, *Irrigation water, *Irrigation practices, Water rights, Canals, Seepage, Arable land, Water requirements.
Identifiers: Rainfall frequency, Lajas Valley, Irrigation Costs, Agricultural Development Programme, Topography.

An attempt was made to investigate and analyze certain factors which, it was presumed were responsible for the high irrigation costs in agricultural development of the farms in the Lajas Val-

ley. The factors included were: (1) water available for irrigation; (2) topography of the farms; (3) types of soil; (4) irrigation methods employed; (5) administrative aspects of the system; (6) structural amenities of the farms; (7) maintenance of irrigation and drainage structures; (8) size of the agricultural unit; (9) land use and (10) handling of water in the farms. The study showed that among the factors investigated, the following are those which exercise the most significant influence on the costs of irrigation operations: (1) topography of the farms; (2) the administrative aspects of the system; (3) methods of irrigation employed and (4) size of the agricultural unit. The effectiveness of irrigation was proved by the fact that those farmers who irrigated obtained greater crop volume and that the total costs per ton of cane produced was much lower. As a result, the net benefit of the farm increased. Sugar cane should continue to be produced, because it produces a considerable income and can rely upon an assured market. Also, the heavy investments made by the Government and private farmers make it necessary a dynamic programming to achieve the efficiency and high production necessary to provide the farmers with the maximum profits.
W72-14678

DECISION ANALYSIS IN WATER RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
T. G. Roefs, and L. Duckstein.
Available from the National Technical Information Service as PB-212 368, $3.00 in paper copy, $0.95 in microfiche. Arizona Water Resources Research Center, Research Project Technical Completion Report, August 1972. 8 p, 9 ref. OWRR A-024-ARIZ (2).

Descriptors: *Planning, *Water allocation (Policy), *Pricing, *Decision making, Management, Streamflow, Groundwater, *Mathematical studies.
Identifiers: Collective utility, Streamflow synthesis, Transforms.

Collective utility calculus was applied to a water allocation and to a water pricing problem. Interrelationships between operating decisions and planning decisions for an idealized groundwater project were determined. A modification of the Corps of Engineers streamflow synthesis routine was made. (See also W72-02223)
W72-14845

THE PLANNING LAND-USE CONTROL RELATIONSHIP: A LOOK AT SOME ALTERNATIVES,
Illinois Univ., Urbana. Coll. of Law.
S. J. Plager.
Land-Use Controls Quarterly, Vol. 3, No. 1, p 26-32, Winter 1969. 16 ref.

Descriptors: *Planning, *Decision making, *Land use, *Control, Regulation, Zoning, Quality control, Long-term planning, Professional personnel, State governments.
Identifiers: *Policy making, *Input planning process, Regularization, Realistic perspective.

Two assumptions are made. (1) Governmental land-use controls must be based on some form of rational decision making process. (2) The functions of the urban planner and the planning professions are to play significant roles in that process. These assumptions are compared with historical and legal fact. Four alternatives are listed for structuring the planning-land-use control relationship: (1) authorization of zoning and other forms of land-use control without requiring formal planning, (2) to state the relationship in terms of directive statements, i.e., 'in accordance with a comprehensive plan', (3) to require specific planning procedures as a prerequisite to exercise of land-use controls, and (4) the input process. (1) and (2) are unacceptable methods. (3) is a substantial improvement over the no-plan and the directive statement alternatives. However, (3) emphasizes the plan rather than the planning process. It defines the contents of the plans in descriptive terms which provide no measure of quality or adequacy of the plans for the job to be done. The question of testing specific land-use decisions is untouched. The consequences of the input process (4) include: (1) long-range planning through governmental initiative, (2) employment of a full-time professional staff, (3) identification of decision makers, (4) regularization of governmental procedures, (5) the shifting of decision making to disinterested parties, (6) a more realistic perspective on the role of the planner, and (7) emergence of the state's role. (Strachan-Chicago)
W72-14881

THE RUN ON THE ENVIRONMENTAL BANK,
For primary bibliographic entry see Field 06G.
W72-14882

PROPOSALS FOR A NON-ESCAPIST NATIONAL URBAN GROWTH POLICY,
J. Carson.
City, Vol. 6, No. 1, p 62-63, January/February 1972.

Descriptors: *Planning, *Decision making, *Urbanization, City planning, Population, Distribution patterns, Land development, Control, Public lands, Tax rates.
Identifiers: *Policy making, *National urban growth policy, Escapist, Public participation.

Most discussion of a national urban growth policy tends to focus upon: (1) the limitation of population growth, or (2) the distribution of population and settlement. These approaches are seen as 'escapist'. An effective national urban growth policy must recognize that: (1) intervention is more effective if it channels rather than generates momentum, (2) opportunities for drastic intervention are limited, (3) the problems must be faced where they are, and (4) the public must participate actively in the urban development process. Five elements of such a national urban growth policy are proposed. (1) planning general distribution of urban land, (2) controlling urban development, (3) public ownership of urbanizing land, (4) a public urban development organization, and (5) changes in real estate tax. These suggestions put the action within the sphere of the metropolitan areas, and where it is needed. Urban development policy should focus on the development end of the process. (Strachan-Chicago)
W72-14885

THE PROFESSIONAL URBAN PLANNER,
Central Naugatuck Valley Regional Planning Agency, Waterbury, Conn.
D. A. Barr.
Journal of the American Institute of Planners, Vol. 38, No. 3, p 155-159, May 1972.

Descriptors: *City planning, *Comprehensive planning, *Decision making, Social aspects, Governments, Regulation, Limiting factors.
Identifiers: *Policy making, Government functionary.

The public image of the planner depicts him as an artist; as the master planner who intuitively prepares the best plans for the community. Planners, through their professional organizations, try to maintain an image of comprehensiveness. Neither image provides an adequate description of the planning profession. Neither explains why the plans prepared by the urban planner fail to gain real social commitment. What urban planners do and why they do it becomes more understandable when they are seen as governmental functionaires. A description of government's role, which is to order and regulate things, becomes a description of the planner's role. A description of the government to which the planner is subordinated can serve to define the practical limitations of the plans urban planners prepare. (Strachan-Chicago)
W72-14894

OUR RESOURCE ENDOWMENT AND OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Denver, Colo. Mid-Continent Regional Office.
R. H. Sharp.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 155-162.

Descriptors: *Resources, *Recreation, *Management, Planning, Governments, Financing, Conservation.
Identifiers: Policy making, Public participation.

The evolution of the dynamics of outdoor recreation is discussed. The resources necessary for outdoor recreation experiences have alternative uses that should be fully understood and recognized. It is important that people become sensitive and conscious of the natural resources. The Bureau of Outdoor Recreation and its relationship to conservation are discussed. The objective of the Bureau is to assure that all Americans have the opportunity to enjoy the out-of-doors, and to assure a rich diversity of outdoor opportunities to enhance the quality of life. The Bureau is responsible for the Water Conservation Fund which financially assists states and local governments in meeting their outdoor recreational needs. It is engaged in special area studies. It provides technical assistance, comprehensive river basin planning, and individual water project planning. It has a responsibility to coordinate the total federal effort in outdoor recreation through a continuing analysis of federal policies and budgeted allocations. The Bureau views its efforts as an important contribution toward the awakening of the public consciousness to critical conservation needs. (Strachan-Chicago)
W72-14909

URBAN OPEN SPACE: PSYCHO-SOCIO AND LEGAL DIMENSIONS,
Colorado Open Space Foundation, Denver.
R. P. Hansen.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 209-220.

Descriptors: *City planning, *Psychological aspects, *Social aspects, *Legal aspects, Conservation, Ethics, Urbanization, Land development, Ecology, Engineering, Economics.
Identifiers: *Open space, Economic development philosophy.

One of the dramatic manifestations of an economic development philosophy measured in quantitative terms is the disruption, contraction, distortion, and destruction of open spaces in urban areas. Several basic errors have been made in the evaluations of open space for urban areas: (1) need for open space has been equated with 'little old ladies in tennis shoes', (2) open space has not been recognized when it was seen, (3) the role of undeveloped areas in the open space system of cities has not been recognized. The absence of open space in cities has assiduous results: delinquency, mental disturbance, and aggravated social and psychological problems. There are specific things to be done to preserve open spaces in metropolitan areas. (1) 'Open space' must be defined in broader, more comprehensive terms than are available under traditional 'parks and recreation' concepts. (2) A new and dynamic conservation must be instituted in the cities that will not merely tolerate, but will justify, for psychological, physiological,

social, and ethical reasons, an urban development that does not utterly destroy the natural environment. (3) Systems and procedures must be devised to effectively correlate ecological information with engineering expertise. Certain legal aspects of open space are also discussed. (Strachan-Chicago)
W72-14911

RECREATIONAL USE OF AN OKLAHOMA SCENIC RIVER BISECTED BY A FLOOD CONTROL-HYDROELECTRIC IMPOUNDMENT (REVISED),
Oklahoma Water Resources Research Inst., Stillwater.
R. C. Summerfelt, and A. K. Andrews.
Available from the National Technical Information Service as PB-212 383, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, 1972. 33 p, 8 tab. OWRR A-026-OKLA (1).

Descriptors: *Recreation, *Fishing, *Reservoirs, *Rivers, *Bass, *Economics, Value, Oklahoma.
Identifiers: *Mountain Fork River (Okla), Fishing man/day, Broken Bow Reservoir (Okla).

A recreation-use survey of a smallmouth bass-scenic river was conducted above and below Broken Bow Reservoir on the flowing portions of the Mountain Fork River, McCurtain County, Oklahoma from 1 August 1970 through 31 July 1971. Only those people actively using the river were interviewed to determine amount of use, aspects of fisherman harvest and economic value of the resource. A total of 16,542 people (8,408 above and 8,134 below) spent $88,133 ($45,188 above and $42,945 below) and caught 31,442 of 17 species of fish (26,457 above and 4,985 below) weighing 13,584 pounds (11,580 above and 2,003 below). People being interviewed stated a preference for the free flowing portions of the river as opposed to the regulated flows below the reservoir. An observed man-day of recreation above was worth $5.37 for a 1.9-hour trip with a man-day of 2.1 hours worth $5.28 below (total river value was $5.33 for a 2.0-hour day). Conversion of these values to the standard 5-hour man-day showed the value above to be $14.13, $12.87 below and $13.48 for total river. These values indicate a need to reevaluate the $3.00/man-day maximum amount allowed for a smallmouth bass fishery by federal law. Distribution of catch over time showed expected variation with few fish caught during the winter months and maximum catches occurring in the spring. Differences in catch above and below the reservoir were attributed to changes in the water quality below the reservoir.
W72-14917

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A COST ANALYSIS OF WASTE MANAGEMENT IN THE STEEL INDUSTRY,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05D.
W72-14379

MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM, WASTEWATER COLLECTION, TREATMENT AND DISPOSAL.
Humboldt County Planning Commission, Eureka, Calif.; and Baruth and Yoder, Walnut Creek, Calif.
For primary bibliographic entry see Field 05D.
W72-14380

EFFECT OF SIZE OF RESERVOIR ON HYDRO PROJECT COST,
National Technical Univ., Athens (Greece); and Public Power Corp., Athens (Greece).
M. S. Chandrakis.
Water, Vol. 24, No. 3, p 90-95, March 1972. 8 fig, 5 tab, 3 ref.

Descriptors: *Hydroelectric power, *Graphical analysis, *Annual costs, Peak loads, Electric power production.
Identifiers: Annual charges, Annual charges curve, Primary energy, Secondary energy.

A new graphical method is used to analyze the annual cost variation of a hydroelectric project following a change in the size of the storage reservoir. This original graphical technique is employed to derive a new curve, the annual charges curve, in which the production of secondary energy from the hydroelectric project is taken into account. The annual charges curve takes into consideration the possibility that a hydro project can produce both primary and secondary energy. Consequently, the annual charges curve may be used, without any reservations about the existence of secondary energy, as an equivalent to the curves for the thermal power stations. Furthermore, the disadvantage of showing the annual charges of a hydro station in relation to its produced energy during an average hydrological year is avoided when this new curve is used. In view of the fact that in most power economy studies it is necessary to know the change in the annual charges of power stations, the usefulness of this new analytical method appears significant. It contributes to a more correct evaluation of a hydroelectric station's ability to meet peak load demands. (Settle-Wisconsin)
W72-14419

EFFECTS OF POLLUTION CONTROL ON THE FIRM,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 05G.
W72-14420

ECONOMICS OF HATCHERY SALMON DISPOSAL IN OREGON,
Oregon State Univ., Corvallis.
K. J. Roberts.
NOAA Commercial Fishing Publication, Marine Advisory Program, Sea Grant No 17. 20 p, 1 fig, 7 tab. (1972).

Descriptors: *Salmon, *Fish hatcheries, *Disposal, *Economic impact, Prices, Supply, Demand, *Oregon, *Waste disposal.
Identifiers: *Hatchery fish, Consumption.

Oregon's commercial fishermen frequently complain that the sale of returned hatchery salmon by Oregon's hatcheries adversely affects the fishing industry. Some poor quality hatchery salmon probably have been sold for human consumption. However, in 1971 the Fish Commission of Oregon began a grading program for the returned hatchery salmon that should prevent the sale of poor quality salmon for human consumption. Returned salmon are now judged to be (1) in excellent condition with no restrictions placed on their use, (2) in reasonably good condition but unfit to be sold as fresh or fresh frozen, and (3) in poor condition and restricted to use for non-human consumption. Also, the complaint that the sale of returned hatchery fish substantially lowers the market price for salmon seems to be unfounded. Between 1968 and 1971 the hatchery fish poundage used for human consumption was always less than 5 percent of commercial landings. Thus, it seems inaccurate to assume that this volume of hatchery fish could be responsible for lowering prices and that the other 95 percent of salmon marketed had no effect. The total effect of hatchery fish on prices is likely to be small. (Settle-Wisconsin)
W72-14423

PHOSPHATES, HEAVY METALS, AND DDT: POLLUTION CONTROL COSTS AND IMPLICATIONS,
For primary bibliographic entry see Field 05G.
W72-14424

A SURVEY OF ALTERNATE METHODS FOR COOLING CONDENSER DISCHARGE WATER--SYSTEM SELECTION, DESIGN, AND OPTIMIZATION.
Dynatech R/D Co., Cambridge, Mass.
For primary bibliographic entry see Field 05D.
W72-14724

UPPER COLORADO RIVER BASIN.
For primary bibliographic entry see Field 06E.
W72-14786

6D. Water Demand

A MATHEMATICAL-PROGRAMMING MODEL FOR PLANNING A REGIONAL WATER RESOURCE SYSTEM,
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 06B.
W72-14242

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO (PART 1).
For primary bibliographic entry see Field 03F.
W72-14257

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY,
RAND Corp., Santa Monica, Calif.
F. S. Roberts.
Rand Report No. R-756-NSF, May 1971. 47 p, 6 fig, 25 ref.

Descriptors: *Graphical methods, *Energy, *Powerplants, *Mathematical models, *Demand, Air pollution, Solid wastes, Water pollution, Transportation, Employment, Algorithms, Forecasting, Graphical analysis, Population, *Electric power demand, Smog, Taxes, Tax rates, Environmental control, Water demand.
Identifiers: *Signed digraphs, *Energy demand, Energy consumption, Pulse processes, Policy problem.

Many of the problems of our complex, modern society, particularly those relating to energy use, air pollution, and solid waste disposal, seem amenable to formulation using the techniques of the rapidly growing field of graph theory, in particular the notion of a signed digraph. This report outlines a methodology which exploits the signed digraph for handling problems of forecasting energy demand and the effect of new technologies and institutions on that demand, and for generating and analyzing policy alternatives for modifying energy use to meet environmental constraints or standards. The forecasting and policy problems are translated into signed digraphs problems, and in particular to problems of so called pulse processes on signed digraphs. Research problems related to the development of the methodology are described. (Oleszkiewicz-Vanderbilt)
W72-14411

WATER CONSUMPTION STUDY FOR NAVAJO PLANT,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
For primary bibliographic entry see Field 05G.
W72-14413

REVISED WATER AND SEWER STUDY.
Bootheel Regional Planning Commission, Malden, Mo.

Available from the National Technical Information Service as PB-209 667, $3.75 in paper copy, $0.95 in microfiche. February 1972. 26 p, 2 tab. HUD Mo.P-195/SA/153.

Descriptors: *Water supply, *Sewerage, *Waste water treatment, *Water resources development, *Planning, Cities, Urbanization, Sewerage, Long-term planning, Federal project policy, Financing, Missouri, Administration, Regional analysis, Municipal water, Waste water disposal, Governments, Comprehensive planning, Local governments.
Identifiers: *Southeastern Missouri, Bootheel (Missouri).

This report provides the Department of Housing and Urban Development and local constituents with information concerning progress made in providing water and sewer services in the counties served by the Bootheel Regional Planning Commission (Dunklin, Mississippi, New Madrid, Pemiscot, Scott and Stoddard). An inventory is presented of existing local comprehensive plans, local municipal water and sewer plans, individual county water and sewer plans, and a four-county regional water and sewer plan. Progress the municipalities have made in improving and seeking federal financial assistance as an aid in providing the recommended water and sewer services to their respective citizens is discussed. A priority ranking is given of proposed needed water and sewer improvements based upon the date that a project received its A-95 review. This priority ranking of projects may be added to or changed based upon the number of applicants recieved. All projects are reviewed and the commission's recommendations are governed by the projects conformance to a plan. (Poertner)
W72-14442

MASTER WATER PLAN FOR STOCKTON--EAST WATER DISTRICT, IN COOPERATION WITH CITY OF STOCKTON, SAN JOAQUIN COUNTY CALIFORNIA WATER SERVICE COMPANY.
Stoddard and Associates, Los Banos, Calif.

February 1972. 146 p, 12 fig, 15 tab, 31 ref.

Descriptors: *Water supply, *Planning, *Water sources, *Water demand, *California, Saline water intrusion, Comprehensive planning, Imported water, Urbanization, Groundwater availability, Irrigation water, Water table.
Identifiers: Stockton (Calif), San Joaquin County (Calif).

The growth of the Stockton-East Water District will result in additional, unsatisfied demands of 39,000 acre-feet in 1980 and 144,000 acre-feet by 2020. The present use of ground water supplies has led to an extensive cone of depression and, as a result, saline water intrusion has occurred. The Stockton and East San Joaquin Water Conservation District should contract promptly for an additional surface supply of water from the Folsom South Canal of 79,000 acre-feet per year, and they should begin to utilize a portion of this supply as soon as the Folsom South Canal is capable of making deliveries to the District. Any delay in acquiring the initial deliveries of the additional surface supply will prolong the existence of the cone of depression and thereby increase the extent of intrusion of saline water into the ground water underlying the District. All other supplies of water from the Calaveras River and the New Hogan Project should be utilized. Recommendations are given for obtaining additional water supplies for other water supply problems in the area. (Poertner)
W72-14446

COMPREHENSIVE WATER AND SEWERAGE STUDY.
San Joaquin County Advisory Planning Association, Stockton, Calif.

For primary bibliographic entry see Field 06A.
W72-14447

A COMPREHENSIVE PLAN FOR WATER-WORKS AND SANITARY SEWERAGE FACILITIES, RIDGELAND, MISSISSIPPI.
Dawson Engineers, Inc., Jackson, Miss.

Available from the National Technical Information Service as PB-208 897, $3.00 in paper copy, $0.95 in microfiche. Town of Ridgeland, Mississippi and the Ridgeland Planning Commission, July 1971. 77 p, 5 fig, 6 tab, Mississippi P-91.

Descriptors: *Water supply, *Sewerage, *Local governments, *Water resources development, *Long-term planning, Construction costs, Capital costs, Comprehensive planning, Cities, Urbanization, Mississippi, Municipal water, Waste water disposal.
Identifiers: *Ridgeland (Miss).

The plans are intended to serve as guidelines for the Town of Ridgeland and the Ridgeland Planning Commission for the period of 1971 to 1990. The recommended plans were developed from the most suitable alternate plans considered, based on immediate and long-range needs, economy, practicality, and compatibility with existing facilities and trends in land development. Preliminary engineering design of facilities has included studies of the most feasible means of developing water supply and providing a sewerage system. The recommended water plan proposes that two intermediate systems be established in the eastern and western portions of the Planning Area. The western portion, being the Ridgeland Municipal System, would be improved and expanded initially within the economic capability of the community. The eastern portion, being the Pearl River Valley Supply District, Tavern Hill area, and the Natchez Trace Village area would combine to form a single district under one authority. These systems would assume supply, treatment (if required), and distribution functions within each separate area. The estimated sewage flows for the Planning Area are given. The concept of initial limited decentralized and ultimate centralized systems are applicable to the planning of sewerage systems as well as water systems. The development of two systems initially offers the advantage of providing sewerage facilities to a majority of residents in the Planning Area. The ultimate centralized concept invisions a single system easily adapted to a comprehensive long-range solution to water pollution problems. (Poertner)
W72-14450

PLANNING OF REGIONAL WATER RESOURCE SYSTEMS FOR URBAN NEEDS,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau.
Completion Report, March 30, 1972. 3 p. OWRR B-021-NC (1).

Descriptors: *Urban hydrology, *Planning, *Water demand, *Water supply, *Regional development, *River basins, *North Carolina, Water resources, Land resources, Sewers, Streamflow, Optimization, Simulation analysis.
Identifiers: *Piedmont.

A comprehensive study was undertaken to examine modifications to existing planning and analytical models that are necessary for the development of limited water and related land resources to serve the needs of several emerging urban areas within a region that spans several river basins in the Piedmont of North Carolina. Three basic tasks were set forth in the proposed research plan: (1) To identify emerging needs for water and related lands within the region; (2) to examine a limited set of alternative programs for development and management of a regional system; and (3) to examine adaptations of water resource planning to a new institutional framework and its relationships to state and federal activities. The newly established institutional arrangement assigned to multi-county planning districts the responsibility to develop regional water and sewer plans in compliance with guidelines set forth by the Environmental Protection Agency and the Department of Housing and Urban Development. Project No. B-021-NC presents writings based upon the two-year study's first year of research. A completion of the project is found in B-45-NC. In keeping with the proposed plan, individual research papers in the project present supply-demand relationships, monthly streamflow models, a water quality model, a simulation model, and others. (See also W72-14639 thru W72-14641) (Bell-Cornell)
W72-14638

RELATIONSHIPS BETWEEN SUPPLIES AND PROJECTED DEMANDS FOR WATER IN A SIX-COUNTY URBANIZING REGION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau.
(1972). 13 p, 2 fig, 6 tab, 10 ref.

Descriptors: *North Carolina, *Urban hydrology, *Water demand, *Water supply, *Water quality, *Regions, *River basins, *Human population, *Economic prediction, Municipal water, Industrial water, Estimating, Biological treatment.
Identifiers: *Supply-demand relationships, *Piedmont, *Water use, Winston-Salem, High Point, Chapel Hill, Greensboro, Burlington, Durham, Raleigh, Cape Fear River basin, Neuse River basin, Yadkin River basin, Roanoke River basin.

Considerable insight into the magnitudes of future regional water demands can be gained by examining projected population levels together with anticipated changes in economic activities that tend to alter water use rates. Such examination is made of a linear six-county region in North Carolina, containing four river basins and seven cities. The locations of these cities with respect to basin boundaries, and with respect to each other, place intense demands for water supply and waste disposal on the small streams on which they are situated. Serious water quality problems are recurrent even with exceptionally high levels of biological treatment of domestic and industrial wastes. Limitations on quantities of water available have already deprived the area of several otherwise desirable wet process industries, a situation that will be further aggravated as growth continues to occur. Examination results indicate a possible 64% increase in population by the year 2000. After approximating current demands for municipal and industrial water supplies and surveying the regional economic trends, it is assumed that percapita use rates and resulting total water demands for the year 2000 will increase by 90%. Oxygen demands on streams are expected to grow in direct proportion to the population. (See W72-14638) (Bell-Cornell)
W72-14639

UTILIZATION OF AN INPUT-OUTPUT MODEL FOR PREDICTING WATER DEMAND ON A SMALL WATERSHED,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 06A.
W72-14644

THE MEASUREMENT OF THE DEMAND FOR IRRIGATION WATER WITH SPECIAL REFERENCE TO SOUTHWEST KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 03F.
W72-14677

PRELIMINARY STUDIES ON GROUNDWATER N SAMARATIKRIT AREA,
nstitute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 04B.
W72-14872

6E. Water Law and Institutions

NTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Vendell and Schwann, Washington, D.C.

Available from NTIS, Springfield, Va. 22151, as PB-210 358 for $12.50 paper copy. National Water Commission Report no. SBS 72-049, Sept. 1972, 130 p, append.

Descriptors: *Water resources development, Water policy, *Institutions, *Organizations, Coordination, *Decision making, Financing, Regulation, Planning, Manpower, Water law, Governments, Interagency cooperation, Interstate compacts, Water Resources Planning Act.
Identifiers: *Intergovernmental relations, *Institutional arrangements, *Environmental institutions.

Intergovernmental arrangements for public water activities are examined within their historical context in the first half of the report. These arrangements are classified in terms of nine tools which Federal, state and/or local units of government use to secure water resources actions by the other levels of government. The tools are financial incentives, regulation, intergovernmental planning, technical assistance, manpower training, project development, comprehensive management, legal rights to water, and development and dissemination of information. The second half of the report analyzes the characteristics, uses and effectiveness of each of the nine tools, both singly and in combination. The efficacy of interagency committees, interstate and Federal interstate compacts, the Water Resources Planning Act and other intergovernmental mechanisms is assessed. Arrangements for improved environmental quality and solution to metropolitan problems are given particular emphasis, with a chapter devoted to environmental institutions. On the basis of its analysis, the report makes recommendations for changes in the nine tools and the institutions on which they operate. (NWC)
W72-14238

HEARINGS--PUBLIC WORKS FOR WATER, POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATIONS FOR FISCAL YEAR 1973--PARTS 1-5.
For primary bibliographic entry see Field 05G.
W72-14251

POWERPLANT SITING AND ENVIRONMENTAL PROTECTION, PART 2.
For primary bibliographic entry see Field 06G.
W72-14252

GATEWAY AREA PROPOSALS.
For primary bibliographic entry see Field 06G.
W72-14253

SEWAGE-POLLUTION PREVENTION.
For primary bibliographic entry see Field 05D.
W72-14254

VERMONT WHEY POLLUTION ABATEMENT AUTHORITY LAW.
For primary bibliographic entry see Field 05G.
W72-14255

ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING, AND MANAGING WATER RESOURCES IN AGRICULTURE.
Economic Research Service, Madison, Wis.
For primary bibliographic entry see Field 03F.
W72-14256

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO (PART 1).
For primary bibliographic entry see Field 03F.
W72-14257

INTRODUCTION OF A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.

Senate Bill 4105, 91st Cong, 2d Sess (1970). 2 p.

Descriptors: *Federal Water Pollution Control Act, *Grants, *Municipal wastes, *Treatment facilities, Sewage, Sewage treatment, Water pollution, Water pollution control, Pollution abatement, Legal aspects, Water law, Government finance, Federal government, Waste disposal, Sewage disposal, Storm drains, Water quality, Water quality control, Legislation.

Two major amendments in the Federal Water Pollution Control Act are proposed by S.4105. The first is an amendment to section eight, subsection (f), which would authorize a special twenty per cent incentive grant for new construction of pollution abatement works by municipalities which have built sewage projects since 1956 which were qualified for federal assistance at the time they were built but were not in fact aided by the authorized thirty per cent federal grant. The total of these incentive grants would be limited to the total amounts of federal grants by which such municipalities were shorted since 1956. These municipalities failed to receive any grants because of a lack of full funding and a dollar ceiling imposed on all project grants. The second change is an amendment to subsection (c) of section twenty-three which would permit federal funding of projects directed toward the solution of the combined sanitary and storm sewer problem. Recent research indicates that large metropolitan complexes are not receiving a proportionate share of federal funding for waste treatment works. (Brackins-Florida)
W72-14258

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS (DIGEST OF BILL).
Senate Bill 2770, 92d Cong, 1st Sess, Digest of General Bills and Resolutions (1971). 5 p.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Water pollution control, *Water quality standards, Water pollution, Water quality, Water quality control, Legal aspects, Water law, Watercourses (Legal aspects), Administrative agencies, Federal government, State governments, Governmental interrelations, Industrial wastes, Municipal wastes, Sewage effluents, Government finance, Federal budget permits, Treatment facilities.
Identifiers: Citizen suits, Injunctions (Prohibitory).

Amendments to the Federal Water Pollution Control Act establish a policy that discharges of pollutants should be eliminated by 1985 and for restoration of natural water integrity by 1976. The bill also provides for expanded Environmental Protection Agency (EPA) participation in research programs and water treatment demonstration projects; provides for research into preventing agricultural runoff pollution, and appropriates funds, inter-agency grants, and scholarships. Federal financing for construction of treatment works is increased to sixty percent of the total cost. The federal share shall be increased to seventy per cent if the state contributes ten per cent. Provisions are included for establishment of water quality standards and enforcement and for publishing effluent guidelines. A permit program for the discharge of pollutants into navigable waters and beyond is also included. This program would replace the Refuse Act Permit Program. However, an approved state permit program may be approved in place of the federal program. The bill also empowers the EPA to take remedial action against pollution which presents an imminent danger to health, provides for expanded civil remedies by private citizens, provides for notice of such suits to the EPA, and provides for state suits and standards. (Brackins-Florida)
W72-14259

EFFECTIVE POLLUTION CONTROL IN INDUSTRIALIZED COUNTRIES: INTERNATIONAL ECONOMIC DISINCENTIVES, POLICY RESPONSES, AND THE GATT,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 05G.
W72-14426

SOCIAL GOALS IDENTIFICATION: A SURVEY APPROACH,
Utah State Univ., Logan.
For primary bibliographic entry see Field 06B.
W72-14428

WATER RESOURCES ADMINISTRATION IN MINNESOTA - 1972,
Minnesota Univ., Minneapolis. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service as PB-212 277, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Bulletin 49, April 1972. 188 p, 15 ref. OWRR A-021-Minn (4).

Descriptors: *State government, *Legislation, *Water policies, *Administration, Budgeting, Programs, Coordination, Institutions, Minnesota, Organizations, Water law, Water districts, Political aspects, Environment, Water resources, Federal government, Interest groups, Lobbying, Attitudes, Resource agencies, Issues, Ecology.
Identifiers: *State governmental reorganization, *Legislative process, *State environmental policy, Federal governmental reorganization, Citizen participation, Viewpoints, Associations.

In 1970, Minnesota's State government contained at least 21 departments, agencies, boards, commissions, committees, etc. with water and related land resources responsibilities. Expenditures by these organizations increased from $5.7 million in 1950 to $31.9 million in 1970. About 86% of expenditures were made by the Department of Conservation. Total State agency staff complements increased from 1,100 in 1960 to 1,400 in 1970. Prime responsibility for water and related land resources programs rested in 3 Committees of the Senate and 2 Committees in the House. The Governor's and Legislature's control of the State's administrative apparatus is hampered through fragmented organization. In 1970, there were 5 International, 5 regional, 3 interstate, and 4 Federal-State organizations with programs in the State. Federal responsibilities in water and related land resources plannin pumping, rehabilitation of a small flowage, urban runoff, characterization private controls for recreational land development, shoreland development, and lake rehabilitation legislation and programs. The progress of Minnesota's shoreland program and activities in lake demonstration projects was described. Alum was used successfully for chemical inactivation of nutrients in an overfertilized small lake in WISCONSIN. Dilutional pumping resulted in some success in reducing the phosphorus content of another lake. Plastic sheeting, in combination with sand and gravel blankets

on the bed of a millpond, was used to control aquatic plants. With regard to water-oriented recreational developments, it was suggested that an automatic property owners association can provide a mechanism for maintaining and managing the common open space and facilities to which individual lake lot owners have common rights. A nation-wide survey disclosed that explicit statutes saying that a local unit of givernment or State agency is authorized to project, manage, or rehabilitate lakes are rare. (Walton-Minnesota)
W72-14438

THE TEXAS WATER QUALITY ACT.
Texas Water Quality Board, Austin.

Agency Publication Number 72-02, February 1972. 90 p.

Descriptors: *Legislation, *Texas, *Legal aspects, *Water law, *Water quality standards, Water pollution control, Governments, Water quality.

In order to familiarize the public with changes in the Texas water laws, the Texas Water Quality Board prepared this extract of the changes. The nine subchapters are: (1) general provisions; (2) administrative provisions; (3) powers and duties of the Texas Water Quality Board; (4) regulations applying to regional systems; (5) provisions for the enforcement of these laws; (6) the defining of the authority of local governments; (7) provisions for judicial review; (8) regulations regarding criminal prosecution; and (9) rules concerning financial assistance for waste treatment construction. In most cases the revisions are of form, but there are instances of alteration and deletion of prior statutes. (Poertner)
W72-14443

WATER SUPPLY MANAGEMENT STUDY FOR THE SOUTHEASTERN CONNECTICUT REGIONAL PLANNING AGENCY.
Peat, Marwick, Mitchell and Co., Hartford, Conn.

Available from the National Technical Information Service as PB-208 671, $3.00 in paper copy, $0.95 in microfiche. Southeastern Connecticut Regional Planning Agency, Norwich, December 1971. 55 p, 4 fig, 1 tab. HUD CPA-CT-01-26-1011.

Descriptors: *Administration, *Administrative agencies, *Planning, *Water supply, *Water resources development, Connecticut, Water supply development, Municipal water, Cities, Regional analysis, Urbanization, Legislation, Optimum development plans, Feasibility studies, Financial feasibility.
Identifiers: *Southeastern Connecticut.

The Southeastern Connecticut Water Authority is evaluated from a management standpoint. Particular emphasis is placed on organizational and financial requirements for an effective regional service agency. Proposals for short-range improvements to the present Water Authority are made. From a long-range management standpoint Southeastern Connecticut should move toward the creation of a multi-purpose regional agency concerned with planning, water supply, waste water disposal, air pollution control, and recreation. An Ad Hoc Advisory Regional Organization Committee of about 15 members should be established. The Committee would have responsibility for taking steps needed to secure appropriate legislation for establishing a new Southeastern Connecticut Regional Agency. Public hearings are recommended for consideration of the proposed plan for establishing the Agency. (Poertner)
W72-14449

PRIVATE COMPENSATION FOR INJURIES SUSTAINED BY THE DISCHARGE OF OIL FROM VESSELS ON THE NAVIGABLE WATERS OF THE UNITED STATES,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 05G.
W72-14545

THE ECE SYMPOSIUM ON PROBLEMS RELATING TO ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14546

SCL SPONSORED 'EXCURSION' INTO FORESTRY, ECOLOGY, AND NATURAL RESOURCES IN SOUTH CAROLINA,
House, Washington, D.C.
T. S. Gettys.
Congressional Record, Vol 118, No 79, E5284-E5288 (daily ed), May 16, 1972. 5 p.

Descriptors: *South Carolina, *Forest management, *Ecology, *Forestry, Natural resources, Recycling, Resources development, Administrative agencies, Comprehensive planning, Air pollution, Water pollution, Land use, Trees, Lumbering, Water quality control, Recreation, Recreation demand, Clear-cutting, Forest fires, Planting management, Reforestation.

The Hon. Tom S. Gettys of South Carolina speaks in the U.S. Congress of a Seaboard Coast Line sponsored excursion in forestry, ecology, and natural resources in South Carolina. Mr. Gettys discusses the nature and scope of this presentation, which included remarks by the Hon. William E. Gailbraith, Deputy Under Secretary of Agriculture, on South Carolina's forest resources and the need for more enlightened harvesting techniques. Mr. James C. Hair, president and general manager of Bowaters Carolina Corp. comments on what only one industry, the forest products, is doing to improve the quality of our environment. These efforts include the National Council of the Paper Industry for Air and Stream Improvement, which is totally dedicated to research to improve air and water quality, and massive reforestation efforts, clearcutting, wilderness preservation, and recycling. Also discussed is the controversy over whether undeveloped wilderness areas should be developed for recreation and managed or whether more forests should be allowed to remain as permanent wilderness. (Widman-Florida)
W72-14547

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 06G.
W72-14548

THE DEEP SEABED HARD MINERAL RESOURCES BILL,
Auckland Univ. (New Zealand).
F. M. Auburn.
San Diego Law Review, Vol 9, No 3, p 491-513, 1972. 133 ref.

Descriptors: *Law of the sea, *Beds, *Mineral industry, *Legislation, *Oceans, Legal aspects, Legal review, International law, Expolitation, Exploration, Ships, Mining, Ownership of beds, Manganese, Permits, Boundaries (Property), Continental shelf, Social aspects, Political aspects, United Nations, Federal jurisdiction, United States, Economic impact.

Provisions are analyzed of the Deep Seabed Hard Mineral Resources Bill which was drafted by the American Mining Congress. There is currently no international mechanism for controlling deep sea mining beyond the continental shelf except an international moratorium, which the United States does not consider binding. The bill would permit the Department of Interior to license deep sea hard mining by persons and juridical entities subject to United States jurisdiction. International legal problems involved with the bill are discussed including the related problem of defining the limit of the continental shelf and the territorial sea, control of exploitation of the seabed on the traditional high seas, classification of minerals such as petroleum and minerals suspended in water, nonuniform provisions dealing with reciprocating states, inadequate licensing requirements, liability provisions, conflicts of federal agency jurisdiction, and investment protection. The bill is strictly 'municipal' legislation that does not consider the need for resolving international conflict nor the need for protecting the common heritage of the deep sea. (Grant-Florida)
W72-14549

OIL POLLUTION PROBLEMS ARISING OUT OF EXPLOITATION OF THE CONTINENTAL SHELF: THE SANTA BARBARA DISASTER,
For primary bibliographic entry see Field 05G.
W72-14550

EXEMPTIONS FROM NEPA REQUIREMENTS SOUGHT FOR NUCLEAR PLANTS, POLLUTION PERMITS,
C. E. Barfield.
National Journal, Vol 4, p 1025-1034, June 17, 1972. 1 photo.

Descriptors: *Legal review, *Electric powerplants, *Water permits, *Water pollution, Water pollution sources, Administrative agencies, Adoption of practices, Environmental effects, Political aspects, Legal aspects, Political constraints, Regulation, Judicial decisions, Legislation, Rivers and Harbors Act, Federal jurisdiction, Water law, Nuclear powerplants.
Identifiers: *National Environmental Policy Act, *Environmental Impact Statements.

Recent court decisions construing the National Environmental Policy Act (NEPA) and the effect that they have had in encouraging attempts to amend NEPA are examined. Two problems are the cause of these efforts: the shortage of electricity and the ability to avert it by ignoring some of NEPA's procedural safeguards, and delays in implementing NEPA's permit program due to required impact statements. Court decisions have strictly construed NEPA's impact statement requirement and also the permit requirement of the Refuse Act. Several bills which would relieve the situation by dispensing with the needed impact statements are reviewed. The arguments of industry and environmental groups with respect to each bill is summarized as is the position of the Nixon administration, which generally is favorable to the proposed amendments. Measures proposed by the bills include the following: suspension of the impact statement requirement for issuance of discharge permits, interim authority to operate nuclear power plants, expedited procedures for power plant siting decisions, exemption from procedures by Presidential declaration of an emergency, and exceptions to the need for impact statements for certain types of projects. (Grant-Florida)
W72-14551

MARINE ARCHAEOLOGY AND INTERNATIONAL LAW: BACKGROUND AND SOME SUGGESTIONS,
H. H. Shore.
San Diego Law Review, Vol 9, No 3, p 668-700, 1972. 116 ref.

Descriptors: *Law of the sea, *International law, *Archaeology, *Marine geology, *Beds, Continental shelf, Legal review, Legal aspects, Oceans,

Governments, Jurisdiction, International Joint Commission, Coasts, Coastal areas, Shores, United States, United Nations, Exploration.
Identifiers: *Marine archaeology.

Some of the current legal problems confronting marine archaeology are analyzed including the right to explore and excavate. Current United Nations guidelines and the European Convention on the Protection of the Archaeological Heritage are discussed. The problems presented by current definitions of territorial sovereignty and rights in adjacent waters and seabed areas are examined. The purposes of state sovereignty over coastal waters are discussed. Archaeological research differs from state sovereignty interests since the research has no distinct commercial or military objective and does not infringe the security of other nations nor give an unfair advantage in the exploitation of resources. Suggestions for international principles governing marine archaeology include an international commission, special consideration for certain organizations, control beyond state jurisdiction, and regional commissions. The current state of property rights in archaeological finds is examined. Ownership should not automatically belong to the state in which the find is located. Included are suggestions for international principles governing property rights of finds within and without coastal state jurisdiction. It is recommended that modern marine archaeology be made an agenda item at the next United Nations Conference on the Law of the Sea. (Grant-Florida)
W72-14552

THE PROBLEMS OF DELIMITATIONS OF BASE LINES FOR OUTLYING ARCHIPELAGOS,
M. A. Leversen.
San Diego Law Review, Vol 9, No 3, p 733-746, 1972. 38 ref.

Descriptors: *Islands, *International law, *Atolls, *International waters, Oceans, Law of the sea, Treaties, Commercial fishing, Foreign waters, Legal aspects, Boundary disputes, Legal review, United States, International commissions, United Nations.
Identifiers: *Archipelagos, *Territorial sea.

A major problem of international law is defining the extent of the territorial sea and contiguous zone of a nation-state archipelago. The conflicting views of freedom of the seas and an island's need for exploiting the sea are discussed. Most archipelagos claim sovereignty over all waters inside a straight base line drawn around all islands in the group. This presents problems where islands are several hundred miles apart. Some proposed solutions are discussed including use of a straight base-line method where islands are within certain maximum distances of each other, use of a straight base-line following the coast, and use of the low-water line along the coast as the normal base line or the territorial sea. However, none of the proposals deal satisfactorily with the diverse characteristics of archipelagos. Some combination is needed such as using the base-line method to define the contiguous zone and the low-water line to define the territorial sea. (Grant-Florida)
W72-14553

WATER POLLUTION--PENALTY.

Maine Public Laws ch. 458 (1971).

Descriptors: *Maine, *Legislation, *Solid wastes, Oil pollution, Legal aspects, Water law, Oil spills, Oil, State governments, Regulation, Water pollution, Water pollution control, Water quality, Water quality control, Industrial wastes, Potatoes, Wood wastes, Penalties (Legal), Waste disposal.

The act provides that no legal entity shall discharge or permit the discharge of oil into the inland waters of Maine. Anyone who does discharge oil into the waters shall report the fact of such discharge to the commission and undertake to remove such discharge to the commission's satisfaction. A failure to report a discharge of oil shall be subject to a fine between $500 and $1,000. Other proscribed discharges, whether direct or indirect, include forest products refuse, including any slabs, edgings, sawdust, shavings, chips, or bark; potatoes, and refuse, including scrap metal, junk, paper, garbage, septic tank sludge, rubbish, old automobiles or similar refuse. Violation of the discharge section is punishable by a fine of not less than $100 nor more than $500. (Brackins-Florida)
W72-14554

FISCAL YEAR 1973 AUTHORIZATION OF APPROPRIATIONS FOR THE FEDERAL SALINE WATER CONVERSION PROGRAM.
Hearing on S. 3097--Subcomm. on Water and Power Resources--Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, March 9, 1972. 29 p.

Descriptors: *Legislation, *Desalination, *Government finance, Desalination apparatus, Administrative agencies, Long-term planning, Financial analysis, Desalination processes, Publications, Federal government, Water resources development, Legal aspects, Saline water, Environmental effects, Thermal pollution, Water pollution sources.

Testimony is included on S.3097 authorizing appropriations for the saline water conversion program for fiscal year 1973. Current areas of development discussed include desalination, prototype plants, desalination of geothermal brines, the San Diego test facility, and reverse osmosis test beds. The specific areas in which an increase in funds is needed are discussed. The bill also contemplates deletion of section 6 (d) of the Saline Water Conversion Act of 1971 concerning availability of information and patents resulting from research under the Act. The effect of deleting this provision would be to bring patents and distribution of information under general federal policy. Included in the hearing is the statement of J. W. O'Meara, Director of the Office of Saline Water of the Department of the Interior. Recent prototype and laboratory tests with desalination and the associated environmental effects of such an operation are also described. (Waldron-Florida)
W72-14555

INTERNATIONAL COOPERATION IN THE HUMAN ENVIRONMENT THROUGH THE UNITED NATIONS.
Hearings on H.R. 13116--Subcomm. on International Organizations and Movements--Comm. on Foreign Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, March 15 and 16, 1972. 101 p.

Descriptors: *Environmental control, *Legislation, *International law, *United Nations, *Water pollution control, Long-term planning, Governments, Law of the sea, Foreign countries, Aquatic environment, Oceans, Atmospheric pollution, Pollution abatement, Federal government, Political constraints, Conferences, International joint commission.
Identifiers: *U.N. Conference on the Human Environment.

The hearings centered around H.R. 13116, proposed by Congressman Seymour Halpern. This proposed legislation is described by its author as a bill to promote international cooperation in United Nations efforts to protect the world's oceans and atmosphere. The aim of the bill is to encourage an international accord on pollution abatement standards and enforcement mechanisms. Testimony and discussion concerns the political and economic advisability of unilateral pollution abatement by the United States when considering the high cost of industrial pollution abatement. The State Department position is that the proposed legislation would interfere with initiatives which the executive branch has already placed in motion. The second subject considered by the subcommittee concerns the United States' role at the upcoming U.N. Conference on Human Environment. The testimony considers such questions as: how the United States policy has been formulated thus far; who is making the major inputs to that policy; how the work of the preparatory committee of the U.N. is progressing; what the policies of other major nations are; what problems have been encountered concerning conference participation by some nations; and what contributions can be made by Congress and the public toward a constructive United States role at the Conference. (Waldron-Florida)
W72-14557

CATTLE FEEDERS MUST COMPLY WITH ANTI-POLLUTION LAWS,
R. Reiman.
The Cattleman, Vol. 58, No. 2, p. 43, 58, July 1971.

Descriptors: *Legal aspects, *Pollution abatement, *Agricultural runoff, *Return flow, *Waste disposal, Cattle, Permits, Discharge (Water), Animal wastes (Wildlife), Feedlots, Texas, New Mexico, Oklahoma, Irrigation water, Pollutants, Surface waters, Water pollution control, Sediment discharge, Erosion, Salinity, Fertilizers, Pesticides, Water quality control, Taxes.

Current federal anti-pollution laws for cattle feeders are reviewed. The Environmental Protection Agency (EPA) now requires that a permit be obtained from the Army Corps of Engineers before any discharges or deposits can be made into a navigable stream. The ruling applies to feedlots with more than 1,000 animal units and all new feedlots. It applies to at least 306 lots in Texas, 45 in New Mexico and 48 in Oklahoma. It is estimated that 10,000 beef cattle on a feedlot produce 200 tons of daily waste, comparable to a 100,000 to 200,000-person city. Agricultural runoff, irrigation return flow and confined feeding operations concern the EPA. The greatest quantity of pollutants in the surface waters of the country is sediment caused by erosion. Increased salinity concentration in receiving waters is a problem, especially when coupled with fertilizers and pesticides. Management of polluted waters is a growing research area. Some practices qualify for tax breaks. (Popkin-Arizona)
W72-14579

GEOLOGIC HAZARDS AND LAND-USE PLANNING,
For primary bibliographic entry see Field 06B.
W72-14580

A CURRENT PROBLEM IN THE ENVIRONMENTAL CRISIS, MERCURY POLLUTION, AND ITS LEGAL IMPLICATIONS,
Washington Univ., St. Louis, Mo. Center for Biology of Natural Systems.
For primary bibliographic entry see Field 06G.
W72-14631

WATER QUALITY VERSUS RESIDENTIAL DEVELOPMENT: POLITICAL AND ADMINISTRATIVE ASPECTS OF WATER QUALITY MAINTENANCE IN PERRY AND CLINTON RESERVOIRS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 05G.
W72-14675

ILLINOIS LAWS RELATING TO WATERWAYS, 1971.
Illinois State Div. of Waterways, Springfield, Ill.
For primary bibliographic entry see Field 04A.
W72-14752

POLLUTION CONTROL IN INDIANA,
House, Washington, D.C.
L. H. Hamilton.
Congressional Record, Vol 118, p E5633-E5634 (daily ed.) May 23, 1972. 2 p.

Descriptors: *Indiana, *Water pollution control, *Administration, *Pollution abatement, Costs, State governments, Regulation, Municipal wastes, Sewage, Sewage effluents, Industrial wastes, Water pollution, Water pollution control, Local governments, Governmental interrelations, Water quality standards, Financing, Budgeting, Government finance, Water law, Law enforcement, Legal aspects, Water quality control, Administrative agencies, Waste treatment.

Administration of water pollution control programs and construction of control facilities in Indiana are funded separately. The State General Assembly increased the manpower on the Stream Pollution Control Board. Still, personnel on the Board believe the staff should be increased to provide adequate monitoring. The Environmental Protection Agency has approved the proposed water quality standards submitted by Indiana, making Indiana one of the first ten states to have such approval. The Stream Pollution Control Board has initiated approximately one hundred actions against polluters since January 1970. Almost ten per cent of Indiana municipalities lack secondary treatment. Furthermore sixty to seventy municipalities are located on streams that do not provide adequate year round dilution for secondary effluents. Generally most industries are taking action to provide adequate treatment facilities. But continuing water pollution control programs are needed to keep pace with industrial developments. In many suburban areas regional sewage and treatment facilities are needed to solve problems of sewage disposal. (Brackins-Florida)
W72-14754

DOCUMENTS FOR THE U.N. CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, JUNE 5-16, 1972--PART III.
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14773

STOCKHOLM CONFERENCE ON THE HUMAN ENVIRONMENT,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-14774

PEPPER V. NAIMISH (RIPARIAN RIGHTS IN WATER BODY BASED ON CONTIGUITY WITH WATER BODY ON OWNER'S LAND).

197 N.W.2d 866-867 (Mich. Ct. App. 1972).

Descriptors: *Adjacent landowners, *Judicial decisions, *Michigan, *Access routes, Channels, Legal aspects, Dredging, Common law, Right-of-way, Boundaries (Property), Relative rights, Water law, Easements, Legal review.
Identifiers: Injunctive relief.

Plaintiffs, owners of land in Highland Township, Michigan, brought suit to restrain defendant, adjacent landowners, from interfering with their right of access to a body of water on defendants' land. Defendants have made substantial improvements on their property over the years, including dredging a channel from Duck Lake, which exists on their property. The channel is separated from the water on plaintiffs' property by a roadway. As a result of defendants' operations this roadway has been filled in. Plaintiffs claim that this barrier interferes with their access to Duck Lake from the small body of water on their property. The Court of Appeals of Michigan held that based on the facts presented the lower court's finding that Duck Lake and body of water on plaintiffs' property were never contiguous was not clearly erroneous and should therefore be affirmed. The court ruled that when one owns property on a small body of water which is connected to a larger body of water at normal legal water level, he has riparian rights in the larger body. (Widman-Florida)
W72-14775

DEPT. OF PUBLIC HEALTH V. CUMBERLAND CATTLE CO. (POLLUTION OF WATER SOURCE BY DAIRY FARM OPERATIONS).

282 N.E.2d 895-906 (Mass. 1972).

Descriptors: *Massachusetts, *Judicial decisions, *Agricultural runoff, *Pollution abatement, Administrative agencies, Legal review, Legal aspects, State governments, Administrative decisions, Law enforcement, Water quality control, Regulation, Standards, Equity, Water supply, Water pollution sources, Farm wastes.

Plaintiffs State Health Department and town Board of Health brought suit in equity and for contempt against defendant dairy farm owner for alleged acts of pollution and carrying on noisome trade. Defendant contended that provisions of the state noisome trade statute were inapplicable to dairy farms. The Supreme Judicial Court of Massachusetts held that the statute providing for regulation of trades which may result in nuisance or be dangerous to the public health and providing conditions for appeal from an order of town board has clear application to a dairy farm operated as a nuisance. The court also held that under the statute where a dairy farm owner continues to violate a town board's orders to cease committing acts of pollution, that the farmer's failure to comply with the order pending the appeal is sufficient reason to deny the appeal. The court ruled that unnecessary and unreasonable storage of vast quantities of solid and liquid manure, in places where it can cause pollution of streams nearby is not an ordinary method of agriculture within the meaning of the statute. The court also ruled that if defendant could convince the court of its willingness to comply with the order that it could continue its operation in modified form pending compliance. (Widman-Florida)
W72-14776

BLOMQUIST V. COUNTY OF ORANGE (STATE CONSERVATION LAW COMPLIANCE AS A CONDITION TO WATER SUPPLY DEVELOPMENT).
332 N.Y.S.2d 546-552 (Sup. Ct. 1972).

Descriptors: *Water supply development, *New York, *Judicial decisions, *Bond issues, Legal aspects, Financing, Standards, Water supply, Water resources development, Legal review, Constitutional law, Equity, Conservation, Permits.
Identifiers: *Injunctive relief, Declaratory judgment.

Defendant county adopted a $5,000,000 serial bond and capital note resolution to pay for various county purposes including land acquisition for proposed reservoir sites. No engineering studies were conducted to determine the feasibility of the proposed sites and no submission was made to the Water Resources Commission pursuant to the Conservation Law. Plaintiff landowner brought suit seeking (1) a judgment declaring defendant bond resolution unconstitutional, illegal and void; (2) an injunction against further payment of monies or acquisition of property authorized by the resolution; and (3) money damages. In denying plaintiff's motion for summary judgment the Supreme Court, Orange County, held that where the county bond resolution does not state the specific purpose of the bonds or that county has obtained the consent of the Water Resource Commission to purchase land, the resolution is vulnerable to challenge. The court further held that where the county has not complied with the Conservation law, which requires approval from the Water Resources Commission before condemning or acquiring lands for additional water supply, the court will enjoin further acquisition of land for that purpose or any unspecified purpose until the county complies with such provisions. (Widman-Florida)
W72-14777

BEANE V. MCMULLEN (LIABILITY FOR ALTERATION OF FLOW OF SURFACE WATERS)

291 A.2d 37-55 (Md. Ct. App. 1972).

Descriptors: *Adjacent landowners, *Maryland, *Surface waters, *Surface drainage, Legal aspects, Flow, Water law, Abatement, Surface runoff, Drainage, Alteration of flow, Drainage patterns, Drainage engineering, Judicial decisions, Flow augmentation, Floods, Natural flow.
Identifiers: Intentional torts, Injunctions (Mandatory).

Plaintiff landowners and defendant adjacent landowners sued each other for wilfully and wrongfully collecting surface waters which did not naturally flow onto their lands and casting them upon their respective property. The area had long had drainage problems and defendant had constructed a ditch and pipe which plaintiff alleged drained waters onto his land. The Maryland Court of Appeals held that an upper owner may not artificially increase or concentrate the natural flow of water and damage the lower owner as a result of this. The Court held that the evidence indicated that defendant and the County, a third party defendant, were damaging plaintiff's lands; affirmed the lower courts mandatory injunction requiring removal of the pipe and ditch; and reversed the lower court and remanded the case on the issue of the adequacy of the injunctive relief for plaintiff. (Widman-Florida)
W72-14778

THE ENVIRONMENTALIST AND RADIOACTIVE WASTE,
Lake Forest Coll., Ill. Industrial Management Inst.
For primary bibliographic entry see Field 05G.
W72-14779

THE NATIONAL OCEAN PROGRAM, IMPLEMENTATION AND BENEFITS,
M. Morton.
Vital Speeches of the Day, Vol. 38, p 264-26
February 16, 1972.

Descriptors: *Oceans, *Ships, *Transportation, *Natural gas, Coasts, Economics, Resource development, Manpower, Research and development, Resource allocation, Weather modification, Monitoring, Technology, Energy, Meteorology, Offshore platforms, Water pollution sources, Energy.
Identifiers: *Coastal waters.

Substantial economic and social benefits could be realized by developing our ocean resources, improving ocean transportation and trade, and successfully competing in the world market. Problems related to ocean pollution, expansion of trade and technological stagnation could be remedied by the implementation of three oceanic projects. The first project is the development and use of liquified natural gas (LNG) carriers. The role of LNG in the world energy market is projected to grow rapid-

n the seventies. The development of ocean trans-
ortation to carry the LNG would provide more
obs and eventually a less polluted atmosphere.
The second project is the development of large,
nulti-purpose offshore platforms. In addition to
roviding jobs for persons in the coastal areas,
uch platforms would solve the expanding
roblem of handling the giant containerships and
upertankers. The third project is the large-scale
nonitoring of the ocean environment, leading to
ts proper management and control. These systems
vould assess the 'state of health' of the oceans,
letect pollutant levels and monitor and predict
atural environmental phenomena. (Nielsen-
Florida)
W72-14780

THE TENNESSEE WATER QUALITY CONTROL ACT OF 1971,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W72-14781

THE PATHOLOGY OF LAKE ERIE,
For primary bibliographic entry see Field 05G.
W72-14782

SHOWDOWN ON DELAWARE BAY,
For primary bibliographic entry see Field 05G.
W72-14783

REVIEW OF THE LEGAL ASPECTS OF INTERNATIONAL WATER POLLUTION CONTROL,
For primary bibliographic entry see Field 05G.
W72-14784

FISHING RIGHTS AND UNITED STATES-LATIN AMERICAN RELATIONS.
Hearing--Subcomm. on Inter-American Affairs--Comm. on Foreign Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, February 3, 1972. 128 p, 4 tab, 6 append.

Descriptors: *International law, *International waters, *Commercial fishing, *Legislation, Foreign waters, Treaties, Oceans, International boundaries and Water Commission, Legislation, Federal government, Water resources, Political aspects, Long-term planning, Water law, Legal aspects, Fishing, Legal review.
Identifiers: Inter-American Affairs, *Territorial waters.

The Inter-American Affairs Subcommittee hearing concerns the controversy between the United States and certain Latin American countries over fishing rights. Secretary of State for Inter-American Affairs, Charles A. Meyer, reviews the entire range of United States-Latin American relations with respect to the fishing controversy. Fisheries disputes arise from differences which the United States has with certain Latin American countries regarding the breadth of the territorial sea and coastal state rights over resources of the waters adjacent to their coasts. The origin of the respective claims and possible solutions are discussed. Legislation has been passed by Congress as vessel seizures have drawn increasing attention to the problems that exist. This body of legislation calls upon the executive branch to act or consider acting against countries that seize American fishing vessels. Secretary Meyer submitted into the record an example of a Draft Fisheries Agreement proposed by the United States for discussion with Chile, Ecuador, and Peru at Buenos Aires in September 1970. A copy of an agreement tween the United States and Brazil concerning shrimp is also included. (Waldron-Florida)
W72-14785

UPPER COLORADO RIVER BASIN.

Hearing on S.3283 and S.3287--Subcomm. on Water and Power Resources-- Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, April 12, 1972. 18 p, 2 tab.

Descriptors: *Legislation, *Colorado River Basin, *Government finance, *Water resources development, Long-term planning, Costs, Financing, Water supply, Administrative agencies, Federal government, Colorado River, Reservoir storage, Recreation, Fish conservation, Wildlife conservation, Irrigation programs, Municipal water, Electric power production.
Identifiers: *Department of the Interior.

S.3287 and S.3283 are identical bills to increase the authorization for appropriation for continuing the comprehensive development of the water resources of the Upper Colorado River Basin. The bill would increase the present $760 million appropriation authorization by $610 million. This is the current estimate of the amount required to complete construction of the storage units of the Colorado River Storage project and the participating projects, with related power transmission facilities, which were originally authorized by the Act of April 11, 1956. The hearings included the statement and questioning of G. G. Stamm, acting Commissioner of the Bureau of Reclamation of the Department of the Interior. (Waldron-Florida)
W72-14786

MOORE V. VENTNOR GARDENS (OWNERSHIP OF LANDS BELOW HIGH WATER MARK).

149 A.536-538 (N.J. Ch. 1930).

Descriptors: *New Jersey, *Riparian rights, *Ownership of beds, *Riparian land, Shores, High water mark, Boundaries (Property), Navigable waters, Beds, Streams, State jurisdiction, Accretion (Legal aspects), Land tenure, Judicial decisions, Legal aspects, Beds under water, Watercourses (Legal aspects), Waterlaw.

Plaintiff mortgagee sought foreclosure of a mortgage and alleged the lands under water adjacent to the premises were subject to the mortgage. Defendants were grantees of the state of New Jersey of the riparian rights adjoining the mortgaged premises, having acquired them before the foreclosure of the mortgage. The New Jersey Court of Chancery dismissed plaintiff's bill. The United States Supreme Court had adversely disposed of a situation similar to plaintiff's. Under the riparian laws of New Jersey, lands below high water mark--shores and submerged lands of navigable waters--are the property of the State. Title and interest in these lands is a distinct and separate estate to be dealt with and idsposed of in accordance with statutory law. Title under the New Jersey grants is not only of a new estate, but in a new subject divided from the upland or riparian property by a fixed and permanent boundary. Thus the lien of the mortgage extends no further than the land described therin and the lands acquired from the State are not subject to it. (Duss-Florida)
W72-14787

PEACEFUL USES OF THE SEA-BED.
Committee on the Peaceful Uses of the Sea Bed and the Ocean Floor Beyond the Limits of National Jurisdiction (UN), New York.

U.N. Monthly Chronicle, Vol. 8, p. 51-54, August 1971. 4 p.

Descriptors: *International commissions, *International law, *Beds under water, *United Nations, Law of the sea, Oceans, Continental shelf, Sub soil, Resources, Pollution, Resources development, Conservation, Research and development, International waters, Exploitation, Pollution abatement, Political aspects, Political constraints, Institutions, Legal aspects.
Identifiers: *U.N. Committee on Peaceful Uses of the Seabed.

The Committee concluded its second 1971 session on 27 August by adopting its report to the General Assembly. The main committee attempted to resolve the following outstanding issues: establishment of an equitable international regime for the area and the resources of the sea-bed and the ocean floor, and the subsoil thereof; and the international machinery and the economic implications of exploitation of the sea-bed. The issues considered by Sub-Committee I included the following: the instrument by which the international regime should be established; the regime and its limits; orderly development of the marine environment; and sharing in benefits to be derived from the development of the resources of the area. Sub-Committee II debated topics covering the regime of the high seas, the continental shelf, the territorial sea and contiguous zone, and fishing and conservation of the living resources of the high seas. Sub-Committee III considered the preservation of the marine environment including the prevention of pollution and matters relating to scientific research. (Nielsen-Florida)
W72-14788

ASPECTS OF AQUIFER MANAGEMENT,
Environmental Protection Agency, Ada, Okla. National Groundwater Research Program; and Environmental Protection Agency, Washington, D. C. Water Quality Office.
For primary bibliographic entry see Field 04B.
W72-14876

CITY PLANNING AND POLITICAL VALUES,
Rutgers - The State Univ., New Brunswick, N.J.; and Columbia Univ., New York.
S. S. Fainstein, and N. I. Fainstein.
Urban Affairs Quarterly, Vol. 6, No. 3, p 341-362, March 1971. 21 ref.

Descriptors: *City planning, *Political aspects, *Decision making, *Formulation, Technology, Urbanization.
Identifiers: *Implementation, Typology.

As the breadth of planning increases and as it affects more aspects of the urban environment, it becomes important to understand the political implications of different kinds of planning. Even though many aspects of the planning process are technical and 'nonpolitical', the way in which a plan is formulated and implemented can be treated in the same terminology as political decision making. Four kinds of planning are discussed: (1) traditional - the planner prescribes both the goals and the means of the plan, (2) user-oriented - the desires of the clients become the goals of the plan, (3) advocacy planning - recognition of a multitude of conflicting social interests, and (4) incremental planning - the policy maker comes to the decision by weighing the marginal advantages of a limited number of alternatives. Four major types of political theory are discussed: (1) technocratic thinking - a product of the industrial era, (2) democratic theory - the primacy and sanctity of the individual, (3) socialist theory - conflict analysis of society, and (4) liberal theory - guarantee of the rule by law. This typology of planning types and political theories shows that the concepts of planning are not only analogous to certain trains in modern political thought, but actually are fragments of these political formulations. (Strachan-Chicago)
W72-14884

STATE WATER PLANNING IN TRANSITION,
G. J. Kelnofer, Jr.
Journal of Soil and Water Conservation, Vol. 27, No. 3, p 98-99, May-June 1972.

Descriptors: *State governments, Water resources development, *Environment, *Planning, *Management, *City planning, Federal government, Decision making, Personnel management, Administration.
Identifiers: *Metropolitan water resources management, *Policy making, Increased efficiency, Responsibilities, Reorganization, Public participation.

Water resources planning must consider the role of the states in managing water and other related land resources. Years of dependency on federal initiatives in this field have left many states poorly prepared to assume the responsibilities that they would now claim as theirs. Many state governments are too understaffed and poorly trained to perform competently as resource managers. State governments frequently lack an organizational framework suited to the task of management. It is generally argued that the states could do a better job of managing water and related resources if their resource agencies were organized along more efficient lines. The idea of increasing efficiency through the consolidation of agencies and the addition of new agencies with more power and personnel is attractive, and of substantial merit. However, there is some skepticism cast upon reorganization proposals. There is belief that the system of divided responsibility can be made to work more effectively. In addition, public participation is minimal. The major interests of the states and the nation do not lie in the areas of environmental problems, but rather, in the area of problems of defense, education, welfare, and transportation. Although the US is characterized as an urban and metropolitan society, it is recommended that a decision making process be developed which will respect the majority values of an urban people without doing irreparable damage to the legitimate needs of the rural-based producers of the food and fiber which are needed by the urban society. (Strachan-Chicago)
W72-14893

THE COUNCIL ON ENVIRONMENTAL QUALITY: AN EVALUATION,
North Carolina Univ., Chapel Hill.
R. N. L. Andrews.
Journal of Soil and Water Conservation, Vol. 27, No. 1, p 8-11, January/February 1972. 2 photo, 10 ref.

Descriptors: *Planning, *Decision making, *Environment, *Quality control, *Management, *Administration, Personnel management, Federal government, Land use, Projects, Evaluation, Economics, Costs, Benefits.

The Council on Environmental Quality (CEQ) is evaluated in terms of its powers, achievements, and problems during its first years of existence in order to put in accurate perspective both its potentials and its limitations. Since its establishment, CEQ has been responsible for a wide range of policy actions, including at least six executive orders, e.g.: reversal of a ruling by the Internal Revenue Service denying tax-exempt status to nonprofit environmental law groups; discontinuation of construction on the Cross-Florida Barge Canal; formulation of the president's 1971 environmental legislative program; and establishment, organization, and budgeting of the new Environmental Protection Agency. In addition to the legal limitation on its power to compel action, CEQ has suffered from several administrative problems. The first problem resulted from the heavy responsibilities which were thrust upon it before complete funding. It operated for a year with an inadequate staff borrowed from other agencies. A second and ongoing problem is that of the small size and unbalanced composition of CEQ's staff. In addition, there is no objective framework for systematically evaluating the environmental consequences of federal actions and weighing them against traditional costs and benefits. CEQ must operate with the awareness that its future effectiveness is intimately related to the fate of the environmental issue in general. Two particular problems appear likely to figure prominently in CEQ's activities in the near future: land use, and project evaluation criteria, especially the problem of relating environmental quality criteria to traditional economic criteria for project justification. (Strachan-Chicago)
W72-14895

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 08A.
W72-14929

WELLS AND STREAMS: RELATIONSHIP AT LAW,
Missouri Univ., Columbia. Coll. of Law.
For primary bibliographic entry see Field 04B.
W72-14934

DISCHARGING NEW WINE INTO OLD WINESKINS: THE METAMORPHOSIS OF THE RIVERS AND HARBORS ACT OF 1899,
For primary bibliographic entry see Field 05G.
W72-14935

EVOLVING SOCIAL ATTITUDES ON POLLUTION CONTROL,
Cincinnati Univ., Ohio. Environmental Health Engineering.
For primary bibliographic entry see Field 05G.
W72-14936

WATER QUALITY STANDARDS SUMMARY FOR THE INTERSTATE WATERS OF NEBRASKA.
Environmental Protection Agency, Washington, D.C.; and Nebraska State Dept. of Environmental Control, Lincoln.
For primary bibliographic entry see Field 05G.
W72-14956

6F. Nonstructural Alternatives

GEOLOGIC HAZARDS AND LAND-USE PLANNING,
For primary bibliographic entry see Field 06B.
W72-14580

ZONING FOR BEAUTY,
Ross, Hardies, O'Keefe, Babcock, McDugald and Parsons, Chicago, Ill.
M. deH. Newsom.
Land-Use Controls Quarterly, Vol 3, No 3, p 33-42, Summer 1969.

Descriptors: *Zoning, *Aesthetics, *Land use, *Control, *Regulation, *City planning, Land development, Construction, Design criteria, Administration.
Identifiers: *Policy making, Low income housing.

Ways in which land-use controls can be used to achieve urban beauty are discussed. Aesthetic concern for the inner city will come in response to the following types of proposed action relating to the use of land: (1) construction of new large-scale developments, (2) construction of new single, small, or scattered developments, (3) demolition, deterioration, or alteration of extensive districts or areas already built up, (4) demolition, deterioration, or alteration of landmarks or other individual structures already in existence, (5) establishment of new open space, (6) destruction or alteration of existing open spaces, (7) construction of new public works such as street furniture, and (8) destruction, deterioration, or alteration of existing public works. What zoning can do to encourage urban beauty is discussed. (1) Zoning can prohibit the construction of buildings that do not meet certain design criteria. (2) Zoning can encourage the construction of buildings that meet certain design criteria by granting bonuses to the developer for meeting these criteria. (3) Zoning can discourage the construction of buildings that do not meet certain design criteria. Problem areas are in the issues of low-income housing and administration and policies. (Strachan-Chicago)
W72-14880

THE HOUSTON SOLUTION: THE CASE FOR REMOVING PUBLIC LAND-USE CONTROLS,
B. H. Siegan.
Land-Use Controls Quarterly, Vol. 4, No. 3, p 1-19, Summer 1970.

Descriptors: *Land use, *Land development, *Control, *Regulation, *Management, Zoning, Legislation, Governments, *Texas.
Identifiers: *Houston (Tex.).

As a result of an extensive study of land use and development in Houston and other medium-sized Texas cities without zoning, it is concluded that the Houston system of non-zoning offers the most preferable alternative to obviating the problems arising from or created by the prevailing system of land-use controls. A private market, regulated by relatively few ordinances, is better able to serve the community than is the mixture of planning, law, and politics known as zoning. The Houston experience reveals that regulation of land use is neither necessary nor desirable to the functioning of a community. Legislation should, therefore, move in the direction of doing away with control and creating a much less restricted market. The powers of the municipalities should be lessened and they should not be replaced by those at higher levels of government. Changing the direction of land-use controls from the local to the regional or federal levels and giving more discretion to government may cure some of the problems of zoning, but it will probably create as many or more, for the real problem is government control. Over half a century of experience with zoning clearly illustrates that governmental control over land-use generally has been unworkable and inequitable and an impediment to the real estate market and its consumers. (Strachan-Chicago)
W72-14883

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 08A.
W72-14931

6G. Ecologic Impact of Water Development

INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES ACTIVITIES.
Wendell and Schwann, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-14238

HEARINGS--PUBLIC WORKS FOR WATER POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATIONS FOR FISCAL YEAR 1973--PARTS 1-5.
For primary bibliographic entry see Field 05G.
W72-14251

POWERPLANT SITING AND ENVIRONMENTAL PROTECTION, PART 2.

Hearings--Subcomm. on Communications and Power--Comm. on Interstate and Foreign Commerce, U.S. House of Representatives, 92d Cong, 1st Sess, Part 2, p 375-764, May 4, 6, 7, 11, 12, 13, 25, 26, 27, 1971. 390 p, 3 fig, 10 map, 26 tab, 2 chart.

Descriptors: *Electric powerplants, *Sites, *Environmental effects, *Decision making, Project planning, Federal government, Legislation, State governments, Regional analysis, Adoption of practices, Administrative decisions, Political aspects, Social aspects, Economic impact, Standards, Water pollution sources, Electric power demand, Public utilities, Federal jurisdiction, State jurisdiction, Federal Power Act, Governmental interrelations.
Identifiers: *Electric power consumption, Powerplant Siting Act of 1971 (Proposed).

Testimony by industry and government representatives before the House Subcommittee on Communications and Power is included. The testimony concerns several bills which have been introduced related to powerplant siting. Common problems which are touched on by most of the witnesses include: the basic responsibility of utilities to plan for an adequate power supply; coordinated long-range planning between suppliers; interdisciplinary approach to planning so as to consider resources, needs, and environmental values; institutional mechanisms for working out conflicting interests and completion of interconnecting networks; and recognition of a need for a speedy resolution of disputes and for a speedy transition from state to federal siting controls. Appendixes accompanying testimony provide statistical information concerning specific projects and figures and tables relevant to the magnitude of the reliability and environmental problem of siting. A comparison of major siting bills is included. Testimony also deals with some of the technical aspects of powerplant siting such as capacity evaluation and ecological impact and with some of the administrative problems involved such as the need to cut down on the number of agency approvals. (Grant-Florida)
W72-14252

GATEWAY AREA PROPOSALS.

Hearings on H.R. 1370, H.R. 1121 and Related Bills--Sub. Comm. on National Parks and Recreation--Comm. on Interior and Insular Affairs, House of Representatives, 92d Cong, 1st Sess, June 26, July 19, 20, 1971. 425 p.

Descriptors: *Legislation, *National recreation areas, *National seashores, *New York, New Jersey, Political aspects, Bays, Beach erosion, Shores, Recreation demand, Recreation facilities, Wetlands, Political constraints, Water utilization, Land use, Water quality, Water resources, Water ports, Water resources development, Water quality control.
Identifiers: Coastal waters.

Evaluated are various bills providing recreation areas in the metropolitan New York City area. H.R. 1370 establishes the Sandy Hook National Seashore in New Jersey. H.R. 1121 and other related bills provide for the establishment of the Gateway National Seashore on the Gateway National Recreation Area in New York and New Jersey. Various bills included authorize the Secretary of the Army to undertake water resource development within the specified areas including the control of shoreline erosion and navigation improvements. Testimony largely concerns the question of the acquisition of certain lands surrounding the Breezy Point, Jamaica Bay, and Sandy Hook areas. The importance of adequate provisions for erosion control to protect the shoreline and beaches is stressed. It is emphasized that adequate provisions to protect the waters, wetlands, and islands of Jamaica Bay are a necessity. It is pointed out that certain areas encompassed are unsafe for swimming, but that action is being taken to upgrade the water quality in those areas, especially Jamaica Bay. (Ellis-Florida)
W72-14253

NAVIGATION OF THE KANSAS RIVER, LAWRENCE TO THE MOUTH (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W72-14260

SMALL BOAT HARBOR, PORTSMOUTH STATE PARK, OHIO, OHIO RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 04A.
W72-14261

SAN LEANDRO CREEK SMALL FLOOD CONTROL PROJECT, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08D.
W72-14262

SCITUATE HARBOR, SCITUATE MASSACHUSETTS (FINAL ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14263

MAINTENANCE DREDGING, SCITUATE HARBOR, MASSACHUSETTS (DRAFT ENVIRONMENTAL STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14264

SWEETWATER CREEK WATERSHED PROJECT, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14265

CHOWAN RIVER, NORTH CAROLINA, BLACKWATER RIVER, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 08D.
W72-14266

BIG CREEK AND TRIBUTARIES, LOWER WHITE RIVER BASIN, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W72-14267

LIBBY DAM AND LAKE KOOCANUSA, KOOTENAI RIVER, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14268

DIKED DISPOSAL AREA PROGRAM, ONTONAGON HARBOR, ONTONAGON, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14270

DIKED DISPOSAL AREA PROGRAM, ASHLAND HARBOR, ASHLAND, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14271

BLACK ROCK CHANNEL AND TONAWANDA HARBOR, NEW YORK (OPERATION AND MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14272

ROCHESTER HARBOR, MONROE COUNTY, NEW YORK (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14273

ZUMBRO RIVER, MINNESOTA, KELLOGG TO MOUTH, WABASHA COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 08D.
W72-14274

HILLSDALE LAKE, BIG BULL CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-14275

SMALL NAVIGATION PROJECT, ANDREWS RIVER, HARWICH, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14276

NEW BEDFORD AND FAIRHAVEN HARBOR, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14277

TRUMBULL LAKE, PEQUONNOCK RIVER, TRUMBULL, CONNECTICUT (UPDATED FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 08A.
W72-14278

DOG RIVER, MOBILE BAY, ALABAMA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14279

THE 1969 UPPER MISSISSIPPI RIVER DREDGE SPOIL SURVEY FROM HASTINGS, MINNESOTA TO CAIRO, ILLINOIS,
Missouri Dept. of Conservation, Jefferson City.
For primary bibliographic entry see Field 05G.
W72-14374

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05C.
W72-14376

SOME ENVIRONMENTAL FACTORS TO BE CONSIDERED IN THE DESIGN OF THERMAL POWER PLANTS IN THE NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 05G.
W72-14394

THERMAL DISCHARGES - AN OVERVIEW,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 05G.
W72-14399

ENERGY USE IN CALIFORNIA: IMPLICATIONS FOR THE ENVIRONMENT,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 05C.
W72-14408

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 06D.
W72-14411

THE ECE SYMPOSIUM ON PROBLEMS RELATING TO ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
R. E. Stein.
American Journal of International Law, Vol 66, No 1, p 118-123, 1972. 24 ref.

Descriptors: *United Nations, *Environmental control, *Regional development, *Information exchange, Coordination, Foreign countries, Governments, Economics, Political aspects, Planning, Environment, Regional analysis, Water resources development, Information retrieval, Control, Organizations, Comprehensive planning, Water law, International law, Legal aspects, International commissions.
Identifiers: *U.N. Economic Commission for Europe.

The United Nations Economic Commission for Europe (ECE) held a symposium in Prague, Czechoslovakia, May 3-10, 1971, on problems relating to environment, which had the sole purpose of providing an opportunity for an exchange of views on selected problems in the field. The agenda was divided into two major sections: (a) a survey of the present environmental situation, including a detailed examination of problem sectors and problem areas; and (b) a discussion of various means of environmental improvement on the national and international levels. The present situation was viewed through a series of country monographs on problems relating to the environment. The symposium reached general and tentative conclusions in the areas of plant locating, regional planning, information exchange, and international cooperation in environmental management. Panel discussions were held on major socio-economic questions relating to the environment and economic aspects of environmental improvement from the viewpoints of the centrally planned and market economies. The test of the ECE will depend on the strength of its future work program and on making the ECE a principal focus of East-West cooperation and coordination. (Widman-Florida)
W72-14546

JETPORT: PLANNING AND POLITICS IN THE BIG CYPRESS SWAMP,
Florida Univ., Gainesville. Coll. of Law.
M. Kessler, and L. Teply.
Miami Law Review, Vol 25, No 4, p 713-748, 1971. 212 ref.

Descriptors: *Administrative decisions, *Water quality control, *Decision making, *Environmental effects, Water pollution, Water pollution control, Administrative agencies, Administration, Regulation, Governmental interrelations, Institutional constraints, Water management (Applied), Water resources conservation, Project planning, Federal government, Local governments, Water conservation, Land use, Water pollution sources, Urbanization, Florida, Political aspects, Social aspects.
Identifiers: South Florida Jetport controversy.

The Miami Jetport Controversy exemplifies problems encountered by administrative agencies in assessing and coping with environmental issues. Involved is a conflict between the need for expanded transportation facilities and the need of the public to protect the Everglades. The allocation of governmental responsibility is discussed, including the state and local agencies, the Federal Aviation Administration and the Interior Department. Planning of the jetport is chronicled from 1952 until the present with discussion of the increasing transportation needs of the area. Also included is consideration of alternative sites. The growth of opposition by conservationists is followed with discussion of various studies of the environmental effects of the jetport and alternative solutions to the area's transportation problems. The crucial water table situation and the delicate ecology of the south Florida area are discussed. Mission oriented agency causes of the controversy are discussed. These agencies often have difficulty understanding the problems and viewpoints of other interests. Public participation in the decision making process and the role of the scientist in policy making are discussed. (Brackins-Florida)
W72-14548

EVERGLADES-BIG CYPRESS NATIONAL RECREATION AREA.
For primary bibliographic entry see Field 06B.
W72-14556

INTERNATIONAL COOPERATION IN THE HUMAN ENVIRONMENT THROUGH THE UNITED NATIONS.
For primary bibliographic entry see Field 06E.
W72-14557

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.

Available from the National Technical Information Service as PB-207 240-D, $3.00 in paper copy, $0.95 in microfiche. February 23, 1972. 18 p.

Descriptors: *Washington, *Comprehensive planning, *Environmental effects, *Water resources development, Flood protection, Flood control, Basins, Pollution abatement, Rivers, Estuarine environment, Habitats, Impoundments, Navigation, Watershed management, Water supply development, Water quality control, Water utilization, Water quality, Water supply, Recreation, Land use, Feasibility, Classification, Water storage.
Identifiers: *Environmental Impact Statements, *Puget Sound (Wash), Coastal waters.

The comprehensive plan for Puget Sound consists of various water and land related resource categories. Additional storage facilities are proposed along the Noonsack, Cedar, and Sultan Rivers. Water quality control elements of the plan include improved monitoring and surveillance systems on rivers, lakes, and marine shoreline together with preparation of basin-wide sewage plans for pollution abatement and waste water control. The flood damage reduction portions include flood plain management, levees, channel improvements and upstream storage. Watershed management measures proposed include reforestation, erosion control, and fire control. Marine and estuarine environments will be affected by the proposed channel deepening and widening and small boat harbor navigation improvements. Freeflowing segments of various rivers would be lost at proposed impoundment sites as would wildlife habitat and lumber producing lands. Channel improvements for flood protection would disrupt the ecology of segments of two of the area's rivers. Navigation channel dredging and disposal could also create problems. Direct river pumping and treatment, desalinization, diversion, storage, increased groundwater utilization, and improved water yield through various watershed management practices were considered as means for satisfying water supply needs. Only desalination proved uncompetitive. Various alternatives were also examined to satisfy water quality and flood protection needs. (Ellis-Florida)
W72-14558

WINTERS CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14559

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 04D.
W72-14560

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14561

EDEN WATERSHED, MISSISSIPPI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Jackson, Miss.
For primary bibliographic entry see Field 04D.
W72-14562

WATER TREATMENT FACILITIES, FOSS RESERVOIR, CUSTER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of Housing and Urban Development, Fort Worth, Tex. Region VI.
For primary bibliographic entry see Field 05F.
W72-14563

PERICO ISLAND PERMIT APPLICATION, MANATEE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-206 105D. $3.00 in paper copy, $0.95 in microfiche. January 1972. 26 p, 1 map, 1 illus.

Descriptors: *Environmental effects, *Land use, *Land reclamation, *Florida, Dredging, Canal construction, Intertidal areas, Mud flats, Aquatic habitats, Terrestrial habitats, Monetary benefits, Permits, Soil disposal areas, Shellfish, Oysters, Sewage disposal, Water quality control, Turbidity, Sedimentation.
Identifiers: *Environmental Impact Statements, *Perico Island (Fla).

The proposed residential development site is located on the south half of Perico Island approximately five miles west of Bradenton, Florida. Approximately 2.1 million cubic yards of material will be dredged to produce approximately 370 acres of usable upland and 92.4 acres of canals from former upland. Seawalls will be constructed around the perimeter of the island. Environmental impacts of the project include loss of grassland and tidal flats caused by filling which will destroy part of the estuarine environment and the marine food chain, increased recreational values with attendant noise and pollution, increased turbidity during construction, lessened siltation, and elimination of the existing mosquito hazard. Adverse impacts include loss of the submerged mud flats and associated fauna, loss of grasslands, loss of 0.4 acres of coon oyster beds, and temporary water quality degradation. Alternatives which were considered include modified development, partial continued agricultural use, public purchase and use of the land, and no development. Development would mean the relatively irreversible commitment of 360 acres of undeveloped upland and submerged land to the uses of man. (Waldron-Florida)
W72-14564

DUST ABATEMENT AT CANYON FERRY LAKE, CANYON FERRY UNIT, HELENA--GREAT FALLS DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Billings, Mont. Region 6.
For primary bibliographic entry see Field 04D.
W72-14565

TRAINING DIKE AND BREAKWATER, EVERETT HARBOR, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14566

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK AT AND IN THE VICINITY OF BREWSTER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 08D.
W72-14567

ALTERNATE DISPOSAL METHOD FOR DETROIT AND ROUGE RIVERS, WAYNE COUNTY, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 05G.
W72-14568

LINCOLN LAKE, EMBARRAS RIVER, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 08A.
W72-14569

MUD MOUNTAIN DAM AND RESERVOIR, WHITE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08D.
W72-14570

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08A.
W72-14571

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14572

PROPOSED CLOSED BASIN DIVISION, SAN LUIS VALLEY PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-14573

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-14574

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.
For primary bibliographic entry see Field 08A.
W72-14575

A CURRENT PROBLEM IN THE ENVIRONMENTAL CRISIS, MERCURY POLLUTION, AND ITS LEGAL IMPLICATIONS,
Washington Univ., St. Louis, Mo. Center for Biology of Natural Systems.
B. Commoner.
Natural Resources Lawyer, Vol 4, p 139-152, 1971. 4 ref.

Descriptors: *Mercury, Water pollution, *Legal aspects, Legislation, Economics, Social impact, Regulation, Technology.
Identifiers: *National Environmental Policy Act, Environmental Impact Statement, Information accessibility.

The history of the mercury pollution problem in the United States is traced and the ratio of the economic value of a technological advance to its environmental costs is examined. Four issues generated by the environmental crisis which point toward problems in the law are presented: controlling pollution by making social judgments which balance overall benefits against social costs; insuring adequate public access to information on environmental problems; legal action necessary on a local level in order to handle local environmental problems; and changing the base of legal education so as to make it more relevant to today's social problems. The problem of effective laws governing environmental pollution is discussed with emphasis on the National Environmental Policy Act of 1969 and the requirement for federal agencies to prepare a statement on the environmental impact of proposed federal actions. From examples of a variety of environmental problems it is concluded that out technological system of productivity is degrading its own essential environmental base and therefore is self-destructive. (Eagle-Vanderbilt)
W72-14631

MERCURY POLLUTION: THE MAKING OF AN ENVIRONMENTAL CRISIS,
Massachusetts Inst. of Tech., Cambridge. Lab. of Nuclear Science.
For primary bibliographic entry see Field 05C.
W72-14637

ECOLOGICAL ASPECTS OF RADIOACTIVITY IN THE MARINE ENVIRONMENT,
Bureau of Commercial Fisheries, Beaufort, N.C. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W72-14658

SOME ECOLOGICAL POINTS REGARDING WATER POLLUTION, (EINIGE OKOLOGISCHE GESICHTSPUNKTE BEIM GEWASSERSCHUTZ),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 05B.
W72-14669

NATURAL REGENERATION OF THE KAMBUI HILLS FOREST IN EASTERN SIERRA LEONE: I. ECOLOGICAL STATUS OF THE LOPHIRA/HERITIERA RAIN FOREST,
Forestry Dept., Sandakan (Malaysia). Research Branch.
For primary bibliographic entry see Field 04A.
W72-14696

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 08A.
W72-14751

PUEBLO DAM AND RESERVOIR, FRYING-PAN-ARKANSAS PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo. Region 7.
For primary bibliographic entry see Field 08A.
W72-14753

SUGAR AND BRIAR CREEKS PROJECT, CATAWBA RIVER BASIN, NORTH CAROLINA AND SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14755

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATER ALONG THE LOUISIANA COAST (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 05G.
W72-14756

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.

W72-14757

BLUE SPRINGS LAKE, LITTLE BLUE RIVER LAKES, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08A.
W72-14759

JACKSONVILLE HARBOR, FLORIDA (SECTION I). NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W72-14760

MANITOWOC HARBOR, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W72-14761

MAINTENANCE OF THE WESTCHESTER CREEK, NEW YORK, NAVIGATION PROJECT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-14762

TESORO TANK FARM AND BARGE SLIP, JUNEAU, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-14763

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04D.
W72-14764

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-14765

LONG HOLLOW CREEK CHANNEL CLEARING, NEZ PERCE, IDAHO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 04A.
W72-14766

BALDWIN AND HANNON SLOUGHS, MONTGOMERY, ALABAMA, FLOOD PROTECTION (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W72-14768

PANAMA CITY HARBOR, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-14769

KINGSTREE BRANCH FLOOD CONTROL PROJECT, BLACK RIVER BASIN, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14770

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 08D.
W72-14772

DOCUMENTS FOR THE U.N. CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, JUNE 5-16, 1972--PART III.
Department of State, Washington, D.C.

Available from the National Technical Information Service as PB-206 618-3, $3.00 in paper copy, $0.95 in microfiche. March 1972. 85 p.

Descriptors: *United Nations, *Water resources development, *Environmental control, *Governmental interrelations, Coordination, Comprehensive planning, Governments, International commissions, International water, Water management (Applied), Management, Regulation, Multiple-purpose projects, Water law, Conferences, Publications, Monitoring, Technology.
Identifiers: *U.N. Conference on the Human Environment.

Current activities of the United Nations system are discussed including the planning and management of human settlements for environmental quality; the environmental aspects of national resources management; identification and control of pollutants of broad international significance; educational, informational, social and cultural aspects of environmental issues; development and the environment; and multidisciplinary aspects of ongoing activities within the United Nations system of organizations. The environmental orientation of the United Nations system is described; functions and perspective in terms of information, collection, interpretation, analysis, and dissemination; monitoring and surveillance, including the development of sensors and indices of environmental change; research on environmental changes; development of scientific criteria and guides relevant to environmental quality; development of policy guidelines; establishment of national environmental institutions, legislation, and standards; establishment of regional and international agreements; development of technology; education, training, and public information; cooperation on technical aspects; and funding. The summary and conclusions of the Administrative Committee on Co-ordination (ACC) Consolidated Document on the United Nations system and the human environment are included. (Widman-Florida)
W72-14773

STOCKHOLM CONFERENCE ON THE HUMAN ENVIRONMENT,
Senate, Washington, D.C.
E. Muskie.
Congressional Record, Vol. 118, S8445-S8448 (daily ed.) May 25, 1972. 4 p.

Descriptors: *United Nations, *International commissions, *Budgeting, *Federal government, United States, Federal budget, Grants, Political aspects, Foreign countries, Environmental control, Governments, Government finance, Governmental interrelations, Administration, Economics, Regulation, Legislation, Coordination, Conferences, Costs, Federal Water Pollution Control Act.

The positions to be assumed by members of the United States delegation to the Stockholm Conference on the Human Environment will amoun to a replay of narrow and retrogressive environ mental policies. These positions are in conflic with environmental goals set forth by Congress i the Clean Air Amendments of 1970 and th Federal Water Pollution Control Act. Furthermor the United States is not willing to provid economic assistance to poorer nations. Included i the Record is the Scope Paper containing th United States positions. The overall United State objective for the conference is to raise the level o national and global capabilities to recognize an solve problems affecting the environment. Ther are five critical issues on which the United State must oppose recommendations contrary to its in terests: creation of a fund to be used for economi development, creation of a new agency to dea with environmental problems, increase of finan cial support to deal with environmental problem of development, increased funding of environmen tal problems through United Nations specialize agencies, and any attempt to amend the Draf Declaration on nuclear testing. (Brackins-Florida)
W72-14774

THE ENVIRONMENTALIST AND RADIOAC TIVE WASTE,
Lake Forest Coll., Ill. Industrial Management Ins
For primary bibliographic entry see Field 05G.
W72-14779

STUDIES ALONG THE EDGE OF A LICHE DESERT,
Sheffield Univ. (England). Dept. of Landscap Architecture.
For primary bibliographic entry see Field 05C.
W72-14873

THE RUN ON THE ENVIRONMENTAL BANK,
G. Clay.
Land-Use Controls Quarterly, Vol. 4, No. 2, p 11, Spring 1970. 18 ref.

Descriptors: *Environment, *Quality contro *Costs, Benefits, Pollution, Managemer Planning, Decision making.
Identifiers: *Environment responsibility, Publ participation.

A short history of the American attitude towa environmental quality control is presented. Ce tain facts of American life have become indicati of the need for environmental responsibility. (The American standard of living was achieved fantastic costs, creating debts which are not co ing due. (2) Freedom to move everywhere cheap by automobile was achieved only at the high co of air pollution and highway death and damage. (Machines and chemicals were being used defoliate in Viet Nam. (4) The capacity to produ has become a dangerous capacity to overproduc Certain trends in the society influence attitud toward environmental control. (1) There is a gro ing militance about the future. (2) There is growi self-determinism among wider segments of t public. (3) Large-scale developments of every s are distrusted. (4) Side-effects of environmen change are more predictable than ever. (5) development is now subject to question and pos ble attack. The American public now sees its e vironment as a limited resource. It perceives th all environment is subject to man's manageme and influence. The Ecology Action movement only the latest evidence that the public has begu long-term run on the environmental bank. It se all land as invested with the public interest. T public is determined to have increasing voice decisions about its environment. (Strach Chicago)
W72-14882

MAN AND HIS ENVIRONMENT: THE ISSU IN PERSPECTIVE,
Resources for the Future, Inc., Washington, D.C

S. Brubaker.
Journal of Soil and Water Conservation, Vol. 27, No. 3, p 100-103, May-June 1972. 1 photo.

Descriptors: *Environment, *Quality control, *Planning, *Management, *Institutions, *Technology, Economics, Population, Income distribution, Consumptive use, Decision making, Short-term planning, Long-term planning.
Identifiers: *Policy making.

The root cause of environmental problems is identified as economic and demographic growth. These problems have been compounded by emphasis on incentives more appropriate to achieving growth than to improving environmental quality. Pressure on the environment could be reduced by restraining income growth. Improved design and durability of goods could alter patterns of consumption so as to reduce the required volume of materials. Nonmaterial forms of consumption - education, sport, music, and theater - could be stressed. In an ascending order of gravity, the environmental problems are identified as: (1) amenity considerations like litter, noise, and appearance of cities and countryside, (2) threats to human helath, (3) threats to human genetics and reproduction, and (4) effects on ecological systems which would threaten the earth's capacity to sustain life. The remedies which seem important could involve one or more of a wide variety of economic, institutional, and technological approaches. The classification of problems into short-term and long-term is useful. Short-term problems are those that already require remedial action to avert unacceptable congestion or to avoid permanent damage. Long-term problems strain the conventional decision apparatus. These two problem areas are not separate, since decisions made today will condition the possibilities of tomorrow. The prospect of solving the environmental problems is viewed optimistically. Technology and management can be improved to eliminate much environmental damage, and to generate a social dividend. (Strachan-Chicago)
W72-14892

SOCIETY, ENVIRONMENT, AND TECHNOLOGY: CHALLENGE AND OPPORTUNITY,
Department of Commerce, Rockville, Md.; and Maryland Univ., College Park.
J. R. Hibbs, and J. H. Cumberland.
In: Man and the Quality of His Environment, Western Resources Conference, 1967, University of Colorado Press, Boulder. 1968. p 3-15. 1 tab, 9 ref.

Descriptors: *Social aspects, *Environment, *Technology, Management, Planning, Population, Ecosystems, Costs.
Identifiers: *Policy making, Social-environmental-technological relationships.

(1) Man is in serious trouble with his natural environment. The assumption that environmental resources are unlimited is not valid in the face of technology and population explosions. (2) To solve the problems of a deteriorating environment requires recognition of the fact that 'man's ecosystem is the total of the interacting relationships between him and the physical, biological, and societal factors of the system'. (3) A multidisciplinary assault of effectively integrated physical, biological and social sciences is required to address and solve these problems. (4) A joint and multidisciplinary institute is proposed as one needed action to expand our systematic knowledge as a basis for meeting the challenge of the social-environmental-technological relationships. (5) Such an investment to provide both advances in the state-of-the-art and proposed problem solutions will cost less than one percent of current and foreseeable federal government expenditures caused by the deteriorating environment. (Strachan-Chicago)
W72-14900

LIVING WITH OUT WASTES,
California Univ., Richmond. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05G.
W72-14901

AN ECOLOGICAL PERSPECTIVE,
Illinois Univ., Urbana.
W. R. Boggess.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 23-35. 23 ref.

Descriptors: *Ecology, *Management, Sedimentation, Habitats, Ecosystems, Engineering, Technology, Planning, Governments.
Identifiers: *Conflicts of interest, Biocides, Self-interest.

The conflicts of interest which arise in management of the environment are discussed. The conflicts are: biocides, sedimentation, destruction of habitats, and preservation of habitats. Science has produced means of controlling both weeds and insects in the many biocides. However, many broad-spectrum biocides have adverse effects on populations other than those for which control is desired. Accelerated erosion of soil occurs with agriculture and the development of heavy earth-moving equipment. The presence of sediment particles in stream water is a form of pollution because biological populations are adversely affected. Man has been destroying natural habitats in a variety of ways. A given ecosystem possesses a degree of resilience and can absorb varying amounts of manipulation before breaking down. Conflicts of interest are bound to arise as the population pressure increases, and when additional land and resources are withdrawn from the marketplace in order to preserve habitats. The present status of man's ecosystem is not one to promote a spirit of optimism. Concerted effort will be required of science, engineering, and technology if the rebuilding process and planning for the future are to succeed. Self-interest must be replaced by a philosophy that dictates along lines of the greatest common good. The example of cooperation should be set at the top levels of government. Agencies, which are charged with building and construction, should develop a greater understanding of resource conservation and use. (Strachan-Chicago)
W72-14902

A CITIZEN'S COMMENTS ON CONSERVATION,
Colorado House of Representatives, Denver.
R. G. Gebhardt.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 37-43.

Descriptors: *Conservation, *Environment, *Quality control, Planning, Water pollution control, Legislation, Legal aspects, Regulation, Taxes, Zoning.
Identifiers: *Policy making, Commitment.

A layman's view of conservation problems is presented. Five problem areas of maintaining environmental quality control are: (1) beautification of the environment, (2) air pollution control, (3) water pollution control, (4) orderly development of large cities, and (5) waste disposal. The problems of water pollution control are discussed. The following are related to a quality environment: (1) divided parkways, (2) trees, and shrubs, (3) large beautiful schoolgrounds, (4) acreage in public building areas, (5) landscaped industrial parks, and (6) a city without utility poles. These qualities can be attained by: (1) legislative pilot programs on greenbelts, (2) laws on highways and rights-of-way, (3) allocation of a percentage of taxes for environment, (4) tax penalties for ugliness, (5) tax credits for private beautification, (6) requirement of percentage of land given by developers as condition of zoning, (7) assessed valuation concessions for land donations, (8) zoning changes to permit environmental consideration, (9) broader condemnation proceedings, and (10) an insistence from candidates for public office of their commitment to concern for environment. (Strachan-Chicago)
W72-14903

WATER QUALITY CONTROL FROM A STATE VIEWPOINT,
Wyoming State Dept. of Public Health, Cheyenne.
For primary bibliographic entry see Field 05G.
W72-14905

A STRUCTURE FOR THE TASK AND SOME AREAS FOR STUDY,
Wisconsin Univ., Madison. Water Resources Center.
I. K. Fox.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 129-140.

Descriptors: *Environment, *Quality control, Research and development, *Planning, Institutions, Technology, Behavior, Psychological aspects.
Identifiers: *Policy making.

A broad outline is presented of what concern with environmental quality appears to imply. The need for research on the kind of policy and institutional development that will accommodate advances in science and technology in such a way as to permit effective solutions to problems of wastes and contaminants is discussed. Some of the more difficult problems will not be solved by systems management, governmental regulations, subsidies and other popular instruments of public policy. A pleasing environment will be achieved through the adoption of modes of individual behavior that reflect an appreciation of environmental quality. Three classes of influences on the environment are: (1) waste disposal, (2) incidental contamination, and (3) development. Three kinds of environments are (1) wild, (2) rural, and (3) urban. Three problem areas in the work of the behavioral sciences are (1) inducing individual and corporate behavior to achieve socially desirable environmental conditions, (2) development of efficient arrangements for wastes and contaminants, and (3) motivating desirable patterns of developmental design. (Strachan-Chicago)
W72-14907

FOUR PROBLEM AREAS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 05C.
W72-14908

OUR RESOURCE ENDOWMENT AND OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Denver, Colo. Mid-Continent Regional Office.
For primary bibliographic entry see Field 06B.
W72-14909

METROPOLITAN GROWTH -- ENCROACHMENT OR ORDERLY PROCESS,
Department of Housing and Urban Development, Washington, D.C. Land and Facilities Development Administration.
For primary bibliographic entry see Field 05G.
W72-14910

URBAN OPEN SPACE: PSYCHO-SOCIO AND LEGAL DIMENSIONS,
Colorado Open Space Foundation, Denver.
For primary bibliographic entry see Field 06B.
W72-14911

BOULDER, COLORADO: A STUDY IN GROWTH,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 03D.
W72-14912

ECONOMIC GROWTH AND ENVIRONMENTAL COSTS,
Coe Coll., Cedar Rapids, Iowa.
J. H. Chapman, Jr.
In: Man and the Quality of His Environment, Western Resources Conference 1967, University of Colorado Press, Boulder, 1968, p 231-239.

Descriptors: *Economics, *Environment, *Costs, *Input-output analysis, Income analysis, Employment, Pricing, Water pollution, Air pollution, City planning.
Identifiers: *Boulder (Colo), Space program, Accommodation costs, Removal costs.

A study of the Boulder, Colorado economy (1963-65) was published by the West Virginia University Library. The study, 'The Impact of the Space Program on a Local Economy', was financed by a grant from the National Aeronautics and Space Administration. Its major purpose was to utilize input-output analysis to trace sectorally the total income and employment effects of federally funded space research and production spending by several local establishments such as Ball Brothers and Beech Aircraft. While the Boulder study was commissioned to investigate a particular problem, it is useful for other purposes. The study authors used the study to investigate the impact of the proposed IBM construction of a major production facility near Niwot, Colorado. This input-output analysis could be used to assess costs, direct and indirect, of air pollution and solid waste disposal. Certain problems involved with economic growth are mentioned. There is a problem of external diseconomies of scale which accrue to agglomerates of people. The more people and the more income in any one area, the greater becomes the problem, because dependence on the marketplace to set prices means that costs which never appear there cannot be estimated, e.g., the cost of water pollution. There are accommodation costs and removal costs. The former are the public kinds of costs of accommodating more people with higher incomes. Removal costs have to do with the pervasive growth problems of air and water pollution, where there is an excellent chance to assess the creators the private cost of removing whatever it is that they are dispensing which pollutes. (Strachan-Chicago)
W72-14913

ENVIRONMENTAL PLANNING ALONG MONTANA'S BLUE-RIBBON TROUT STREAMS,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W72-14923

LEAD-DEADWOOD SANITARY DISTRICT NUMBER 1, SOUTH DAKOTA (FINAL ENVIRONMENTAL STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 05D.
W72-14924

PROPOSED DIABLO CANYON DESALTING PROJECT (DRAFT ENVIRONMENTAL STATEMENT).
Office of Saline Water, Washington, D.C.; and California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 03A.
W72-14925

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 08D.
W72-14926

ERIE HARBOR, PENNSYLVANIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-14927

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AFB FLORIDA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.
For primary bibliographic entry see Field 05D.
W72-14928

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 08A.
W72-14929

DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-14930

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 08A.
W72-14931

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-14932

LOCAL PROTECTION PROJECT, WATERLOO, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 08D.
W72-14933

TEST TO DETERMINE THE COMBINED EFFECTS OF WAVES AND CURRENTS ON BARRIER MOTIONS AND OIL RETENTION EFFICIENCY IN ROUGH WATER. POINT CONCEPTION, CAL. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-14937

07. RESOURCES DATA

7A. Network Design

URBANIZATION, WATER POLLUTION, AND PUBLIC POLICY,
Barnard Coll., New York.
For primary bibliographic entry see Field 05G.
W72-14437

ADAIR IHD EXPERIMENTAL BASIN NO 14, 1970.
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 04A.
W72-14729

7B. Data Acquisition

WATER FEATURES ON TOPOGRAPHIC MAPS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-14211

GROUND-WATER FLOW,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02F.
W72-14248

A REAPPRAISAL OF NEEDHAM AND USINGER'S DATA ON THE VARIABILITY OF A STREAM FAUNA WHEN SAMPLED WITH A SURBER SAMPLER,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
F. M. Chutter.
Limnology and Oceanography, Vol 17, No 1, p 139-141, January 1972. 3 tab, 9 ref.

Descriptors: *Statistical methods, *Sampling, *Aquatic animals, Mathematical studies, Streams, Variability, Estimating.
Identifiers: *Counting, Analysis of variance, Surber sampler, Variance ratios, Data analysis, Reliability.

In 1956, Needham and Usinger reported on the collection of 100 faunal samples using a Surber square foot sampler to determine the variability of results. In that study, they concluded that 73 samples would be necessary to give significant figures on total numbers at a 95 percent level of confidence. Data are presented here to show that this conclusion, which has made a major impact on limnology, is erroneous. It is concluded that 448 samples are required to give a sample mean within 5 percent of the population at a 95 percent confidence level. Data from sampling sites where the sampling apparatus is totally submerged are particularly variable. (Mortland-Battelle)
W72-14296

A SIMPLE MICROLAYER METHOD FOR SMALL SAMPLES,
Makapuu Oceanic Center, Waimanalo, Hawaii Marine Ecology Div.
G. W. Harvey, and L. A. Burzell.
Limnology and Oceanography, Vol 17, No 1, p 156-160, January 1972. 1 fig, 1 tab, 2 ref.

Descriptors: *Sampling, *Equipment, *Thin films, Chlorophyll, Fluorometry, Evaluation, Organic matter, Diatoms, Protozoa, Detritus, Methodology.
Identifiers: Spectrofluorimetry, Tryptophan, Tyrosine, Chlorophyll a, Flagellates.

A simple method for the collection of surface microlayer samples involves the immersion of a clean hydrophilic surface in the water and withdrawing it vertically at a controlled rate so that a layer approximately 60-100 microns thick is retained. The surface film and water layer adhering to the plate are removed from both sides with a neoprene windshield wiper blade. This method was found ineffective with layers of oil significantly thicker than monolayers. When the method was tested against a standard microlayer sampling method, the data obtained indicated fairly good agreement between the 2 microlayer methods. (Snyder-Battelle)
W72-14297

AN APPARATUS FOR DOSING LABORATORY FERMENTERS WITH SUSPENSIONS,
West of Scotland Agricultural Coll., Auchincruive (Scotland). Dept. of Bacteriology.
For primary bibliographic entry see Field 05A.
W72-14309

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - I. PRESSURE,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
J. D. Irish, and F. E. Snodgrass.
Deep-Sea Research, Vol 19, No 2, p 165-169, February 1972. 4 fig, 2 tab, 6 ref.

Descriptors: *Pressure measuring instruments, *Quartz, *Crystals, *Waves (Water), Oceanography, Aquatic drift, Pressure, Temperature, Sea water, Measurement, Instrumentation, Vibrations.
Identifiers: Sensors.

The use of quartz crystals as pressure sensors in oceanographic studies is considered. A Hewlett Packard Sonde was used which utilizes a crystal disc resonating torsionally near 5 MHz at the center of an evacuated quartz cylinder. This cylinder transfers fluid pressure to radial forces on the disc thus increasing its resonance frequency. A reference crystal is used to heterodyne the sensing crystal signal and obtain a frequency below 100 KHz. The instrument was evaluated for 92 hr on the sea floor off San Clemente Island, California. After initial equalization, the Sonde drift rate was less than 1 cm of seawater pressure per day and appeared to diminish with time. The noise level decreased from 0.1 sq cm per cph at 0.1 cph to less than 0.0001 sq cm per cph at 10 cph. This noise spectrum was sufficiently low so that the instrument could measure ocean waves of 1 mm of period 1 h. (See also W72-14331) (Mortland-Battelle)
W72-14330

QUARTZ CRYSTALS AS MULTIPURPOSE OCEANOGRAPHIC SENSORS - II. SPEED,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
F. J. Resch, and J. D. Irish.
Deep Sea Research, Vol 19, No 2, p 171-178, February 1972. 7 fig, 2 tab, 14 ref.

Descriptors: *Quartz, *Crystals, *Currents (Water), *Measurement, Oceanography, Convection, Instrumentation, Temperature, Sea water, Telemetry, On-site data collections, Velocity.
Identifiers: Sensors.

An indirectly heated speed sensor, utilizing temperature-sensitive quartz crystals, is evaluated for measuring deep-sea currents. In this instrument, a quartz crystal is mounted in a pressure case at the end of a tube. Speed sensors behind this tube contain two additional quartz crystals mounted on the ends of bent tubes in a configuration so that their ends face each other. One of these is heated, the other is not and measures the ambient temperature. The heated crystal then measures the increase above ambient temperature of the heated element, which is a function of the current magnitude. The sensor is used to measure horizontal currents perpendicular to the two sensing elements. The instrument is shown in tests to be capable of measuring currents well below 1 cm per second and is particularly well adapted for deep-sea tidal measurements. (See also W72-14330) (Mortland-Battelle)
W72-14331

THE CALIBRATION OF THERMISTORS OVER THE TEMPERATURE RANGE 0-30 DEGREES C,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
A. S. Bennett.
Deep-Sea Research, Vol 19, No 2, p 157-163, February 1972. 5 fig, 2 tab, 5 ref.

Descriptors: *Instrumentation, *Calibrations, Mathematics, Equations, Measurement, Least squares method, Thermometers, Water temperature, Hydrostatic pressure, On-site investigations.
Identifiers: *Thermistors, Sensors.

A thermistor suitable for long-term temperature recording in the ocean was calibrated to IPTS-68 standards and recalibrated day to day using a triple-point-of-water apparatus. A constant temperature bath was used for the temperature calibrations, with resistance measurements having been obtained with a pair of a. c. Kelvin bridges at 159 Hz. The measured thermistor resistances were corrected for the heating effect of the measuring current by extrapolation of measurements at different currents. The thermistor resistance-temperature relationship can be determined with an accuracy of 0.001C over the range of 0-30C by a formula with four parameters. One of the four parameters may be taken as constant for a particular type of thermistor leaving only three parameters to be obtained by individual calibration. For reduced accuracy or over a narrower temperature span, only two parameters need to be obtained by individual calibration. If rapidly drifting thermistors are eliminated, the mean value of the root mean square drift rate of the remainder is likely to be below the square root of 0.00175 C/yr for the type of thermistor used in these tests. The steel probe provides adequate protection against ambient pressure. This type of thermistor is thus suitable for long-term temperature recording in the ocean. The effect of pressure on the steel probe type of thermistor is .0013 plus or minus .0015 nano (standard deviation) degrees C/bar at pressures up to 700 bar (10,000 psi). (Snyder-Battelle)
W72-14332

INSTRUMENTATION FOR OCEANOGRAPHIC RESEARCH,
E. G. Cromer.
Electronics Instrumentation Digest, Vol 8, No 4, p 9-19, April 1972. 1 tab.

Descriptors: *Instrumentation, *On-site data collections, *Oceans, *Electronic equipment, Computers, Oceanography, Data transmission, Data collections, Automation, Durability, On-site investigations, Hydrologic data, Physicochemical properties, Physical properties, Water pollution control, Hydrography, Salinity, Turbidity, Dissolved oxygen, Hydrogen ion concentration, Pollutant identification, Velocity, Water pressure, Depth, Conductivity, Turbulence, Waves (Water), Tidal waters, Atmospheric pressure, Dew point, Estuaries, Measurement, Water temperature, Ocean currents, Currents (Water), Wind velocity, Precipitation (Atmospheric), Magnetic studies, Ocean waves, Air temperature, Sounding.
Identifiers: Sensors, Transparency, Visibility, Magnetic field.

Oceanographic research has begun to use electronic instruments for measuring a large number of parameters. The use of such instruments makes it possible to gather large amounts of data on a global basis. Formerly, in the interest of accuracy, most data were recorded within instrument packages or sensors and were available only after the package had been brought back to the surface. Modern electronic techniques make it possible to provide signal-conditioning circuitry right at the transducer location, and the signals can be converted into forms that can be transmitted to a central data-acquisition facility with no loss in accuracy. One of the outstanding problems facing oceanographers today is that of obtaining equipment that is suited to - if not designed for the marine environment. Instruments that need perform only in the relative serenity of shipboard environment must be capable of taking line voltage variations of as much as plus or minus 20 V, and frequency variations as great as plus or minus 3Hz in stride without hiccuping. They may also have to tolerate voltage spikes of 40 V or more, without suffering any ill effects. Temperature and humidity extremes, as well as salt atmosphere, pose further survival problems. Even when instruments can be confined to air-conditioned quarters, they must still manage to survive continuous vibration- and low-frequency vibration, in particular. Some of the oceanographic programs in progress include (1) marine charting, (2) estuarine pollution-measurement/control, (3) data buoy program, (4) FLARE project, and (5) naval oceanographic research. In order to obtain the massive amounts of data necessary to understand the earth's oceans, a pragmatic approach in building reliable instruments has been suggested. (Long-Battelle)
W72-14340

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION,
Transportation Systems Center, Cambridge, Mass.
J. R. Lifsitz, and H. C. Ingrao.
Available from NTIS, Springfield, Va. 22151, as PB-204 805; Price $3.00 paper copy; 95 cents microfiche. Department of Transportation, U.S. Coast Guard, Report No. DOT-TSC-CG-71-3, June 1971. 125 p, 34 fig, 4 tab, 26 ref.

Descriptors: *Remote sensing, *Infrared radiation, *Fog, Tracking techniques, Meteorology, Weather, Coasts, Methodology, Costs, Instrumentation, Data collections, Analytical techniques.
Identifiers: *Laser backscattering, *Fog bank detection.

The feasibility of laser backscattering (LIDAR) and infrared radiometry is explored in the detection of coastal fog banks by remote sensing methods. These techniques are analyzed theoretically, and experimental data are presented supporting the analysis. A design study is carried out for several laser systems, considering safety, reliability, cost, convenience, efficiency and maximum range. A fog bank detector utilizing a GaAs laser array is described which best satisfies these criteria. Before the prototype design is selected, a brief in situ test program is recommended. (Woodard-USGS)
W72-14372

MAN-MADE ENVIRONMENT AS VIEWED FROM SPACE: WATER AND AIR POLLUTION,
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 05B.
W72-14373

THERMAL DISCHARGE: A MODEL-PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 05B.
W72-14393

EVALUATION OF LIMESTONE FORMATION CHARACTERISTICS FROM WELL LOGS,
Qater Petroleum Co. Ltd., Umm Said.
For primary bibliographic entry see Field 04B.
W72-14491

A PRELIMINARY INVESTIGATION OF TERRESTRIAL AND LOW ALTITUDE AERIAL INFRARED PHOTOGRAPHY AS AN AID IN DETERMINING WATER TABLE DEPTHS AND BURIED GEOLOGICAL STRUCTURES IN THE PIERRE SHALE IN WESTERN SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City.
E. R. Hoskins, D. W. Hammerquist, and P. H. Rahn.
Available from the National Technical Information Service as PB-206 494, $3.00 in paper copy, $0.95 in microfiche. South Dakota School of Mines and Technology Final Report on HP 5806 (5115) P, June 1971. 59 p, 43 fig, 3 ref.

Descriptors: *Geology, *Groundwater, *Hydrologic data, *Aerial photography, *South Dakota, Remote sensing, Photogrammetry, Terrain analysis, Subsurface investigations, Faults (Geologic), Fracture permeability, Aquifers, Water tables, Analytical techniques, Photography.
Identifiers: Infrared film, Road cuts.

Faults and joints and water table depths in road cuts in the Pierre shale were investigated from terrestrial and low altitude aerial photographs. Over 1200 photographs were taken during the project. Three sites on Interstate 90 east of Rapid City received repeated monthly multispectral photographic coverage for about one year. Black and white panchromatic, natural color, and infrared color films were used. The negatives and transparencies were enlarged and printed on both color and black and white paper with various filters on the enlarger to enhance the data presentation. Small faults and joints previously correlated with pavement distress were identifiable from nearly all of the combinations of films and filters and printing techniques. The most useful and easiest to interpret display of information was from the low altitude (500 to 1000 feet above the ground) aerial color infrared photographs printed in color. (Woodard-USGS)
W72-14527

REMOTE SENSING OF SEA SURFACE TEMPERATURE FROM EARTH SATELLITES,
Natioanl Oceanic and Atmospheric Administration, Rockville, Md.
P. K. Rao.
Available from Sup Doc, GPO, Washington, DC 20402, Price $5.25. In: Proceedings of the International Workshop on Earth Resources Survey Systems, Washington, D C, May 13-14, 1971, Vol II, p 595-606, 1971 (release date). 6 fig, 6 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Water temperature, *Infrared radiation, Computer programs, Data processing, Data collections, Sea water.

By using earth orbiting satellites containing radiometers, it is possible to measure sea surface temperature under relatively clear sky conditions. The mapping of sea surface temperature from satellite IR observations requires the capability to discriminate the Earth's surface from cloud. To overcome this problem, a method was developed to examine a large number of measurements within an area larger than that covered by most cloud masses. From such a sample of measurements, the surface temperature can be found by making use of the following: (a) the magnitude of the temperature should be highest for the cloud-free observations; and (b) modes dominated by relatively cloudfree observations will be distinct. (Knapp-USGS)
W72-14531

PROSPECTING OF UNDERGROUND WATER BY THE MEASUREMENT OF NATURAL RADIOACTIVITY,
National Research Institute of Agricultural Engineering, Hiratsuka (Japan).
For primary bibliographic entry see Field 02F.
W72-14600

A STUDY OF THE RELATIONSHIP BETWEEN THE GEOPHYSICAL P.D.R. (POTENTIAL DROP RATIO) RESISTIVITY MEASUREMENTS AND THE COEFFICIENT OF TRANSMISSIBILITY (T) OF THE AQUIFERS,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
For primary bibliographic entry see Field 02F.
W72-14607

THE FRAUNHOFER LINE DISCRIMINATOR: AN AIRBORNE FLUOROMETER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-14613

THE USE OF PHOTOGRAPHY IN WATER QUALITY RESEARCH,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05A.
W72-14728

DETERMINATION OF SOIL MOISTURE CONTENT WITH AIRBORNE MICROWAVE RADIOMETRY,
Aerojet-General Corp., El Monte, Calif. Microwave Div.
For primary bibliographic entry see Field 02G.
W72-14748

AN IMPROVED SEPARATION AND DETERMINATION OF URANIUM IN SEAWATER,
Hawaii Univ., Honolulu. Dept. of Chemistry; and Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 05A.
W72-14798

A NOTE ON THE MEASUREMENT AND ESTIMATION OF EVAPORATION,
For primary bibliographic entry see Field 02D.
W72-14879

MODIFICATIONS OF SHIELDED NET RADIOMETERS TO MEASURE SOLAR RADIATION PROFILES IN WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso.
Limnology and Oceanography, Vol 17, No 3, p 462-466, May 1972. 3 fig, 1 tab, 12 ref.

Descriptors: *Solar radiation, *Underwater, *Instruments, *Calibrations, *Thermal radiation, Light, Adsorption, Energy, Thermal properties, Temperature.
Identifiers: *Radiometers.

Five modifications of polyethylene-shielded net radiometers were developed and tested for use in determining both downwelling and upwelling radiation underwater. A field trial of the instruments yielded a logarithmic extinction relation in very turbid water, with the upwelling radiation equal to about 2.2% of the downwelling radiation at any level. (Knapp-USGS)
W72-14962

7C. Evaluation, Processing and Publication

WATER FEATURES ON TOPOGRAPHIC MAPS,
Geological Survey, Washington, D.C.
M. M. Thompson.
ASCE Proceedings, Journal of the Surveying and Mapping Division, Vol 98, No SU1, Paper 9018, p 1-16, July 1972. 18 fig.

Descriptors: *Mapping, *Maps, *Remote sensing, *Photogrammetry, *Hydrologic data, Data collections, Topographic mapping, Terrain, Hydrography, Surveys, Water resources.

Topographic maps are a prime source of information for planning the improvement of man's environment with respect to water. In order to utilize the tremendous amount of hydrologic information shown on these maps, the water resources planner must know what maps are available and how to interpret the map portrayal of water features. This paper explains how various features are shown and how to interpret features that are subject to change because of seasonal conditions, construction of dams, reclamation of swamps, and changes in stream courses. The classes of water features discussed include streams, lakes, ponds, reservoirs, canals, aqueducts, ditches, springs, wells, glaciers, and coasts. Methods of improving the hydrologic information on maps are considered, with specific reference to orthophotomaps. Applications of special types of photography such as color infrared, and the use of orbiting satellites as vehicles for sophisticated sensors are mentioned. (Knapp-USGS)
W72-14211

DIGEST OF THE CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
F. H. Pauszek.
Geological Survey Open-file Report, 1971. 66 p, 17 fig, 17 tab.

Descriptors: *Hydrologic data, *Data collections, *Federal Government, *Indexing, Reviews, Water quality, Surface waters, Groundwater, Streamflow, Information retrieval, Gaging stations, Sampling, Sites.
Identifiers: *Catalog (Water data).

The Catalog of Information on Water Data is a file of information about water-data acquisition activities, maintained in accordance with the directions set forth in Circular A-67, issued by the Office of Management and Budget. This Circular calls upon the U.S. Department of the Interior to coordinate certain water-data acquisition activities conducted by Federal agencies on streams, lakes, reservoirs, estuaries, and groundwaters. This report is a digest of information appearing in the 1970 edition of the Catalog. It also includes information on active groundwater stations reported in the 1968 edition of the Catalog. The digest highlights some of the Catalog information by means of illustrations and tables; a brief explanation precedes each. Items covered are who is reporting, what is reported, the scope of activities, and the periods of record. (Woodard-USGS)
W72-14234

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1971,
Geological Survey Helena, Mont.
M. V. Johnson, and R. J. Omang.
Available from NTIS, Springfield, Va 22151 PB-208 079 Price $3.00 paper copy; 95 cents microfiche. Geological Survey Open-file Report, March 1972. 140 p, 1 fig.

Descriptors: *Streamflow, *Peak discharge, *Flood forecasting, *Small watersheds, *Montana, Stream gages, Gaging stations, Crest-stage gages, Hydrologic data, Basic data collections, Reviews.

A program to investigate the magnitude and frequency of floods from small drainage areas in Montana was begun July 1, 1955. Originally, 45 crest-stage gaging stations were established. In September 1971 there were 182 stations. The annual peak stage and discharge at each crest-stage gaging station are tabulated by water year. Also, the activities and progress made during the 1971 water year are summarized. The purpose of the program is to define the magnitude and frequency of floods, on a regional basis, for Montana. Hydrologic data on small drainage areas are collected to supplement data obtained from the established stream-gaging program of the Geological Survey. (Woodard-USGS)
W72-14235

POTOMAC RIVER WATER QUALITY NETWORK: COMPILATION OF DATA.
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 05A.

W72-14281

BAYESIAN OPTIMIZATION IN SAMPLING FINITE POPULATIONS,
Manitoba Univ., Winnipeg. Dept. of Actuarial Mathematics and Statistics.
J. N. K. Rao, and P. D. Ghangurde.
Journal of the American Statistical Association, Vol 57, No 338, p 439-443, June 1972.

Descriptors: *Sampling, *Population, *Finite element analysis, Mathematical studies, Algorithm, Data collections, Methodology, Statistical methods, Variability, Size, Optimization.
Identifiers: *Bayesian optimization, Random sampling.

The problem of optimum allocation in sampling finite populations using prior information is considered. The following cases are investigated: (1) stratified simple random sampling with known strata sizes; (2) Neyman's double sampling with unknown strata sizes; (3) the Hansen-Hurwitz method for the non-response problem; (4) two-stage random sampling. The optimum allocation in each case is obtained by minimizing the expected posterior variance of the mean subject to constraints. The results are extended to multiple prior distributions and/or multiple characters. The solutions are distribution-free and also free from the assumption of infinite populations and/or known variances. Attention is given to 'data-based' prior distributions. (Long-Battelle)
W72-14341

PARTIALLY BALANCED DESIGNS FOR HALF SAMPLE REPLICATION METHOD OF VARIANCE ESTIMATION,
Malaya Univ., Kuala Lumpur (Malaysia). Faculty of Economics and Administration.
K-H. Lee.
Journal of the American Statistical Association, Vol 67, No 338, p 324-334, June 1972. 10 tab, 15 ref.

Descriptors: *Methodology, *Design, *Variability, *Estimating, Mathematical studies, Statistical models, Sampling, Data collections, Population, Regression analysis, Efficiencies.
Identifiers: Replication, Precision, Performance evaluation.

Half sample replication has been used as a method for estimating variances in stratified sampling whereby two primary selections are drawn from each stratum. This article considers some procedures of improving the precision of the variance estimator computed from a partially balanced set of half samples. Both the theoretical and empirical findings suggest that the SAOA procedure is an effective method to employ, in particular with a '2-order partially balanced design'. (Long-Battelle)
W72-14342

ESTIMATING ERRORS IN EXPERIMENTAL DATA,
Atomic Energy of Canada Ltd., Chalk River (Ontario).
J. M. Blair.
Instruments and Control Systems, Vol 45, No 5, p 95-97, May 1972. 4 tab, 2 ref.

Descriptors: *Statistical methods, *Numerical analysis, *Estimating, Mathematical studies, Finite element analysis, Variability.
Identifiers: *Experimental error, Errors, Analysis of variance, Data analysis, Confidence limit.

A numerical technique based on finite differences for estimating errors in experimental data is presented. Finite differences for five experimental points are formed in a finite difference table using given nomenclature. Tables are also given for finite differences for an experimental function, for differences consisting of error terms only, for confidence limits, and for normalized estimates of variance. An example is presented to illustrate the technique. (Mortland-Battelle)
W72-14343

LIKELIHOOD ANALYSIS OF THREE-WAY CONTINGENCY TABLES,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
J. K. Lindsey, and F. W. Nash.
Journal Fisheries Research Board of Canada, Vol 29, No 5, p 590-591, May 1972. 1 ref.

Descriptors: *Statistical methods, *Mathematical studies, *Distribution patterns, Sampling, Analytical techniques, Benthos, Fish, Computer programs.
Identifiers: *Three way contingency tables, Contingency tables, Analysis of variance, Variance ratios, Multinomial distribution, Counting.

The three-way contingency table is considered as an analysis of variance problem. Since the appropriate distribution is multinomial rather than normal, the log likelihood ratios are used to make inferences instead of the variance ratios. Two specific examples of such an analysis are cited. In one, three methods of sampling organisms on the bottom of a stream were compared. In the second, an analysis was run to determine if length-age frequency tables for a given species of fish for a number of samples taken in 1 week could be combined. An IBM computer program for the analysis discussed is available. (Mortland-Battelle)
W72-14346

OPTIMUM RESERVOIR OPERATION USING STOCHASTIC DYNAMIC PROGRAMMING,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 04A.
W72-14347

SUBSURFACE WATER TEMPERATURES OF THE COLUMBIA RIVER AT PRESCOTT, OREGON (RIVER MILE 72), 1968-69,
National Marine Fisheries Service, Seattle, Wash. Biological Lab.
For primary bibliographic entry see Field 05G.
W72-14357

RESEARCH IN NUMERICAL ANALYSIS TECHNIQUES FOR MODEL SIMULATION,
Digital Programming Services, Inc., Waltham, Mass.
For primary bibliographic entry see Field 02B.
W72-14358

FIELD OBSERVATIONS OF WAVE RUNOFF ON A SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
M. J. Hoernemann.
Available from NTIS, Springfield, Va. 22151 as AD-821 832. Price $3.00 paper copy, 95 cents microfiche. M Sc Thesis in Oceanography, June 1967. 90 p, 10 fig, 7 tab, 11 ref, append.

Descriptors: *Ocean waves, *Beaches, *Surf, *Waves (Water), *Velocity, Time, Winds, On-site data collections, Travel time, Measurement, Sea spray, Wave pile-up, Analytical techniques, Correlation analysis, Properties.
Identifiers: Wave runup, Swell, Offshore waves.

Six sets of field measurements of runup resulting from both wind waves and swell were made on a uniform sand beach. Waves were recorded simultaneously directly offshore at a point outside the surf zone. Each individual runup was correlated with a specific wave, using a traveltime plot. Runup occurrences were always found to be fewer in number than wave occurrences, particularly when wind waves were present. There were variations in the runup resulting from waves of a given height. These variations inheight and ratio of runup to waves were caused in large part by the interaction of successive foam lines. Interaction occurred in the form of retardation by backwash of preceding waves, overtaking by a following foam line, and overriding by a small unbroken wave. The complicated nature of runup resulting from ordinary sea and swell makes it difficult to predict runup accurately from laboratory studies. (Woodard-USGS)
W72-14362

A SUMMARY OF PEAK STAGES AND DISCHARGE IN MARYLAND, DELAWARE, AND DISTRICT OF COLUMBIA FOR FLOOD OF JUNE 1972,
Geological Survey, Parkville, Md.
K. R. Taylor.
Geological Survey Open-file Report, 1972. 13 p, 1 tab, 3 fig.

Descriptors: *Floods, *Peak discharge, *Streamflow, *Maryland, *Storms, Hydrologic data, Basic data collections, Gaging stations, Stream gages, Discharge measurement, Correlation analysis, Variability, Historic floods, *Delaware, *District of Columbia.
Identifiers: *Tropical storm Agnes (Md June 1972).

Intense rainfall associated with tropical storm Agnes caused devastating flooding in several states along the Atlantic Seabord during late June 1972. Peak discharges at many gaging stations on streams and rivers in central Maryland, northern Delaware, and the District of Columbia far exceeded the previous maximum flows recorded at these stations. Record peak flows in Maryland occurred on long-term stations (more than 20 years of record) as far west as Conococheague Creek in Washington County and as far east as Morgan Creek in Kent County. Five stations with more than 20 years of record had peak flows that were more than 4 times greater than previously recorded peaks. Western Run at Western Run and North Branch Patapsco River at Cedarhurst had peak flows that were 6 1/2 times greater than any previous peak flow during more than 25 years of record. Peak stages at these stations exceeded the previous record stages by 15.2 feet and 10.4 feet, respectively. At Conococheague Creek at Fairview and Monocacy River at Jug Bridge near Frederick peak flows exceeded the record 1889 peak flows by nearly 50 percent. (Woodard-USGS)
W72-14369

OPTIMUM OPERATIONS MODEL FOR SHASTA-TRINITY SYSTEM,
Bureau of Reclamation, Sacramento, Calif. Water and Power Control Division.
For primary bibliographic entry see Field 04A.
W72-14384

RIVER DEE RESEARCH PROGRAM: 3. A SHORT-TERM CONTROL STRATEGY FOR MULTIPURPOSE RESERVOIR SYSTEMS,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W72-14388

VERMONT WATER QUALITY SIMULATION PROJECT REPORT,
Thayer School of Engineering, Hanover, N.H.
For primary bibliographic entry see Field 05B.
W72-14392

COMPUTER MODEL FOR A THERMAL PLUME,
Detroit Edison Co., Mich.

For primary bibliographic entry see Field 05B.
W72-14407

QUALITY OF SURFACE WATER IN THE BEAR RIVER BASIN, UTAH, WYOMING, AND IDAHO,
Geological Survey, Washington, D.C.
K. M. Waddell, and D. Price.
Available from USGS; Washington, DC 20242- Price $1.50 per set. Geological Survey Hydrologic Investigations Atlas HA-417, 1972. 2 sheets, 14 fig, 2 map, 4 tab, 26 ref.

Descriptors: *Water quality, *Surface waters, *Utah, *Wyoming, *Idaho, Hydrologic data, Data collections, River basins, Streamflow, Water sampling, Water analysis, Water properties, Water types, Chemical analysis, Water resources development, Hydrology, Rainfall, Snowmelt, Runoff, Flow characteristics.
Identifiers: *Bear River Basin (Utah, Wyo, and Idaho).

The U.S. Geological Survey, in cooperation with the Utah Department of Natural Resources, Division of Water Rights, began a reconnaissance in 1967 to obtain essential water-quality information for the Bear River basin in Utah, Wyoming, and Idaho. Water samples were obtained at most sites in a selected network four times during an 11-month period (September 1967-July 1968) to define chemical-quality conditions during low flow in the winter, high runoff (snowmelt period) in the spring, midirrigation period in the summer, and postirrigation period in the fall. Each of the four sets of data was obtained within a 5-day period to establish a concurrent, basinwide, seasonal pattern of chemical quality. Sediment data were collected during the snowmelt period in the spring. The reconnaissance data and selected miscellaneous data collected earlier are the basis for this 2-sheet atlas. Maps, curves, tables, and photographs describe the hydrologic data. The water on the tributaries was predominantly of the calcium bicarbonate type, and the concentration of dissolved solids ranged from 100 to 500 mg/liter. (Woodard-USGS)
W72-14539

WATER RESOURCES OF NORTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
R. H. Pearl, R. S. Roberts, K. M. Keene, and T. J. McClain.
Available from USGS, Washington, DC 20242- Price $1.00 per set. Geological Survey Hydrologic Investigations Atlas HA-429, 2 sheets, 1972. 5 fig, 5 map, 1 tab, 16 ref.

Descriptors: Water resources development, *Groundwater resources, *Surface waters, *Hydrologic data, *Kansas, Aquifer characteristics, Water wells, Water yield, Water quality, Groundwater recharge, Pumping, Drawdown, Transmissivity, Storage coefficient, Streamflow, Runoff, Maps, Curves, Water utilization, Irrigation, Livestock, Domestic water.
Identifiers: Hydrologic atlas.

This 2-sheet atlas presents information on geology and water resources of a six-county area in northwestern Kansas. The data are intended primarily as a guide to the availability of groundwater, which is the main source of supply for domestic, stock, industrial, irrigation, and municipal uses. The principal water-bearing formation is the Ogallala Formation. The Ogallala aquifer has a saturated thickness of as much as 270 feet and yields as much as 2,000 gpm. Transmissivities of the Ogallala range from 10,000 to 130,000 gpd per foot and specific capacities of wells range from less than 10 to about 60 gpm per foot of drawdown. The South Fork of the Republican River, which is affected by irrigation diversions and by storage in Bonny Reservoir, and the Arikaree River are the only perennial streams in the western part of the area. The combined annual streamflow from the area is about 170,000. Concentrations of dissolved solids in the groundwater samples from the Ogallala Formation range from 206 to 591 mg/liter (milligrams per liter). The water is suitable for domestic, stock, and irrigation purposes and meets all standards of chemical characteristics, except hardness, recommended by the U.S. Public Health Service. (Woodard-USGS)
W72-14540

SOIL SURVEY OF TUCSON-AVRA VALLEY AREA, ARIZONA,
Soil Conservation Service, Tucson, Ariz.
For primary bibliographic entry see Field 02G.
W72-14576

GENERAL SOIL MAP LOWER PANTANO WASH AREA, PIMA COUNTY, ARIZONA - A SPECIAL REPORT WITH SELECTED ENGINEERING INTERPRETATIONS,
Soil Conservation Service, Portland, Oreg.
M. L. Richardson.
June 1972. 28 p, 3 tab, 2 map.

Descriptors: *Soil surveys, *Land use, *Arizona, *Remote sensing, *Environmental engineering, Surveys, Hydrologic aspects, Mapping, Southwest U.S., Drainage area, Soil properties, Soil types.
Identifiers: *Pantano Wash area (Ariz).

The purpose of the survey produced in cooperation with Office of Arid Lands Studies, University of Arizona, was to determine the distribution and characteristics of the major soils in the area, using standard methods, and comparing their distribution to the pattern depicted on high altitude, small scale color photographs. Information so obtained is intended to provide basic guidance for future land use planning along Pantano Wash with consideration being given to soil and hydrological limitations, together with esthetic factors as determined from high altitude and space photography. Seven mapping units, comprising 6 soil associations, are delineated on a 2-inch=1 mile half-tone aerial photo mosaic, and contain information on such properties as texture, slope, depth, carbonate content, rock fragment content, and natural drainage. The geology, hydrology, climate, and general description of the area are stated. Estimated soil properties significant to engineering interpretations for residential, industrial, and recreational used are displayed in tabular form, as well as soil limitations ratings, and features affecting engineering interpretations. A glossary is appended. (Paylore-Arizona)
W72-14578

ON HYDROGEOLOGY AND GROUNDWATER WELLS OF ETHIOPIA,
Ministry of Public Water Works, Addis Ababa, (Ethiopia). Water Resources Dept.
For primary bibliographic entry see Field 04B.
W72-14591

GROUNDWATER BASIN TYPES IN TURKEY,
State Hydraulic Works, Ankara (Turkey). Groundwater Div.
For primary bibliographic entry see Field 02F.
W72-14592

THE HYDROGEOLOGY OF THE ANSEONG RIVER BASIN, KOREA,
Geological Survey of Korea, Seoul.
For primary bibliographic entry see Field 02F.
W72-14594

APPLICATION OF THE WATER BALANCE SIMULATION FOR PREDICTING LAND SUBSIDENCE--A DIGITAL COMPUTER APPROACH,
For primary bibliographic entry see Field 02F.
W72-14604

WATER RESOURCES DATA FOR NEW YORK, 1971: PART 1. SURFACE-WATER RECORDS.
Geological Survey, Albany, N.Y. Water Resources Div.

Geological Survey Basic Data Report, 1972. 311 p, 14 fig, 3 ref.

Descriptors: *Surface waters, *Water resources, *Basic data collections, *Hydrologic data, *New York, Streamflow, Flow rates, Low flow, Peak discharge, Average flow, Lakes, Reservoirs, Gaging stations, Reservoir storage, Water levels, Water yield, Discharge measurement, Crest-stage gages.

Surface-water records for the 1971 water year (October 1, 1970-September 30, 1971) for New York are given, including records of streamflow, reservoir storage or lake elevations at gaging stations, partial record stations, and miscellaneous sites. Records for a few pertinent gaging stations in bordering states are also included. The data include daily discharge records for 204 gaging stations; daily or monthly stage or contents for 45 lakes and reservoirs; discharge measurements for 509 sites, 163 of which are low-flow partial-record stations and the remainder, miscellaneous sites; and annual maximum stages and discharges for 106 crest-stage partial-record stations. (Woodard-USGS)
W72-14609

MODELS FOR THE SYNTHESIS OF MONTHLY STREAMFLOWS FOR A PORTION OF THE NORTH CAROLINA PIEDMONT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 02E.
W72-14640

SPACE-TIME ANALYSIS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W72-14643

THE PRACTICAL APPLICATION OF DYNAMIC PROGRAMMING TO RESERVOIR SYSTEMS WITH PUMPED INPUTS,
Water Research Association, Medmenham (England).
For primary bibliographic entry see Field 04A.
W72-14646

THE ECONOMICS AND USE OF LARGE SCALE ELECTRODIALYSIS PLANTS ON SELECTED TIDAL ESTUARIAL WATERS,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 03A.
W72-14648

THE CONTRIBUTION OF GLACIER ICE TO THE WORLD WATER BALANCE (A STATUS REPORT ON THE WORLD GLACIER INVENTORY),
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 02C.
W72-14715

EVALUATION OF THE STREAMFLOW-DATA PROGRAM IN HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W72-14737

GROUND-WATER CONDITIONS IN THE EAST SHORE AREA, BOX ELDER, DAVIS, AND WEBER COUNTIES, UTAH-1960-69,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14742

WATER RESOURCES OF THE CROW WING RIVER WATERSHED, CENTRAL MINNESOTA,
Geological Survey, Washington, D.C.
G. F. Lindholm, E. L. Oakes, D. W. Ericson, and J. O. Helgesen.
Available from USGS, Washington, DC 20242 - Price $1.75 per set. Geological Survey Hydrologic Investigations Atlas HA-380, 1972. 4 sheets, 24 fig, 4 tab.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Minnesota, Rainfall-runoff relationships, Water yield, Water utilization, Water quality, Streamflow, Groundwater movement, Evaporation, Evapotranspiration, Water balance, Hydrologic cycle, Hydrologic data, Maps, Curves.
Identifiers: *Crow Wing River Watershed (Minn).

This 4-sheet hydrologic atlas uses approximately 40 illustrations (maps, curves, and tables) in describing water resources of the Crow River Watershed in Central Minnesota. On a long-term basis, about 22 inches of the 26 inches of annual precipitation in the Crow Wing River Watershed is lost through evaporation and transpiration. The remaining 4 inches leaves the basin as surface runoff. Essentially all water supplies in the watershed are derived from glacial drift aquifers. Adequacy of this source of water generally precludes development of bedrock aquifers. All water in the watershed is of the calcium-bicarbonate type and is very hard. The ground-water quality varies according to source, whereas, in streams, quality of water is fairly uniform when base-flow conditions exist. Flow in the main stem of the Crow Wing River is stable because of the regulating effect of lakes and marshes at medium and high flows and the sustaining effect of groundwater discharge from outwash areas during low-flow periods. (Woodard-USGS)
W72-14743

COMPUTER SIMULATION OF ACTIVATED SLUDGE PLANT OPERATION,
Purdue Univ., Lafayette, Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W72-14850

STOCHASTIC SPACE-TIME MODELS OF THE RAINFALL-RUNOFF PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02A.
W72-14922

08. ENGINEERING WORKS

8A. Structures

EFFECT OF FOUNDATION ELASTICITY ON ARCH DAM DEFLECTIONS AND STRESSES,
Uttar Pradesh Irrigation Research Inst., Roorke (India).
R. S. Varsheny.
Water Power, Vol. 24, No. 3-4, Part I-II, p 95-99, 130-136, Mar-Apr 1972. 12 p, 12 fig, 32 ref.

Descriptors: *Elastic deformation, *Arch dams, *Rock foundations, *Dam foundations, Deformation, Load distribution, Trial-load method, Stress, Strain, Bibliographies, Tensile stress, Foundations, Rock mechanics, Deflection, Hydraulic pressure.
Identifiers: *Thin arch dams, Canyon shape factor, India, Elastic foundations, Modulus of elasticity, Double-curvature arch dams.

Behavioral studies of arch dams under specific site conditions determined the effects of foundation elasticity, canyon shape factor, constant and variable radii, load distribution, radial deflection of the crown cantilever, and vertical stress. Foundation strains are a function of time, direction of applied forces, and presence of joints, faults, and other geological features. After a few loading cycles, deformations of a rocky foundation may be assumed to be elastic. A factor lambda (ratio of dam concrete elasticity to elasticity of foundation rock) is critically analyzed for its bearing on the state of stress in arch dams, and recommendations on the treatment of different values of lambda are made for dams of different thicknesses. Conclusions are: (1) Stresses and deformations in thin arch dams are less susceptible to change of foundation elasticity than in thicker dams; (2) increased deformability decreases vertical tensile stress at the heel crown cantilever and compressive stress at the toe; (3) values of lambda between 2 and 4 are more critical for thick dams, and between 1 and 2 for thin dams; and (4) variable-radius arch dams are more suitable for narrow valleys and less susceptible to change in lambda. (USBR)
W72-14240

SWEETWATER CREEK WATERSHED PROJECT, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14265

LIBBY DAM AND LAKE KOOCANUSA, KOOTENAI RIVER, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 538-D. $3.00 in paper copy. June 7, 1971. 45 p, 4 map, 1 illus, 1 photo, 1 tab.

Descriptors: *Montana, *Columbia River Basin, *Environmental effects, *Multiple-purpose projects, Construction, Hydroelectric plants, Electric power production, Flood control, Flood protection, Flooding, Aesthetics, Wildlife habitats, Fisheries, Impoundments, Reservoir construction, Water pollution sources, Highway relocation, Railroad relocation, Sites, Dam construction.
Identifiers: *Environmental impact statement, *Libby Dam and Lake Koocanusa Project, *Lincoln County (Mont), Population relocation.

The Libby Dam and Lake Koocanusa Project in Lincoln County, Montana, is a multiple-purpose flood control and hydroelectric project in the Columbia River Basin. A lake will be constructed which will have a surface area of 46,500 acres at normal full pool and 4,965,000 acre feet of usable storage. The dam will be 446 feet high and 3,055 feet long and the powerhouse on the west bank will initially house four 105,000 kw generators with provisions for four more. Environmental impacts include: flood protection for a 56 square mile agricultural area; 854,000 kw of additional power for the Pacific Northwest; aesthetic impairment to the woodland setting of the dam; inundation of cultivated and grazing land, forests, residential areas, and national forest land; and relocation of about 300 people. Adverse environmental impacts include alteration of fish and wildlife habitats due to water impoundment and destruction of wildlife winter ranges by inundation and highway relocation. To mitigate habitat losses, 7,000 acres of national forest lands are being improved for use as a habitat. The only alternative other than design change is to abandon the project. Alternative methods of debris disposal and an alternate relocation route for a highway are being considered. (Grant-Florida)
W72-14268

TRUMBULL LAKE, PEQUONNOCK RIVER, TRUMBULL, CONNECTICUT (UPDATED FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-206 104F, $3.00 paper copy. November 22, 1971. 40 p, 6 tab, 1 fig.

Descriptors: *Connecticut, *Multiple-purpose projects, *Dam construction, *Environmental effects, Flood protection, Municipal water, Water supply, Wildlife habitats, Stream fisheries, Aesthetics, Recreation, Aquatic habitats, Water quality control, Reservoir construction, Flooding, Channel improvement.
Identifiers: *Environmental impact statement, *Trumbull Lake (Conn), Pequonnock River (Conn).

The proposed project involves construction of a concrete dam and storage reservoir to provide flood protection, water supply, and water quality control in the Bridgeport, Connecticut area. The proposed site is in a scenic gorge on the Pequonnock River north of Bridgeport. The reservoir will be 2.5 miles long and 220 acres will be cleared for the project. The project will have the following effect on the local environment: inundation of 200 acres with up to 283 acres during the spring flood; improved conditions downstream; reloaction of 25 homes; loss of swimming opportunities; loss of animalhabitats from inundation; and temporary water, air and noise pollution associated with construction. Adverse impacts which cannot be avoided include: inundation of 200 acres of scenic woodland, loss of the aesthetic quality of the steep valley, loss of stream fishery for 2 miles, and interference with existing water recreational facilities. Alternatives considered include: no action; local protection such as dikes, floodwalls, and channel improvement; flood proofing; evacuation of the flood plain; and flood plain zoning. (Grant-Florida)
W72-14278

TRANSPORTABLE BREAKWATERS-A SURVEY OF CONCEPTS,
Naval Civil Engineering Lab., Port Hueneme, Calif.
D. B. Jones.
Available from NTIS, Springfield, Va. 22151, as AD-887 841. Price $3.00 paper copy; 95 cents microfiche. Technical Report R-727, May 1971. 70 p, 10 fig, 4 tab, 97 ref.

Descriptors: *Breakwaters, *Classification, *Reviews, *Hydraulic structures, Engineering structures, Evaluation, Barriers, Retaining walls.
Identifiers: *Transportable breakwaters, Literature survey.

Published and unpublished reports dealing with transportable breakwaters were reviewed to collect performance data for a wide variety of configurations. Data on 106 concepts were assembled into an outline classification of transportable breakwaters on the basis of structural form. The various configurations are shown in sketches and their performance data are summarized. This state-of-the-art survey establishes a data base to aid in assessing the feasibility of developing an effective, mobile system for use in areas fully exposed to ocean waves. (Woodard-USGS)
W72-14361

NATIONAL ENGINEERING HANDBOOK, SECTION 2-ENGINEERING PRACTICE STANDARDS: PART 1, ENGINEERING CONSERVATION PRACTICES.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08D.
W72-14364

TRENDS IN BAFFLED, HYDRAULIC JUMP STILLING BASIN DESIGNS OF THE CORPS OF ENGINEERS SINCE 1947,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-14368

COOLING TOWER PLUME RISE,
General Electric Co., Schenectady, N.Y. Energy and Environmental Programs.
For primary bibliographic entry see Field 05G.
W72-14396

CHARACTERISTICS, CLASSIFICATION AND INCIDENCE OF PLUMES FROM LARGE NATURAL-DRAFT COOLING TOWERS,
Metropolitan Edison Co., Reading, Pa. Three Mile Island Nuclear Station.
For primary bibliographic entry see Field 05G.
W72-14397

COOLING WATER STRUCTURES FOR FITZPATRICK NUCLEAR PLANT,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-14403

VULNERABILITY OF THE WATER, SEWAGE, AND DRAINAGE SYSTEMS IN SAN JOSE,
Stanford Research Inst., Menlo Park, Calif.
D. W. Goodrich, E. P. Webster, Jr., C. A. Kamradt, and F. H. Merrick.
Available from the National Technical Information Service as AD-822 205, $3.00 in paper copy, $0.95 in microfiche. Office of Civil Defense, Office of the Secretary of the Army, Washington, D. C., October 1967. 127 p, 11 fig, 21 tab, 59 ref. Army OCD-PS-64-201.

Descriptors: *Civil defense, *Nuclear explosions, *Military aspects, *Water supply, *Sewerage, *Drainage systems, California, Hazards, Assessments, Electric power failure, Facilities, Reliability, Water resources, Water delivery.
Identifiers: *Nuclear attack, *Warfare, *Vulnerability, Emergency measures, San Jose (Calif).

The facilities are examined of the water supply, sewage, and drainage systems in the City of San Jose. Their vulnerability to the effects of nuclear attack postulated for the first iteration of the Five city study is assessed. A preliminary estimate is presented of the postattack capability of these systems and their interaction with the electric power system. Additional data presented are: guides for analyzing the vulnerability of water, sewage, electric power, and natural gas facilities to the effects of a 5-MT nuclear burst; and methods for performing rapid network analysis of water supply systems. The Five City Study includes San Jose, Los Gatos, Monte Sereno, Saratoga and parts of Campbell, Cupertino and Santa Clara. All are in Santa Clara County. The water supply system in San Jose is highly dependent on electric power for well and booster pumping. However, since the San Jose Water Works obtains its water supply from both groundwater and surface water sources, some residual supply capability will exist in the event that the supply of electric power is interrupted. The sewage collection system in San Jose was found to be only slightly dependent upon electric power, since the collection system is predominantly a gravity collection system. No significant damage is expected to occur to the collection system as a result of the attack, and therefore no post-attack problem is expected to hinder the collection of sewage in the City of San Jose. The drainage system in the City of San Jose is essentially 182 separate, predominantly-gravity systems tied together by improved and unimproved natural drainage ways. No significant damage is expected from the attack. (Poertner)
W72-14448

LARGE DIAMETER HOLE DRILLING,
Lauman (C. W.) and Co., Long Island, N.Y.
R. H. Lauman.
Ground Water, Vol 1, No 2, p 9, 10, 14, April, 1963.

Descriptors: *Water wells, *Drilling, New York, *Glacial aquifers, Saline water intrusion, Logging (Recording).
Identifiers: *Well construction, Well development, *Large-diameter wells, Reverse-rotary drilling, Licensing, Underreaming, *Long Island (NY).

The construction features of large diameter wells drilled mostly on Long Island, measuring 24 to 42 inches in diameter, and ranging from 100 to 1,000 feet deep with capacities up to 3,000 gpm are described. (Campbell-NWWA)
W72-14507

PUGET SOUND AND ADJACENT WATERS COMPREHENSIVE PLAN (DRAFT ENVIRONMENTAL STATEMENT).
Pacific Northwest River Basins Commission, Vancouver, Wash.
For primary bibliographic entry see Field 06G.
W72-14558

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 941 F. $3.00 in paper copy, $0.95 in microfiche. April 12, 1972. 45 p, 4 plate, 5 tab.

Descriptors: *Kentucky, *Dam construction, *Multiple-purpose projects, *Environmental effects, Flood control, Water quality control, Watersheds (Basins), Wildlife habitats, Reservoirs, Lake fisheries, Aesthetics, Turbidity, Sedimentation, Water resources development, Relocation, Appalachian Mountain Region, Recreation, Recreation demand, Economic impact.
Identifiers: *Environmental impact statements, *Yatesville Lake (Ky), *Big Sandy River Basin (Ky).

The project involves construction of a dam and other facilities for recreation, flood control, and water quality control on Blaine Creek, 18.1 miles above its confluence with Big Sandy River in the Appalachian Region of Kentucky. It will regulate runoff from a 208 square mile watershed. The project involves 20,813 acres and the flood pool will be maintained at 645 feet above mean sea level with a 630 foot normal pool. The area is largely forest and woodland with some agriculture. Environmental impacts include: regulation of downstream flow, conversion of a stream and upland to a lake, loss of 2,500 acres of wildlife habitat, increased lake fisheries, changes in land management practices, and increased development of adjacent land. Adverse environmental impacts include: loss of cropland and wildlife habitat, loss of a natural stream environment, temporary erosion and sedimentation during construction, water quality impairment, and alteration of the living arrangements of long time area residents. Alternatives which were evaluated include: alternative sites, non-structural flood damage controls, recreational development of the stream, recreational development elsewhere, and imposition of more stringent waste discharge requirements. (Grant-Florida)
W72-14561

EDEN WATERSHED, MISSISSIPPI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Jackson, Miss.
For primary bibliographic entry see Field 04D.
W72-14562

TRAINING DIKE AND BREAKWATER, EVERETT HARBOR, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 374F. $3.00 in paper copy, $0.95 in microfiche. August 27, 1971. 32 p, 1 plate, 5 tab.

Descriptors: *Washington, *Dikes, *Wave action, *Coastal structures, *Environmental effects, Turbidity, Safety factors, Engineering structures, Aquatic environment, Estuarine environment, Aquatic habitats, Pollution sources, Fish conservation, Wildlife conservation, Harbors, Fisheries, Wildlife habitats, Water quality control.
Identifiers: *Environmental impact statements, *Everett Harbor (Wash).

Everett Harbor, within the corporate limits of the city of Everett, is in western Washington about 30 miles north of Seattle. The proposed project involves raising the southerly 4,100 feet of the training dike along the Snohomish River to an elevation of 18 feet above mean low water. Additionally the dike will be extended 1,500 feet southwesterly at the same elevation. The project would provide protection from waves for various industries and the boat basin. The project would permanently cover about 13 acres of estuary bottom, thereby affecting fish and wildlife. Turbidity may temporarily affect fishery resources during construction. Adverse impacts include the permanent conversion of 13 acres of estuarine bottom to jetty, aesthetic loss in the dike area, loss of fishery resources in the area of the extension, and impairment of water quality due to debris. Detailed alternative studies were limited to investigating 'no further development' and the use of a composite rubble mound and a planked steel pile dike. No drastic changes in the long-term productivity of the area are anticipated. (Waldron-Florida)
W72-14566

ALTERNATE DISPOSAL METHOD FOR DETROIT AND ROUGE RIVERS, WAYNE COUNTY, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 05G.
W72-14568

LINCOLN LAKE, EMBARRAS RIVER, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.

Available from the National Technical Information Service as PB-198 998D. $3.00 in paper copy, $0.95 in microfiche. April 28, 1971. 16 p.

Descriptors: *Illinois, *Environmental effects, *Dam construction, *Multiple-purpose projects, Damsites, Flood control, Flood protection, Dams, Water management (Applied), Decision making, Alternate planning, Adoption of practices, Balance of nature, Lakes, Project planning, Recreation, Water quality control, Lake fisheries, Stream fisheries, Fish conservation, Wildlife habitats, Waterfowl, Water supply.
Identifiers: *Environmental Impact Statements, *Lincoln Lake, Embarras River (Ill).

The Lincoln Dam site is on the Embarras River near the Coles-Cumberland County, Illinois line. The project will convert 29,600 acres from private to public use and will inundate approximately 6,600 acres. Authorized purposes include flood control, general recreation, fish and wildlife recreation, water supply, and water quality control. Adverse environmental effects include the

following: loss of agricultural land, forests, and wildlife habitat; decrease in wildlife population; conversion of approximately 34 miles of free-flowing stream to a slack-water lake with a concurrent modification of the ecosystem; increased development in the area; possible extinction of the Harlequin Darter; and deterioration from the standpoint of wildlife, forests, natural aesthetics, noise, and air pollution. Non-structural measures and alternate structural measures such as levees and channel improvements were considered but rejected. The alternative of no action would mean the loss of tangible benefits for flood control, water supply, water quality, general recreation and fishery enhancement. The present dam site was found to be the most economical, as well as the most suitable from an environmental viewpoint. (Widman-Florida)
W72-14569

YATESVILLE LAKE, BLAINE CREEK, BIG SANDY RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 941D. $3.00 in paper copy, $0.95 in microfiche. March 31, 1971. 13 p, 1 tab.

Descriptors: *Kentucky, *Environmental effects, *Dam construction, *Flood control, Water quality control, Multiple-purpose projects, Alternate planning, Sedimentation, Adoption of practices, Water management (Applied), Recreation facilities, Reservoirs, Watershed management, Flooding, Wildlife habitats, Fisheries, Aquatic habitats, Tributaries, Recreation, Aesthetics, Turbidity.
Identifiers: *Environmental Impact Statements, *Yatesville Lake, Ky.

The project involves construction and operation of a dam and other facilities for flood control, water quality control, recreation, and fish and wildlife enhancement in Lawrence County, Kentucky. The project will regulate runoff from a 208 square mile watershed. Environmental impacts include regulation of downstream flow, conversion of stream and upland to a lake, entrapment of sediment, change in forest management practices on acquired lands, and change in land use in the lake area. Adverse environmental effects include loss of cropland and forest land and some types of biotic habitat, increased fire hazards, reduced aerobic biodegradation, increased sewage production, and a general disruption of the environment of persons and groups now occupying the lands to be acquired. Alternatives include restraint of development downstream, construction of a reservoir elsewhere, imposition of more stringent requirements for discharge of wastes from existing and prospective developments, local flood protection works, non-structural flood damage controls, recreational development of the stream, fish and wildlife management in the area, increase in recreational and development elsewhere, and no action. (Widman-Florida)
W72-14571

ANACOSTIA RIVER AND TRIBUTARIES, PRINCE GEORGES COUNTY, MARYLAND, LOCAL FLOOD PROTECTION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W72-14574

DUCK RIVER PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Science.

Available from the National Technical Information Service as PB-208 869F. $6.00 in paper copy, $0.95 in microfiche. Tennessee Valley Authority Report TVA-OHES-EIS-72-5, April 28, 1972. 338 p, 10 fig, 14 map, 20 tab, 6 chart, 27 ref.

Descriptors: *Damsites, *Tennessee Valley Authority, *Environmental effects, *Multiple-purpose projects, Flood control, Water quality control, Water supply development, Water resources development, Rivers, Reservoirs, Water utilization, Recreation, Land use, Ecology, Floodplain zoning, Project benefits, Costs, Feasibility, Water control, Water policy, Tennessee, Dam construction, Reservoir construction, Project purposes, Wildlife habitats, Fisheries, Social Aspects, Alternative planning.
Identifiers: *Environmental Impact Statements, *Duck River (Tenn).

The proposed multipurpose water resource development project on the upper Duck River in Middle Tennessee will consist of two dams, which will convert presently uncontrolled sections of the river into two reservoirs. The dams will be operated as a unit and as part of the Tennessee Valley Authority water control system. The principal environmental impacts would be on land and water use; stream flow control for flood, drought relief, and water quality; and the ecosystem of the project area. The project will have adverse effects on certain fish and wildlife values, existing stream-oriented ecosystems and recreation opportunities, certain archaeological values, present land uses, certain water quality parameters, and will require relocation of 396 families. Foregoing action would neither cure present problems nor expand the range of beneficial uses of the environment, as would the project. Alternative sources of water supply such as impounding tributaries, piping water, or use of groundwater would prove insufficient. Alternative measures which would provide control of water quality equivalent to that of the project also are unfeasible. Alternative dam sites and pool levels, levees, stream enlargement, and the use of flood plain zoning would be found unfeasible as alternative measures for purposes of flood control. (Ellis-Florida)
W72-14575

DESIGN ASPECTS AND PERFORMANCE CHARACTERISTICS OF RADIAL FLOW ENERGY DISSIPATORS,
Texas Univ., Austin. Center for Highway Research.
For primary bibliographic entry see Field 08B.
W72-14730

CONNECTICUT RIVER BASIN PLAN FOR COMPREHENSIVE DEVELOPMENT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
New England River Basins Commission, Boston, Mass.

Available from the National Technical Information Service as PB-206 621-D, $9.00 in paper copy. August 20, 1971. 825 p, 10 fig, 7 map, 12 tab, 3 append.

Descriptors: *Environmental effects, *Connecticut River, *River basin development, *Flood control, Flood plain zoning, Flood proofing, Warning systems, Ice jams, Dams, Dikes, Reservoirs, Low-flow augmentation, Waste treatment, Thermal pollution, Powerplants, Hydroelectric power, Nuclear powerplants, Water quality control, New England, Anadromous fish, Wildlife, Navigation, River basin commission.
Identifiers: *Environmental Impact Statements.

The project consists of a series of proposals for improving the Connecticut River Basin through Connecticut, Massachusetts, New Hampshire and Vermont. Among the project's ten recommended elements are water quality, power, outdoor recreation, anadromous fisheries restoration, water supply, navigation and flood control. An early action plan for the next ten years and extension and expansion plans to the year 2020 are provided. The plan involves construction of new facilities and structures in the areas of water quality, navigation, and flood control. Environmental impacts of implementing the plan include the following: improved long-term water quality goals, management of upstream water related lands, preservation of historic sites, stream bank acquisition for recreation, added public land for recreation, and increased flood protection. Adverse environmental effects include the cost and inconvenience of implementation, loss of extensive areas of wildlife habitat, spoil disposal, inundation of lands, loss of free-flowing sections of streams, possible water temperature changes, loss of fishery values, and possible water quality impairment. The alternatives to the plan involve no action, partial implementation or replanning with different criteria. Each alternative is analyzed. (Nielsen-Florida)
W72-14751

PUEBLO DAM AND RESERVOIR, FRYING-PAN-ARKANSAS PROJECT, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo. Region 7.

Available from the National Technical Information Service as PB-206 272-D, $3.00 in paper copy, $0.95 in microfiche. December 1971. 107 p, 10 fig, 8 chart, 4 append.

Descriptors: *Environmental effects, *Colorado, *Dam construction, *Reservoirs, Flood control, Project planning, Multiple-purpose projects, Water resource development, Reservoir operation, Federal government, Sediment control, Irrigation, Water storage, Flood protection, Water supply, Flooding, Water utilization, Water pollution, Water quality control.
Identifiers: *Environmental Impact Statements, *Pueblo (Colo), Arkansas River.

This project consists of the construction of Pueblo Dam and Reservoir six miles west of Pueblo, Colorado, as a major feature of the Fryingpan-Arkansas Project. Its principal functions are to provide storage and regulation of water supplies for irrigation, municipal and industrial use; flood control; recreation and fish and wildlife enhancement; sediment reduction; and regulation and storage of Project water and the native flows of the Arkansas River. The dam and reservoir will inundate eight small farms; augment water supply for municipal, industrial and agricultural uses; provide flood control for the Arkansas Valley; make it possible for Colorado Springs to divert water from the Arkansas River above the reservoir for municipal and industrial purposes; and provide a new reservoir type aquatic ecosystem. Adverse effects include occasional water surface fluctuation which would hinder fishery reproduction and recreational activities; temporary destruction of existing landscape; short term air, water and sound pollution problems; and inundation of 4,646 acres of land and 9 miles of natural river. Alternatives considered were no dam and reservoir, enlarge Twin Lakes, and dam and reservoir construction at an alternative site. (Widman-Florida)
W72-14753

LONGVIEW LAKE, LITTLE BLUE RIVER, MISSOURI (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-200 795-D, $3.00 in paper copy, $0.95 in microfiche. June 16, 1971. 10 p, 1 map.

Descriptors: *Missouri, *Dam construction, *Environmental effects, *Flood protection, Water quality control, Water resources development, Project planning, Dams, Flood control, Floods,

Flooding, Multiple-purpose projects, Recreation, Artificial lakes, River regulation, Flow control, Wildlife habitats, Flood damage.
Identifiers: *Environmental Impact Statements, *Little Blue River (Mo).

The project provides for construction of a dam and lake on Little Blue River in the Kansas City metropolitan area. This will provide downstream flood protection, provide major open space and a lake of 930 acres for recreation, and encourage development in the vicinity of the lake and in the lower basin. Adverse environmental effects will include possible water quality problems, inundation of 930 acres of land, loss of six miles of natural free flowing stream, loss of additional wildlife habitats due to increased development, and the development of mud flats in the upper reaches of the lake. Alternatives include eleven alternative lake sites, no action, and non-structural regulatory measures. Irreversible and irretrievable commitments of resources include destruction of six miles of stream and associated wildlife, inundation of 930 acres of agricultural bottomlands and habitat, and inundation of an additional 1,030 acres at varying intervals. (Brackins-Florida)
W72-14757

BLUE SPRINGS LAKE, LITTLE BLUE RIVER LAKES, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-202 652-F, $3.00 in paper copy, $0.95 in microfiche. December 1971. 35 p, 1 map.

Descriptors: *Missouri, *Multiple-purpose projects, *Flood protection, *Environmental effects, Dam construction, Levees, River basin development, Streamflow, Wildlife habitats, Recreation, Soil erosion, Flood plain zoning, Watershed management, Runoff, Fisheries, Natural streams, Flood protection.
Identifiers: *Environmental Impact Statements, *Little Blue River Lakes (Mo), Jackson County (Mo).

The Blue Springs Lake Project is part of a plan to develop two lakes, channel works, and levee protection in the Little Blue River Basin, Missouri. The project involves acquisition of 2,730 acres of land and construction of a dam and a lake in the Kansas City metropolitan area. The project would control runoff for a 32.8 square mile area, provide for flood control, recreation, and fish and wildlife enhancement. Environmental impacts include provision for downstream flood protection, provision for open space and a 560-acre lake, inundation of 5 miles of stream and habitat, possible lake water quality impairment from nutrient concentration, and increased area development. Unavoidable adverse impacts include inundation of 560 acres of land; loss of 5 miles of unobstructed stream; displacement of some animal species; reduction of wildlife and wildlife habitat; and temporary noise, erosion, and equipment exhaust during construction. Alternatives considered include eleven alternate lake sites, flood plain zoning, and no action. (Grant-Florida)
W72-14759

PANAMA CITY HARBOR, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Office of the Chief of Engineers (Army), Washington, D.C.
For primary bibliographic entry see Field 04A.
W72-14769

KINGSTREE BRANCH FLOOD CONTROL PROJECT, BLACK RIVER BASIN, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-14770

WALLISVILLE LAKE, TRINITY RIVER, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-206 058-F, $3.00 in paper copy. December 18, 1971. 389 p, 22 fig, 6 plate, 33 tab, 2 append.

Descriptors: *Texas, *Multiple-purpose projects, *Dam construction, *Environment effects, Navigation, Flood control, Water supply, Saline water-freshwater interfaces, Saline water intrusion, Estuaries, Tidal marshes, Aquatic habitats, Fisheries, Estuarine fisheries, Fish reproduction, Fish conservation, Lakes.
Identifiers: *Environmental Impact Statements, *Wallisville Lake (Tex).

The project involves construction of a low earth dam in the delta of the Trinity River near its entrance into Trinity Bay. The bay is part of the Galveston, Texas Bay estuarine system. The dam will form a multiple purpose reservoir with a 45,000 acre-feet storage capacity. The project is designed to provide salinity control, navigation, water supply, recreation, and fish and wildlife enhancement. Environmental impacts of the project include prevention of salt water intrusion which now exists, provision for navigation passage upstream, augmentation of the water supply, and creation of a shallow freshwater lake which can be used for water supply. Adverse impacts of the project include loss of 7,200 acres of estuarine nursery area in upper Trinity Bay, which will reduce salt water habitat and fishery resources in the bay. Alternatives include cessation of construction; completion of the navigation channel, lock and floodgates, and construction of a salt water barrier upstream; and other variations in scope and location of project features. (Grant-Florida)
W72-14929

DETAILED PROJECT REPORT, INVESTIGATION FOR FLOOD PROTECTION, MUNDAY, TEXAS, BRAZOS RIVER BASIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.

Available from the National Technical Information Service as PB-206 460-F, $3.00 in paper copy. March 19, 1971. 28 p, 3 tab.

Descriptors: *Texas, *Channel improvement, *Environmental effects, *Flood protection, Flood control, Dredging, Channel flow, Canal design, Hydraulics, Surface drainage, Water conveyance, Storm runoff, Settling basins, River basins, Watersheds (Basins), Aesthetics, Flood damage, Flood forecasting, Vectors (Biological).
Identifiers: *Environmental Impact Statements, *Munday (Tex).

The project involves construction of flood control structures to provide flood protection to Munday, Texas. Project features include channel enlargement and improvement of existing channels for a distance of 4.02 miles. The system is designed to intercept, control and divert the runoff from a 19.6 square mile area in the Lake Creek-Brazos River area. The environmental impact of the proposed project includes reduced frequency of damage-producing floods from approximately two years to those less frequent than 100 years and corresponding development within the city of Munday. No vegetation or habitats exist on channel rights-of-way so no such destruction will result, and vector control measures will be necessary due to water entrapped in the stilling basin. Adverse impacts are minor and involve some slight aesthetic impairment and a loss of 60 acres of agricultural land. Alternative measures which were considered include flood plain zoning as an exclusive measure, construction of a levee system, and no action. (Grant-Florida)
W72-14930

PAPILLION CREEK AND TRIBUTARIES, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Neb.

Available from the National Technical Information Service as PB-202 292-D, $3.00 in paper copy. July 1971. 12 p, 1 plate.

Descriptors: *Nebraska, *Environmental effects, *Flood control, *Watershed management, *Water resources development, Multiple-purpose projects, Project planning, Flood protection, Flood plain zoning, Channel improvement, Levees, Impoundments, Artificial lakes, Land use, Non-structural alternatives, Watersheds (Basins), Water management (Applied).
Identifiers: *Environmental Impact Statements, *Papillion Creek (Neb), Omaha (Neb).

The project consists of the construction of 21 lakes and the implementation of a flood plain management program on the tributaries of the Papillion Creek basin in Nebraska. The structures would control drainage from 47% of the 42 square mile basin. The proposed plan would provide flood protection and create 4250 acres of lake surface. 4700 acres of land would be managed exclusively for wildlife benefits while the remaining 7680 acres of land would maintain open space around project sites for public use. Adverse environmental effects include eliminating approximately 44 miles of riparian wildlife habitat, losing 16,630 acres of agricultural land in the basin, and degradation of the impounded waters due to increased development around the lakes. Alternatives include flood plain zoning, channel improvements and levees, and flood proofing and diversions. The commitment of labor and material resources associated with construction of the project would be irretrievable. Attached is a map illustrating the flood control plan for the Papillion Creek watershed. (Widman-Florida)
W72-14931

LOCAL PROTECTION PROJECT, WATERLOO, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 08D.
W72-14933

8B. Hydraulics

EXPERIMENTAL STUDY OF CHANNEL PATTERNS,
Colorado State Univ., Fort Collins. Dept. of Geology.
S. A. Schumm, and H. R. Khan.
Geological Society of America Bulletin, Vol 83, No 6, p 1755-1770, June 1972. 22 fig, 5 tab, 24 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Meanders, *Hydraulic models, Model studies, Sediment transport, Sedimentation, Regime, Regimen, Stream erosion, Scour, Suspended load, Bed load, Braiding.

A series of experiments was performed in a large flume to determine the effect of slope and sediment load on channel patterns. Sediment loads and slopes were closely related, and as slope and sediment loads increased, threshold values of these variables were encountered, at which channel patterns altered significantly. At a very low slope and sediment load, the channels remained straight, but at a discharge of 0.15 cfs, a meandering-thalweg channel formed at slopes greater than 0.002. With increased slope and sediment loads, thalweg

sinuosity increased to a maximum of 1.25. At slopes greater than 0.016, a braided channel formed. The model channels responded to increased sediment loads by maintaining steeper gradients and by major channel pattern changes, but at very gentle slopes and at steep slopes, the channel could not be forced to develop a meandering thalweg. Landforms may not always respond progressively to altered conditions. Rather, dramatic morhphologic changes can occur abruptly when critical erosional and (or) depositional threshold values are exceeded. The intorduction of clay stabilized the alternate bars of a non-meandering and sour and deepening of the thalweg resulted. A meandering-thalweg channel was thus converted in the model to a meandering channel by the type of sediment load change that has accompanied climatic and hydrologic changes of the recent geologic past. (Knapp-USGS)
W72-14205

RELATIVE SIGNIFICANCE OF HEAD AND BODY SPILL FROM A CHANNELIZED TURBIDITY CURRENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W72-14216

THE EFFECTS OF RAINFALL INTENSITY, PAVEMENT CROSS SLOPE, SURFACE TEXTURE, AND DRAINAGE LENGTH ON PAVEMENT WATER DEPTHS,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 04C.
W72-14360

TRENDS IN BAFFLED, HYDRAULIC JUMP STILLING BASIN DESIGNS OF THE CORPS OF ENGINEERS SINCE 1947,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. R. Basco.
Available from NTIS, Springfield, Va. 22151, as AD-724 536, Price $3.00 paper cover; 95 cents microfiche. Miscellaneous Paper H-69-1, January 1969. 32 p, 13 fig, 2 tab, 11 ref.

Descriptors: *Spillways, *Hydraulic jump, *Hydraulic models, *Design flow, *Engineering structures, Reviews, Flow control, Baffles, Energy dissipation, Dams, Design data.
Identifiers: *Corps of Engineers, *Stilling basin, End sills.

Twenty-one years of hydraulic model tests are summarized on spillways with hydraulic jump type energy dissipators using baffle blocks and end sills. The Coprs of Engineers study was limited to baffled, approximately rectangular, stilling basins that were used below high, concrete and earth dam spillways where the hydraulic jumps formed are either free or only slightly submerged. All primary and computed information is tabulated. The given values of baffle block and end sill geometry were those chosen for the final design, and represnet the ultimate engineering compromise between hydraulic performance and economics. (Woodard-USGS)
W72-14368

RESULTS OF HYDRAULIC AND SHOALING STUDIES IN MARCUS HOOK-SCHUYLKILL REACH OF DELAWARE RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb.
Available from NTIS, Springfield, Va. 22151, as AD-735 777, Price $3.00 paper copy; 95 cents microfiche. Miscellaneous Paper No 2-887, March 1967. 93 p, 31 plate, 12 photo, 27 tab.

Descriptors: *Model studies, *Estuaries, *Delaware River, *Dredging, *Spoil banks, Environmental effects, Tidal effects, Currents (Water), Shoals, Hydrologic data, Dikes, Forecasting, Engineering, Data collections.
Identifiers: *Delaware estuary, Shoaling.

The existing comprehensive fixed-bed model of the Delaware estuary was used to determine the effects of filling several proposed spoil disposal areas and dredging several proposed sediment traps in the Marcus Hood-Schuylkill River reach of the Delaware on tides, currents, and shoaling. Tests were conducted to determine the effects of diking off several areas on hydraulic and shoaling conditions throughout the adjacent reaches of the estuary. The test results consist primarily of measurements of shoaling quantities, tide heights, current velocities, and time-exposure photographs of surface-current patterns. Closing the Tinicum Island and Chester Island back channels would have no adverse effects on the estuary, provided a small-boat channel through Tinicum Island is included. The Mantua Creek anchorage is an effective sediment trap without additional deepening, while additional deepening would increase the ability of the Marcus Hook anchorage to retain sediments. A comprehensive plan for improving the entire reach (Marcus Hook to Schuylkill River), including three silt traps and the Gibbstown spoil disposal area, would materially reduce maintenance dredging in the navigation channel between Marcus Hook and the Philadelphia Navy Yard. (Woodard-USGS)
W72-14370

EFFECTS OF A PROPOSED 35-FOOT CHANNEL TO RICHMOND ON CURRENTS AND SALINITIES OVER THE SEED OYSTER BEDS IN JAMES RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05C.
W72-14376

THERMAL DISCHARGE: A MODEL-PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 05B.
W72-14393

PREDICTION OF COLUMBIA RIVER TEMPERATURES DOWNSTREAM FROM GRAND COULEE DAM FOR WIDE EXTREMES OF FLOW AND WEATHER CONDITIONS,
For primary bibliographic entry see Field 04A.
W72-14402

COOLING WATER STRUCTURES FOR FITZPATRICK NUCLEAR PLANT,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 05G.
W72-14403

HEATED-EFFLUENT DISPERSION IN LARGE LAKES: STATE-OF-THE-ART OF ANALYTICAL MODELING. PART 1. CRITIQUE OF MODEL FORMULATIONS,
Agronne National Lab., Ill. Center for Environmental Studies.
For primary bibliographic entry see Field 05B.
W72-14409

WIND DRIVEN WATER CURRENTS,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
W. D. Baines, and D. J. Knapp.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol. 91, No. HY2, Proc. Paper 4270, March 1965. p 205-221, 8 fig.

Descriptors: *Dispersion, Hydraulics, *Shear stress, *Winds, *Turbulence, Flumes, Dimensional analysis, Turbulent flow, Currents (Water), Reynolds number, *Open channel flow.
Identifiers: *Air movement, Shear velocity, Vertical contraction, Channel contraction, Lateral contraction, Outer law distribution.

Flow induced in a body of water by wind blowing over the surface is studied in a series of experiments in a laboratory channel. Results are coordinated by dimensional analysis and general principles of turbulent flow. For a large Reynolds number mean and turbulent velocities when related to shear velocity follow an outer law distribution. Effects of vertical and lateral channel contraction are also considered. The distribution of mean velocity was found to be similar for jets at both the surface and the bed, with a relatively static central region. Intensity of turbulence is high and almost uniform across the central region. Dispersion of material in the flow is consequently large although net transport is not. Vertical construction caused an appreciable wind direction change only near the shoreline. Lateral constriction introduced secondary flow. (Oleszkiewicz-Vanderbilt)
W72-14412

THERMAL-HYDRAULIC STUDY: ARKANSAS COOLING RESERVOIR,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 05B.
W72-14414

VELOCITY AND TEMPERATURE IN BUOYANT SURFACE JET,
Tahal Consulting Engineers Ltd., Tel Aviv (Israel).
For primary bibliographic entry see Field 05B.
W72-14416

RIPRAP STABILITY ON EARTH EMBANKMENTS TESTED IN LARGE AND SMALL SCALE WAVE TANKS,
Army Coastal Engineering Research Center, Washington, D.C.
A. L. Thomsen, P. E. Wohlt, and A. S. Harrison.
Technical Memorandum No 37, June 1972, 127 p, 22 ref.

Descriptors: *Shore protection, *Riprap, *Hydraulic models, Embankments, Reservoir design, Seawalls, Earth dams.
Identifiers: *Wave tanks, *Stone levees, *Reservoir protection, *Riprap stability.

Tests of models in wave tanks were made to determine the effectiveness of several riprap designs in protecting embankment slopes from wave action. Models ranging from about 1:20 scale to almost full scale were tested with waves up to about 6 feet high. A range of wave periods were tested; embankment slopes varied from 1 on 2 to 1 on 5; armor layers were composed of quarried stone, glacial boulders and tribars. Relationships that define the effect of wave height, wave periods, embankment slopes and Reynolds number on size of stable armor units were experimentally determined, and are given in graphs and tables. (CERC)
W72-14427

METHOD AND APPARATUS FOR CONTAINING WELL POLLUTANTS,
For primary bibliographic entry see Field 05G.
W72-14451

FIVE FACTORS THAT AFFECT DRILLING RATE,
Oklahoma Univ., Norman.
P. L. Moore.
Oil and Gas Journal, Vol. 56, No. 40, p 141-170, 1968. 32 fig, 27 ref.

Descriptors: *Rotary drilling, Drilling fluids, *Drilling equipment, Hydraulics, Economics, *Hydrostatic pressure.
Identifiers: *Hydraulic horsepower, *Bit horsepower, Mud properties, Drilling-fluid pressure, Annular velocity.

Increases in drilling rate as a result of higher bit weight and rotary speed depend on proper use of hydraulic horsepower. This means there must be enough hydraulic horsepower through the bit to remove formation cuttings as they are generated so that no regrinding occurs. The effect of fluid properties does not tie in directly with hydraulics; however, when it is necessary to increase mud weight, viscosity, or solids content, drilling rate decreases. This decrease may be minimized by using more hydraulic horsepower at the bit. To get highest rates of penetration at lowest cost it will be necessary to use the minimum possible mud weight, viscosity, and solids content, and the maximum filtration. (Campbell-NWWA)
W72-14478

MUD-SCOW DRILLING,
Moss (Roscoe) Co., Phoenix, Ariz.
For primary bibliographic entry see Field 08C.
W72-14495

PROCEDURES USED IN GRAVEL PACKING WELLS.

Johnson Driller's Journal, Vol. 38, No. 2, p 1-4, March-April, 1966. 6 fig.

Descriptors: *Water wells, *Gravels, Well screens, Stratification, Stokes law, Uniformity coefficient.
Identifiers: *Gravel-packing, Tremie pipe, *Size separation, Cross-over method, Well development, Annulus, Under-reaming.

Gravel-packing is defined as a process of placing a selected size grading of gravel (or sand) to fill the annular space between a centrally positioned well screen and the borehole drilled into an aquifer. Conditions are described which must be met if gravel-packing is to be economically practical and successful; e.g., gravel size, size-grading, emplacement, etc. (Campbell-NWWA)
W72-14498

RUBBER FIBER WELL SEAL.

Water Well Journal, Vol. 26, No. 6, p 48, June, 1972.

Descriptors: *Water wells, Well regulations, *Sealants, *Rubber, Well casings, *Grouting.
Identifiers: *Well seals, Tires.

This is a field report on a possible solution to the problem of polluted surface water seepage down the side of the well casing. A rubber fiber, made from ground tires reportedly is, when compressed, waterproof and 'rot'-proof, making a seal between the casing and borehole wall. (Campbell-NWWA)
W72-14499

HORIZONTAL WELLS AND DRAINS,
New Mexico Inst. of Mining and Technology, Socorro.
W. K. Summers.
Water Well Journal, Vol. 26, No. 6, p 36-38, June, 1972. 4 fig, 2 tab, 3 ref.

Descriptors: *Water wells, Drainage systems, *Drainage wells, Drawdown, *Dewatering, Drilling equipment, New Mexico, Arizona.
Identifiers: *Horizontal wells, Slotted pipe, *Seeps, Highway construction.

Brief summaries are presented on the early history of the horizontal well and the basic operation of the equipment presently in use. Selected case histories in Southwestern United States are based on U.S. Bureau of Mines Information Circular 8392: 'Horizontal Boring Technology: A State-of-the-Art Study.' (Campbell-NWWA)
W72-14500

INDUCTION-TUNED METHOD TO DETERMINE CASING LENGTHS IN HYDROGEOLOGIC INVESTIGATIONS,
Pennsylvania State Univ., Middletown, Pa. Capitol Campus.
C. R. Marsh, and R. P. Parizek.
Ground Water, Vol 6, No 6, p 11-17, November-December, 1968. 8 fig, 3 tab.

Descriptors: *Well casings, *Logging (Recording), Conductors.
Identifiers: *Inductance, Magnetic force, Coil (Electrical).

An induction-tuned device was designed and tested under a variety of well casing conditions. It can detect casing lengths to within 0.4 to 2.0 inches for casing ranging from 2 to 14 or more inches in diameter which are made from either magnetic or nonmagnetic materials. The sensing element is a coil whose inductance is changed by varying its proximity to any metallic conductor. Twelve to 14 volts at 4 to 6 milliamperes or less than 0.1 watt is sufficient to power the device. All electrical elements are standard except the probe and all materials can be purchased for about $40.00 exclusive of the reel and cable assembly. (Campbell-NWWA)
W72-14501

HYDRAULIC GRAVEL PACKING FOR DEEP WATER WELLS,
Texas Water Wells, Inc., Houston.
A. E. Fawcett.
Ground Water, Vol 1, No 1, p 16, 24, January, 1963. 6 ref.

Descriptors: *Water wells, *Hydraulic conduits, Well screens.
Identifiers: *Gravel packing, Underreaming, Annular space, Gravel pumps.

The practice of placing gravel by the hydraulic method of pumping gravel into the well bore or underreamed section of the hole and into the annular space around the screen sections and blank liner is discussed. (Campbell-NWWA)
W72-14503

PERCUSSION-REVERSE CIRCULATION WATER-WELL DRILLING SYSTEM DESIGNED AND DEVELOPED IN ITALY,
Massarenti (James) Co., Piacenza (Italy).
I. M. Massarenti.
Ground Water, Vol 2, No 2, p 25-27, April, 1964. 4 fig.

Descriptors: *Drilling, *Water wells, Unconsolidated aquifers, Alluvium, Drilling fluids, *Drilling equipment.
Identifiers: *Percussion drilling, *Reverse circulation, *Italy, Po River.

A new percussion-reverse circulation system, designed and developed in Italy for water-well drilling is described. In a special reverse circulation rig, the percussion bit, consisting of a tube with external welded blades, slides up and down on the outside of the hollow drill pipes, while the hollow drill pipes remain still. The field of application of the reverse circulation method is thus enormously enlarged; either hard, cemented formations or soft, unconsolidated deposits, as well as big boulders of any size are bored much faster and more efficiently than with any other method of drilling, provided that a sufficient source of water is available. (Campbell-NWWA)
W72-14506

MAXIMUM YIELDS FROM MINIMUM AQUIFERS,
Johnson (Edward E.), Inc., St. Paul, Minn.
J. L. Mogg.
Ground Water, Vol 4, No 2, p 11-12, April, 1966.

Descriptors: *Water wells, Drilling, *Logging (Recording), Sampling, Well screens, Turbidity.
Identifiers: *Well design, *Well construction, *Well development, Electric logging, Gravel packing, *Horizontal jetting, Development aid chemicals, Cone of depression.

Maximum yields from minimum aquifers can be accomplished only by strict adherence to best known practice procedures while following the three necessary steps to well completion. These steps are well design, well construction and well development. (Campbell-NWWA)
W72-14509

RECENT DEVELOPMENTS IN THERMOPLASTIC PIPING,
Plastic Pipe Inst., Silver Spring, Md.
For primary bibliographic entry see Field 08G.
W72-14511

BASIC PRINCIPLES OF WATER WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.

Johnson's Driller's Journal, Vol 35, No 4 (Part I) p 1-3, 12-13; No 5 (Part II) p 1-3; No 6 (Part III) p 4-5, 8; 1963; Vol 36, No 1 (Part IV) p 6-7, 10; 1964. 16 fig.

Descriptors: *Water wells, Drilling, Well screens, Aquifer testing, Artesian aquifers, Materials, *Design criteria, *Aquifer characteristics, Permeability.
Identifiers: *Strength requirements, Well diameter, Bacterial slimes, *Construction methods, Gravel packing, Laminated formations, Formation stabilizing.

This series of articles describes the general aspects of water well design for municipal, industrial, and irrigation wells since highest efficiency is required from these well applications, e.g., high yield and high specific capacity, as well as trouble-free operation. Well casing selection, total well depth, and screen length are explored. (Campbell-NWWA)
W72-14512

SAND STUDIES CAN IMPROVE WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.

Johnson Driller's Journal, Vol 34, No 3, p 8-10, May-June, 1962. 5 fig, 1 tab.

Descriptors: Sand aquifers, *Sands, Sandstones, *Particle size, Distribution patterns, *Sieve analysis, Glacial aquifers, Uniformity coefficient.
Identifiers: *Size frequency curve, Percent retained, *Sorting, Cementation (Sedimentary), Outwash.

Water-bearing sand formations provide the largest reservoirs of ground water in the United States.

The grading or size analysis shows the range of particle sizes, the distribution of grain sizes, and the proportion of each size. The features of a sand formation result from the mineral origin of the particles, the way in which they are transported, the conditions under which they are deposited and the in-place physical and chemical changes that occur after deposition. A study of sand and gravel particles is a useful and absorbing undertaking. The water-well contractor's interest is to develop such knowledge which, when combined with his experience, will help him to construct and develop better wells in a given type of sand formation. (Campbell-NWWA)
W72-14513

ROTARY DRILLING - SETTING SCREENS AND DEVELOPING.
Universal Oil Products, St. Paul, Minn. Johnson Div.

Johnson Driller's Journal, Vol 26, No 4, p 1-5, August, 1954. 7 fig, 6 ref.

Descriptors: Water wells, *Rotary drilling, Bentonite, Drilling fluids, *Gels, Viscosity, *Well screens, Sand aquifers.
Identifiers: Invasion diameter, Formation damage, *Well development, Ball clay, Polyphosphates, *Surging, Backwashing, Gravel packing.

Rotary drilling requires special methods of screen emplacement and well development. The effect of mud invasion and removal is explored as well as the 'bail-down' and 'wash-down' methods of screen installation. (Campbell-NWWA)
W72-14517

FIELD AND LABORATORY STUDIES-NAVIGATION CHANNELS OF THE COLUMBIA RIVER ESTUARY,
California Univ., Berkeley. Hydraulic Engineering Lab.
M. P. O'Brien.
Available from NTIS, Springfield, Va 22151, as AD-735 778, Price $3.00 paper copy; $0.95 microfiche. Report HEL-24-4, May 1971. 34 p, 7 fig, 7 tab, 10 ref. DACW72-71-C-005 USACE.

Descriptors: *Model studies, *Navigation, *Estuaries, *Channels, *Columbia River, Hydraulic models, Structure, Prototype tests, Channel morphology, Channel improvement, Tidal effects, Sediment transport, Bed load, Currents (Water), Jetties, Engineering.

This model study of navigation channels of the Columbia River estuary was conducted in the years 1932-1936 for the North Pacific Division of the Corps of Engineers. The results of the study are not generally available; consequently, this report is reproduced because of its possible interest. When model scale experiments were proposed, there were two unrelated problems in the area near the mouth of the Columbia; one concerned the channels in the estuary and the other the erosion of the ocean shore just south of the south jetty. The fixed-bed model with a vertical scale of 128 and a horizontal scale of 3600 reproduced with acceptable accuracy the range and lag of tide and the direction and velocity of the currents. The agreement was very good in the channels and deepwater areas near strength of ebb and flood currents. Over shoals and around the time of slack water, the discrepancy between model and prototype was larger. The movement of powdered coal in the model under average and freshet river flows agreed qualitatively with the movement in the estuary. (Woodard-USGS)
W72-14537

GROUNDWATER RECHARGE BY DAMMED UP RIVERS,
For primary bibliographic entry see Field 04B.
W72-14595

EFFECTS OF REMOVAL OF SHOOTERS ISLAND AND SHORE MODIFICATIONS ON TIDES, CURRENTS, AND SHOALING IN THE KILL CHANNELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb.
Available from NTIS, Springfield, Va. 22151 as AD-735 779; Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper No 2-953, December 1967. 68 p, 1 fig, 26 photo, 26 plate, 3 tab.

Descriptors: *Hydraulic structures, *Navigation, *Harbors, *New York, *Channel improvement, Engineering structures, Dredging, Islands, Tidal effects, Currents (Water), Shoals, Data collections, Evaluation.
Identifiers: *New York Harbor.

The existing comprehensive fixed-bed model of New York Harbor was used to determine if construction of a containership terminal on Arthur Kill opposite Elizabethport, New Jersey, would have adverse effects on tides, currents, and shoaling in adjacent Federal navigation channels. Terminal construction plans included the removal of Shooters Island from lower Newark Bay for fill material and widening of Arthur Kill to provide berthing areas adjacent to the terminal. Consideration was given to increasing the depths of the navigation channels in Arthur Kill and Kill Van Kull from the existing 35 ft depth to 42 ft. Tests were made to evaluate the effects of the terminal scheme for both channel conditions. The tests consisted of measurements of tide heights, current velocities, shoaling quantities, and time-exposure photographs of surface-current patterns. From these data it was concluded that construction of the terminal, including the removal of Shooters Island, would have no adverse effects on navigating conditions, maintenance of the Kill Channels, or circulation patterns in the Kills and lower Newark Bay. (Woodard-USGS)
W72-14617

HYDRAULIC GEOMETRY AND LOW STREAMFLOW REGIMEN,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02E.
W72-14680

GRAYS HARBOR ESTUARY, WASHINGTON, REPORT 1, VERIFICATION AND BASE TESTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. J. Brogdon, Jr.
Available from NTIS, Springfield, Va. 22151, as AD-743 169, Price $3.00 in paper copy; $0.95 in microfiche. Technical Report H-72-2, April 1972. 276 p, 236 fig, 2 tab.

Descriptors: *Model studies, *Hydraulic models, *Harbors, *Tidal effects, *Washington, Engineering structures, Jetties, Navigation, Channel improvement, Dredging, Spoil banks, Coastal structures, Pacific Ocean, Currents (Water), Analytical techniques, Data collections, Hydrologic data.

Grays Harbor model, a fixed-bed model with provisions for future conversion to a movable-bed model, was constructed to scales of 1:500 horizontally and 1:100 vertically and reproduced all of Grays Harbor, Washington, the Chehalis River to the head of tidal influence (South Montesano), and a portion of the Pacific Ocean adjacent to the harbor entrance. The primary purposes of the model study are to determine the effects of rehabilitation of both the north and south jetties, investigate the stability of Point Chehalis, determine the effects of enlarging and realigning the navigation channel, and locate suitable dredge spoil disposal areas. The flushing rate and dispersion characteristics of waste materials discharged into the system will be investigated. The model verification tests indicated that the model hydraulic and salinity regimens were in satisfactory agreement with those of the prototype for comparable conditions. It is assumed that the model will provide quantitative answers concerning the effects of the proposed improvement plans on the hydraulic and salinity regimens of the estuary. (Woodard-USGS)
W72-14727

DESIGN ASPECTS AND PERFORMANCE CHARACTERISTICS OF RADIAL FLOW ENERGY DISSIPATORS,
Texas Univ., Austin. Center for Highway Research.
K. Meshgin, and W. L. Moore.
Available from NTIS, Springfield, Va 22151 as PB-208 516; Price $3.00 paper copy; $0.95 microfiche. Research Report 116-2F, 1970. 142 p, 34 fig, 16 ref. 3-5-69-116.

Descriptors: *Energy dissipation, *Flow resistance, *Culverts, *Road construction, *Design criteria, Engineering structures, Testing procedures, Hydraulic jump, Velocity, Analytical techniques, Equations, Model studies, Hydraulic structures.
Identifiers: *Radial flow dissipator.

The feasibility and performance characteristics of a radial flow basin for use as a flow energy dissipator, and design concepts applicable to highway culverts were explored. The radial flow energy dissipator incorporated a vertically curved drop section which induced radial supercritical flow in a rapidly flared basin where an arc of a circular hydraulic jump was formed. High pressures were developed when the flow impinged on the beginning of the basin floor, thus forcing the flow to spread laterally and stay in contact with the flared wingwalls of the stilling structure. The radial flow energy dissipator was effective in stabilizing the jump, reducing the energy of high-velocity flow, and spreading the flow within the basin. The sensitivity of the performance characteristics of the structure to variations in such parameters as the flaring angle of wingwalls, the ratio of the width of downstream channel to the culvert diameters, and the height of the drop from the culvert outlet to the horizontal basin floor were explored. A simplified form of the circular hydraulic jump equation was obtained which was the basis for the design procedure of a radial flow dissipator under a given set of field conditions. (Woodard-USGS)
W72-14730

EFFECTS OF ARTHUR KILL-KILL VAN KULL CHANNEL DEEPENING ON TIDES, CURRENTS AND SHOALING: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb.
Available from NTIS, Springfield, Va 22151 as AD-735 688. Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper No 2-952, December 1967. 7 p, 12 plate, 3 tab.

Descriptors: Channel improvement, *Dredging, *Model studies, *Harbors, *New York, Environmental effects, Forecasting, Shoals, Tidal effects, Currents (Water), Velocity, Navigation, Ships, Engineering.
Identifiers: *Arthur Kill (NY), *Kill Van Kull (NY), *New York Harbor, Channel deepening, Shoaling.

The existing comprehensive fixed-bed model of New York Harbor was used to determine the effects of increasing the depth of the navigation channels in Arthur Kill and Kill Van Kull from the existing -35 ft mlw (below mean low water) depth to -42 ft mlw on tides, currents, and shoaling in the Federal navigation channels. The test results consist of measurements of tide heights, current velocities, and shoaling quantities. The proposed

deepening would have no significant effects on tidal ranges but would cause reductions in tidal current velocities in both Arthur Kill and Kill Van Kull. The overall shoaling rate in the Federal navigation channels in the Kills would be increased about 15%. Shoaling in these channels is now restricted to one reach, adjacent to Shooters Island; however, it appears that new shoals may develop in Elizabethport Range in Arthur Kill and in all three ranges in Kill Van Kull if the channels are deepened to -42 ft mlw. (Woodard-USGS)
W72-14740

A MOMENTUM APPROACH TO OPEN CHANNEL TRANSITIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. W. Patterson.
Available from NTIS, Springfield, Va. 22151, as AD-735-776 - Price $3.00 paper copy; $0.95 cents microfiche. Miscellaneous Paper No 2-848, October 1966. 9 p, 4 fig, 7 ref, 6 append.

Descriptors: *Open channel flow, *Flow characteristics, *Mathematical studies, *Theoretical analysis, *Momentum equation, Analytical techniques, Energy equation, Hydraulics, Velocity, Channel morphology, Hydraulic gradient, Hydraulic structures.
Identifiers: Open channel transitions.

A study of flow conditions upstream and downstream of an open channel transition is summarized. The method of analysis is based on momentum principles, and a theoretical equation is derived to describe the flow. A design procedure is suggested, based on an experimentally determined correction term to be used in the theoretical equation. In considering the energy loss caused by flow through a channel transition, the momentum equation may be written to describe the flow at sections upstream and downstream of the transitions. The inequality in the solution of the momentum equation, given actual upstream and downstream flow conditions, can be attributed to energy loss in and due to the transition. (Woodard-USGS)
W72-14745

MEASUREMENT AND ANALYSIS OF NATURAL-TYPE SURFACE ROUGHNESSES AFFECTING FLUID FLOW,
Connecticut Univ., Storrs. Inst. of Water Resources.
C. J. Posey.
Available from the National Technical Information Service as PB-212 361, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1972. 7 p, 5 fig. OWRR A-020-CONN (1).

Descriptors: *Roughness (Hydraulic), *Flow profile, *Friction, *Statistics, Slopes, Height, Hydraulic structures, Laboratory tests.
Identifiers: *Sand bed roughness, Curvatures.

Investigation of the feasibility of using the statistical distributions of roughness heights, slopes, and curvatures to characterize hydraulically rough surfaces showed first that the direct measurement technique, such as has been employed to find the root-mean-square value of roughness heights, is impractical. When automatically measured and recorded profiles of developing sand bed roughness became available, it was found that each distribution approaches a well defined limit, suggesting that the 95 percentile values may be used to characterize natural-type roughnesses.
W72-14837

SCOUR AND FILL IN THE MISSOURI RIVER AS RELATED TO THE WATER RESOURCES PLANNING,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 02J.
W72-14844

DYE DISPERSION PATTERNS FOR THREE OUTFALL LOCATIONS FOR THE WARWICK RIVER SEWAGE TREATMENT PLANT: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14951

FLOOD PEAKS AS MODIFIED BY DAM SIZE AND LOCATION,
State Univ. of New York, Syracuse. Coll. of Forestry.
For primary bibliographic entry see Field 02E.
W72-14954

8C. Hydraulic Machinery

QUANTITATIVE EVALUATION OF POWER SYSTEM RELIABILITY IN PLANNING STUDIES,
Ente Nazionale per l'Energia Elecrtrica, Rome (Italy).
P. L. Noferi, and L. Paris.
Electrical and Electronics Engineers, Transactions, Power Apparatus and Systems, Vol PAS-91, No 2, p 611-618, Mar-Apr 1972. 8 p, 4 fig, 2 tab, 14 ref, disc.

Descriptors: *Reliability, *Evaluation, *Computer programs, Peaking capacity, Simulation, Peak loads (Electric), Monte Carlo Method, Forecasting, Risks, Numerical analysis, Spinning reserve, Overloads, Planning, Network design, Computer applications.
Identifiers: *Power system stability, *Quantitative analysis, Electrical faults, Outrages, Italy, Computer-aided design.

In considering the problem of quantitatively evaluating the reliability of a power system for planning purposes, the use of 2 risk indices in terms of curtailed energy and abruptly disconnected power are discussed. These indices can be evaluated by computer, using the Monte Carlo simulation method. A computer program to numerically calculate and evaluate the indices shows the method's possibilities and practical application. Numerical examples confirm the applicability of the method and show how the results can be used to obtain indications for improvement of system reliability, and suggest methods of determining capability limits of transmission lines during planning studies. (USBR)
W72-14241

BEHAVIOR TO WIND ACTION OF ANGLE AND T BARS ON H.V. LATTICE STRUCTURES,
Societa Anomima Elettrificazione S.p.A, Milan (Italy); and Politecnico di Milano (Italy).
A. Carpena, and G. Diana.
Electrical and Electronics Engineers, Transactions, Power Apparatus and Systems, Vol PAS-91, No 2, p 536-544, Mar-Apr 1972. 9 p, 12 fig, 2 photo, 1 tab, 12 ref, disc.

Descriptors: *Vibrations, *Transmission towers, *Wind pressure, Motion, Structural steel, Laboratory tests, Vortices, Drag, Aerodynamics, Amplitude.
Identifiers: *Vibration tests, Latticework, Lift, Italy, Vibration damping, Vibration tables, Wind tunnels, Slenderness ratio, Bars.

Wind tunnel and vibrating table tests were made on T bars and 90 deg angles to compare aerodynamic stability, and to improve understanding of the behavior of angles with thin walls. Aerodynamic behavior was examined from 2 standpoints: (1) self-excited vibrations caused by lift and drag variations entailed by vibrations themselves; and (2) vibrations excited by periodic vortex shedding. Angle and T sections were tested in a wind tunnel with forces perpendicular to their surfaces. A vibrating table was used to measure damping of bars. In the latter, values of dissipated energy were nearly proportional to the square of vibration amplitudes at the antinode. In lattice systems, damping values 10 times greater than for a single member were measured. Vibrations caused by vortex shedding were determined for Reynolds numbers up to 5 times 10 to the fourth power, and proved dangerous for tension members having slenderness ratios around 300. Self-excited vibrations caused by lift and drag variations are not considered serious. (USBR)
W72-14243

ANALYSIS AND HYBRID COMPUTER SIMULATION OF MULTICONDUCTOR TRANSMISSION SYSTEMS,
Purdue Univ., Lafayette, Ind.
P. C. Krause, and K. Carlsen.
Electrical and Electronics Engineers, Transactions, Power Apparatus and Systems, Vol PAS-91, No 2, p 469-477, Mar-Apr 1972. 9 p, 11 fig, 9 ref, disc.

Descriptors: *Simulation, *Hybrid computers, *Transmission (Electrical), Mathematical models, Electric power industry, Electrical faults, Analog computers, Electric networks, Transmission lines, Electric conductors, Electric potential, Electric current, Analytical techniques.
Identifiers: *Transpositions (Electrical), *Traveling waves, *Transients, Digital to analog converters, Eigenvalues, Switching, Switching surges.

An analytical method uses a hybrid computer to simulate traveling waves on transposed and untransposed transmission systems. Results of studies are given of: (1) a 3-phase, transposed, distortionless, transmission system; (2) a 3-phase, untransposed, lossless, transmission system; and (3) 2 mutually coupled, untransposed, lossless, 3-phase transmission systems. Performances of transposed and untransposed systems during 3-phase and line-to-ground faults are compared. Application of the diagonalization technique yields eigenvalues and eigenvector-matrices, enabling simulation of untransposed transmission systems. The material presented aids the engineer in making comparisons of hybrid computation techniques with other methods of simulation. (USBR)
W72-14244

A COMEBACK FOR REDDY KILOWATT,
G. D. Friedlander.
Institute of Electrical and Electronics Engineers, Spectrum, Vol 9, No 4, p 44-50, Apr 1972. 7 p, 8 fig, 2 tab, 3 ref.

Descriptors: *Electric power production, *Electric power costs, *Electric power, Energy, Fossil fuels, Electric power demand, Peak power, Labor costs, Peak loads, Environmental effects, Nuclear powerplants manufacturing.
Identifiers: Fuel cells, Breeder reactors, Solar power generation, Solar cells, Magneto hydrodynamics, Electric batteries, Public opinion.

The power shortage problem in the U S is heightened by growing public concern for environmental protection, and by stricter Government licensing of nuclear powerplants. The power industry is having difficulty functioning in this restrictive environment. Compounding these difficulties are the problems of: (1) increasing costs of labor, plant construction, fuels and their transportation, and generating equipment; (2) the near-critical shortage of high-grade low-sulfur-content fossil fuels; and (3) the increased lead time required for manufacture and delivery of conventional generating equipment. Alternative methods of electric power generation discussed are: magnetohydrodynamics (MHD), fuel cells, lithium-sulfur batteries, fast-breeder reactors, and solar cells. The primary obstacle to developing new power sources is the lack of adequate funding for

basic research, design and development, and experimentation to reduce the high costs per kilowatt output to the competitive range of conventional fuels. (USBR)
W72-14249

HVDC INTERFERENCE ON MAJOR CANADIAN PIPELINE COUNTERACTED,
Trans Mountain Oil Pipe Line Co., Vancouver (British Columbia).
A. L. Verhiel.
Materials Protection Performance, Vol 11, No 3, p 37-40, Mar 1972. 4 p, 1 fig, 3 tab, 2 ref.

Descriptors: *Direct current, *Corrosion control, Corrosion, Transmission (Electrical), Field tests, Pipelines, Coal tar coatings, Cathodic protection, Submarine cables.
Identifiers: *Pipe-to-soil potential, *High voltage, *Polarization, Canada, Ground return dipoles, Buried cables, Soil resistivity, Induced currents, Induced voltage.

In 1968, the first monopolar HVDC transmission system in North America was put into operation by the British Columbia Hydro and Power Authority. Until 1970, the system operated at 130 kv, with an earth current of 600 amp, or 78 Mw; then uprated to 260 kv, 1200 amp, and 312 Mw. The HVDC dipole supplies power through 3 submarine cables over 30 mi from the mainland to Vancouver Island. Several pipeline systems are in the area; the closest, 16 mi away, carries crude oil. The oil and power companies conducted numerous tests on soil resistivity and pipe-to-soil potential before and after operation of the HVDC system. A 3/32-in. coal-tar enamel coating reinforced with fiberglass and felt was supplemented by rectifier/groundbed cathodic protection. Detailed discussion is included on variations of parameters measured during field tests, for continuous operation of the power system, and for short-time cyclic load changes. Conclusions include: (1) Depolarization can be expected on buried metallic structures subjected to ground current of HVDC systems; (2) polarization can be achieved with cathodic protection; (3) fluctuations of pipe-to-soil potential from -1000 to -2500 mv appear feasible; and (4) loss of cathodic protection causes very rapid depolarization. (USBR)
W72-14250

LIBBY DAM AND LAKE KOOCANUSA, KOOTENAI RIVER, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 08A.
W72-14268

POWER PLANT CYCLES FOR DRY COOLING TOWERS,
Bechtel Corp., Los Angeles, Calif. Vernon Div.
For primary bibliographic entry see Field 05D.
W72-14395

EFFECT OF SIZE OF RESERVOIR ON HYDRO PROJECT COST,
National Technical Univ., Athens (Greece); and Public Power Corp., Athens (Greece).
For primary bibliographic entry see Field 06C.
W72-14419

INFLATABLE FLOATING BOOMS,
For primary bibliographic entry see Field 05G.
W72-14457

FLEXIBLE FLOATING BOOMS,
For primary bibliographic entry see Field 05G.
W72-14463

OIL WATER SEPARATION SYSTEM FOR TANKERS,
Esso Research and Engineering Co., Linden, N.J. (assignee).
For primary bibliographic entry see Field 05G.
W72-14465

PROCESS FOR ELECTRICAL POWER GENERATION AND WATER PURIFICATION SYSTEM,
For primary bibliographic entry see Field 03A.
W72-14474

DRILLING OPTIMIZATION,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummis.
Journal of Petroleum Technology, p 1379-1389, November 1970. 12 fig, 9 tab, 7 ref.

Descriptors: *Rotary drilling, *Optimization, Drilling equipment, Hydraulics, *Drilling fluids.
Identifiers: *Drilling variables, Hole problems.

Methods and principles are discussed whereby optimization of a drilling program may be obtained, after looking at the development of rotary drilling to its present, 'automated' stage. Drilling variables, both alterable and unalterable, are discussed, with ways in which they influence both each other and the overall operation. Optimum hydraulics, bit selection, and weight-rpm are other factors cited which are critical in keeping drilling costs down. (Campbell-NWWA)
W72-14475

WHAT WEIGHT AND SPEED PRODUCE THE LOWEST DRILLING COSTS,
E. D. McGhee.
Oil and Gas Journal, p 84-87, March 1960.

Descriptors: *Rotary drilling, *Optimization, Mathematical studies.
Identifiers: *Bit weight, *Rotary speed, Mud systems, Bit-life factors, Drilling-rate factors.

Bit weight and rotary speed, in conjunction with good drilling hydraulics and practices, are two variables which the author believes may soon be calculated automatically for drilling optimization. Used as an example are the practices of one oil company which had been using a form of optimum drilling calculations. Charts made from these calculations had cut drilling time spectacularly. Other oil companies were soon following suit. In addition to factors already noted, rig time, drillability and abrasiveness of formation, and the drilling mud program were also discussed as factors of optimization. (Campbell-NWWA)
W72-14476

FIVE FACTORS THAT AFFECT DRILLING RATE,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 08B.
W72-14478

PROBLEMS ASSOCIATED WITH DESIGN PROGRAMS FOR AIR AND GAS DRILLING,
Oklahoma Univ., Norman.
P. L. Moore.
Drilling Contractor, p 47, 48, 64, May-June 1965. 2 fig, 5 ref.

Descriptors: *Drilling, Drilling equipment, *Fluid mechanics.
Identifiers: *Gas drilling, Design programs, Air drilling.

This discussion of air and gas drilling is directed toward problems associated with program design. Problems of predicting pressure, solids accumulation and critical solids concentration are discussed. To reduce repetition, the terms 'air' and 'gas' have been replaced by the term 'gas'. (Campbell-NWWA)
W72-14479

EFFECT OF BIT WEIGHT ON DRILLING RATE,
Oklahoma Univ., Norman.
P. L. Moore, and C. Gatlin.
Oil and Gas Journal, Vol. 58, No. 21, p 90-93, May, 1960. 8 fig, 8 ref.

Descriptors: *Drilling, Analytical techniques, Rock mechanics.
Identifiers: *Bit weight, Blow energy, Crater volume, Drilling rate, Roller bits.

A review of recent empirical approaches on writing an equation for bit weight on drilling rate is presented. Typical force charts are shown for a weight drop on limestone; these are compared with blow energy and crater volume charts in order to find an optimum weight for the wedge-shaped bit. Some equations for the rate-weight problem are discussed; none is applicable in all cases. (Campbell-NWWA)
W72-14482

EFFECT OF ROTARY SPEED ON DRILLING RATE,
Oklahoma Univ., Norman.
P. L. Moore, and C. Gatlin.
Oil and Gas Journal, Vol. 58, p 170, August, 1960. 2 ref.

Descriptors: *Drilling, Analytical techniques, Rock mechanics.
Identifiers: *Rotary speed, *Drilling rate, Roller-bit drilling.

A review of recent empirical approaches to the effect of rotary speed on drilling rate is presented. Instantaneous drilling rate was found to increase as rotary speed increases. However, at higher rotary speeds, the increase in drilling rate is progressively less than the increase in speed. (Campbell-NWWA)
W72-14483

DESILTING MUDS WITH HYDROCLONES,
Pioneer Centrifuging Co., Houston, Tex.
G. S. Ormsby.

Descriptors: *Drilling fluids, *Desilting, Abrasion, Particle size, Distribution, Mud.
Identifiers: Hydroclones, Mud cyclones, Drilling muds.

Many drilling benefits have been reported from 'desilting' drilling muds. The term and the process are not generally understood. The author explains terminology, lists benefits reported, outlines equipment requirements, and gives general installation and operation pointers. (Campbell-NWWA)
W72-14484

HARD ROCK DRILLING,
Hughes Tool Co., Houston, Tex.
For primary bibliographic entry see Field 08E.
W72-14485

HOW WEIGHT AFFECTS PENETRATION RATE,
Hughes Tool Co., Houston, Tex.
H. B. Woods, and E. M. Galle.
The Oil and Gas Journal, Vol. 55, No. 47, p 88-91, November, 1957. 10 fig, 2 tab.

Descriptors: *Rotary drilling, *Penetration, Drilling equipment, Texas.
Identifiers: *Bit weight, Carbide bits, Toothed bits, *Weight - rate relationships.

An AAODC committee composed of personnel from drilling and equipment companies has made a joint study of the factors that enter into the effect of weight and speed of rotation on penetration. The test site was in Dora Roberts field near Odessa, Texas. An exploration drilling rig was used to drill the well. This is a report of the weight study. (Campbell-NWWA)
W72-14489

MUD-SCOW DRILLING,
Moss (Roscoe) Co., Phoenix, Ariz.
K. G. Brown.
Water Well Journal, Vol. 10, No. 6, June-July, 1956.

Descriptors: *Unconsolidated aquifers, *Southwest U.S., Alluvial aquifers, California, Arizona, Drilling, *Water wells, Gravels.
Identifiers: *Cable-tool drilling, *Mud-scow drilling, Double well casing, Valley fills, Walking beam, *Bailing, Flapper valves.

A special kind of cable-tool drilling, known as mud-scow drilling, is practiced in the alluvial valley fills of the Southwest, primarily California and Arizona. Experience has refined the method and developed a special type of drilling machine, generally known as the California Sky Beam. The problem which led to the development of this method of drilling stems from the fact that most ground water obtained in California and Arizona is found in the alluvial valley fills in the inland areas and in the sand, silt, and delta deposits of the seacoast area. (Campbell-NWWA)
W72-14495

RATING PUMP PERFORMANCE BY CAPACITY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
K. Fowler.
Johnson Driller's Journal, Vol. 42, No. 2, p 4-5, March-April, 1970. 1 fig.

Descriptors: *Pumps, Water wells, Efficiencies, *Pressure head.
Identifiers: Horsepower, Submersible pumps, *Capacity (gpm), Output factor.

Rating water system pumps by pumping capacity or output rather than by motor horsepower has been proposed by the Water Systems Council. This scheme has the advantage of selecting the pump to fit the capability of a given well or the needs of the well owner. The nominal pump rating would be its discharge in gpm when operating at the best efficiency point indicated by the head-capacity-efficiency chart for the pump. (Campbell-NWWA)
W72-14497

AIR PUMP FOR SMALL-DIAMETER PIEZOMETERS,
Nova Scotia Dept. of Mines, Halifax.
P. C. Trescott, and G. F. Pinder.
Ground Water, Vol 8, No 3, p 10-15, May-June, 1970. 8 fig, 5 ref.

Descriptors: *Piezometers, Submergence, *Sampling, *Potentiometric level, Transmissivity, Groundwater.
Identifiers: Pumping lift, *Air pumps, Engines, Check valve, *Hydraulic head.

The engine of a field vehicle can easily be used as an air pump by inserting a commercially manufactured check valve into a spark-plug socket. Small-diameter piezometers can be pumped with compressed air from this source. With sufficient air-line submergence, the air lift method can be used to pump 1-inch diameter piezometers where the pumping lift is less than 70 feet and 1.25-inch diameter, piezometers where the pumping lift is less than 50 feet. In cases where this method will not work, some of the water contained in a piezometer can be pumped out by pressurizing the piezometer if the formation transmissivity is low and the pumping lift is not excessive. The maximum pumping lift is a function of the rate at which pressure in the piezometer is increased and the rate at which water flows into the formation with increasing head in the piezometer. (Campbell-NWWA)
W72-14510

MUD PRESSURE AIDS CABLE-TOOL DRILLING,
Church (M.) Drilling Co., Murray, Utah.
M. Church.
Johnson Driller's Journal, Vol 32, No 3, p 4-5, May-June, 1960.

Descriptors: Drilling, *Drilling fluids, Bentonite, Hydrostatic pressure, Casings, *Artesian aquifers, *Grouting.
Identifiers: *Cable-tool drilling, Backwashing, *Mud sealing, Horizontal jetting, Conductor pipe.

This is a field report on a method which allows easier driving of pipe while cable-tool drilling. Hydraulic pressure is maintained on an envelope of drilling mud surrounding the well casing as it is being driven. The mud lubricates the casing and seals the annular space. (Campbell-NWWA)
W72-14515

RESEARCH TO DEVELOP AND DEMONSTRATE A MOBILE PILOT PLANT FOR REMOVAL OF PHOSPHATE FROM WASTEWATERS BY ADSORPTION ON ALUMINA,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
W72-14789

MECHANICS OF DIFFERENTIAL PRESSURE STICKING OF DRILL COLLARS,
Union Oil Co. of California, Brea.
For primary bibliographic entry see Field 08D.
W72-14834

A SEMI-AUTOMATIC GATE TO IMPROVE THE SENSITIVITY OF THE CRUMP WEIR AT LOW FLOWS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
S. C. Knedlhans.
Journal of Hydrology, Vol 16, No 3, p 261-265, July 1972. 3 fig, 1 ref.

Descriptors: *Stream gages, *Weirs, *Instrumentation, *Gaging stations, Water measurement, Automation, Stage-discharge relations, Discharge (Water).

A precalibrated weir can be installed rapidly and gives reliable discharge measurement even when a large downstream head is present (submergence ratio up to 0.96). This is achieved by using simultaneously upstream and downstream head gaging. Insensitivity at low flows can be overcome partly by the installation of a semi-automatic gate which reduces the width of the crest of the weir by one half. (Knapp-USGS)
W72-14947

8D. Soil Mechanics

NEW TRENDS IN IMPROVING PHYSICAL QUALITIES OF ROCKS,
Road and Railway Construction National Co., Prague (Czechoslovakia).
L. Kratochvil.
International Civil Engineering Monthly (Israel), Vol. 2, No. 6, p 241-258, Dec 1971. 18 p, 32 fig, 11 ref.

Descriptors: *Retaining walls, *Embankments, *Soils, Soil properties, Soil mechanics, Construction methods, Plastics, Tensile strength, Analysis, Model tests, Earth pressure, Stress distribution, Bulkheads, Cost comparisons, Construction, Riprap, Earthworks, Costs.
Identifiers: *Reinforced earth, Construction fills, Czechoslovakia, Reinforcing materials, Stability analysis, Field tests.

Reinforced earth involves a relatively new method of constructing retaining walls, embankments, and other earth structures. The method allows earth structures to be constructed with vertical faces. Each layer in a reinforced earth structure is erected in the following sequence: (1) The 10-in.-high skin elements that make up the face of the structure are installed; (2) the 2-3/8-in.-wide reinforcing strips are laid horizontally on the previous reinforced earth layer and attached to the skin elements; and (3) the earth is spread over the reinforcement strips and compacted in 10-in. layers. The material for reinforcement strips should be lightweight, low in cost, resistant to climatic and mechanical damage, and possess great tensile strength. The criteria for selecting earth fill to use with current size skin and reinforcing strips include: (1) Soil should be continuously graded noncohesive or slightly cohesive; (2) too great a percentage of gravel (1-5/8 to 5 in.) should not be used; and (3) stones and boulders larger than 5 in. should be excluded. The theory of reinforced earth, and model and field test results are presented. (USBR)
W72-14239

EFFECT OF FOUNDATION ELASTICITY ON ARCH DAM DEFLECTIONS AND STRESSES,
Uttar Pradesh Irrigation Research Inst., Roorke (India).
For primary bibliographic entry see Field 08A.
W72-14240

TESTING TRANSMISSION LINE BELLED AUGER FOOTINGS,
Bureau of Reclamation, Denver, Colo.
R. S. Saliman.
Paper, American Special Conference on Performance of Earth-Supported Structures, Purdue Univ., Lafayette, Ind, June 1972. 16 p, 8 fig.

Descriptors: *Transmission towers, Foundations, Field tests, Field data, Construction practices, Movement, Foundation failure, Tornadoes, Model tests, Footings, Field investigations, Foundation investigations.
Identifiers: *Uplift footings, *Belled fottings, *Pull-out tests, *Uplift resistance, *Auger-type footings, Belled anchors, Test results, Ponding tests.

With the advent of self-supporting steel tower construction for high-voltage transmission lines, footing design became an important factor in transmission line economics. Because of the variety of soil conditions found along a transmission line and the number of footings involved, economical but adequate footing designs are important. Concrete belled auger footings best satisfied design requirements. These footings are constructed by augering a hole of a certain depth into the foundation material, enlarging the bottom of the hole to form a bell, and filling the hole with concrete. During 1947, full-scale tests of belled auger tower footings were performed by the Bureau of Reclamation at several locations in California. No additional tests were made until 1960, when the Fort Peck-Dawson County 230-kv Line was built in an area of silty sand foundation material. The last full-scale field tests were made during June 1967, on the Mead-Liberty 345-kv Line. The footing tests, all of

which proved the adequacy of design, are discussed. Tower footing failures during tornadoes in South Dakota and a laboratory method of testing footings at one-seventh scale are reviewed. (USBR)
W72-14246

SAN LEANDRO CREEK SMALL FLOOD CONTROL PROJECT, ALAMEDA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, San Francisco, Calif.

Available from the National Technical Information Service as PB-207 056-F. $3.00 in paper copy. November 1971. 88 p, 3 plate, 10 photo, 2 chart, 5 ref, 3 append.

Descriptors: *California, *Flood control, *Environmental effects, *Channel improvement, Flood protection, Benefits, Costs, Dredging, Feasibility, Flood damage, Industries, Water control, Habitats, Ecosystems, Land development, Vegetation, Water management (Applied), Wildlife habitats, Waterfowl, Benthic flora, Benthic fauna, Turbidity, Sedimentation.
Identifiers: *Environmental impact statement, *San Leandro Creek (Calif).

This federal flood control project extends along the lower San Leandro Creek from San Leandro Bay upstream a distance of approximately two miles. The project consists principally of unlined earthen levees with a trapezoidal cross section and rectangular concrete channel. The project will eliminate many existing habitats of both plant and animal life. The recreational use and scenic quality of the area will be enhanced. Better drained land more capable of providing a suitable environment for increased industrial and commercial activity will be provided. Protection against a 100 year flood will be afforded and areas of stagnant water will be eliminated thereby reducing mosquito populations. The project will result in the loss of plants and animals associated with a natural stream and the temporary loss of benthic organisms and pickleweed along the banks within earth channel reach. Nonstructural alternatives were rejected since they would not eliminate floods. Without action flood induced damage to property and structures would continue unabated and the ecosystem could not gain stability. A concrete channel upstream from 98th avenue was selected since it required the aquisition of less right-of-way. Primary benefits to be derived are from the prevention of flood damage. (Ellis-Florida)
W72-14262

CHOWAN RIVER, NORTH CAROLINA, BLACKWATER RIVER, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.

Available from the National Technical Information Service as PB-206 258-F. $3.00 in paper copy. October 1, 1971. 16 p, 1 map, 1 tab.

Descriptors: *North Carolina, *Virginia, *Navigation, *Environmental effects, Channel improvement, Wildlife habitat, Fisheries, Dredging, Turbidity, Fish conservation, Fish establishment, Stream fisheries, Wetlands, Disposal, Landfills, Spoil banks, Project benefits, Alternative planning.
Identifiers: *Environmental impact statement, *Chowan River (N.C.), *Blackwater River (Va).

The proposed project involves construction of three cut-off channels within an eight-mile reach of the Chowan and Blackwater Rivers, which are located in North Carolina and Virginia respectively. The cut-off channels will eliminate three sharp bends in the river channel thereby greatly assisting navigation. The proposed channels will be created by dredging approximately 169,000 cubic yards of material thus converting 28 acres of wooded swamp into navigable waters. Environmental impacts include: reduction in the risk of marine accidents and consequent destruction, loss of 28 acres of swamp woodland, and destruction of three miles of high quality stream fisheries in the bypassed streams. Adverse environmental impacts include the alteration of the wetland habitat and loss of the stream fishery, conversion of tideland into a spoil dumping area, destruction of natural and wildlife resources in the spoil area, and an adverse effect on fish life in the project area due to increased turbidity due to construction. Alternatives which have been considered include land transport, flexibility in selection of disposal sites, flexibility in selection of the time of year in which to work, and no development. (Grant-Florida)
W72-14266

DIKED DISPOSAL AREA PROGRAM, ONTONAGON HARBOR, ONTONAGON, MICHIGAN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14270

DIKED DISPOSAL AREA PROGRAM, ASHLAND HARBOR, ASHLAND, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-14271

ZUMBRO RIVER, MINNESOTA, KELLOGG TO MOUTH, WABASHA COUNTY, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from the National Technical Information Service as PB-201 851-F. $3.00 in paper copy. October 6, 1971. 48 p, 4 plate, 7 tab, 1 append, 1 map.

Descriptors: *Minnesota, *Flood control, *Channel improvement, *Environmental effects, Levees, Flood protection, River draining, Flood plain zoning, Flood frequency, Flood flow, Wildlife habitats, Aquatic animals, Aquatic habitats, Stream fisheries, Spoil banks, Vegetation effects, Aesthetics, Sedimentation, Water quality control, Dredging, Spoil banks.
Identifiers: *Environmental impact statement, *Zumbro River (Minn).

The Zumbro River flood control project is located in Wabasha County, Minnesota. The plan calls for 15,900 feet of continuous channel modification and 23,500 feet of improved and realigned levees. The modified channel sill have a 250-foot bottom width. Two curves in the stream will be straightened. Spoil will either be used for levees or placed on spoil banks. The channel will be designed to accommodate a flood flow of 48,000 cubic feet per second. The project will have the following environmental impact: removal of streamside trees and herbaceous cover, alteration of the ecosystem of the surrounding area which has adapted to flooding, alteration of aquatic life, reduced flooding to the extent of only 2% chance of occurrence, and additional flood plain sedimentation. Unavoidable adverse impacts include: loss of natural stream environment and conversion of some stream habitat to a pond, limited fishery development in the channel, temporary loss of 20 acres of wildlife habitat from spoil dumping, and temporary water quality impairment. Alternatives include: an all-channel plan, all-levee plan, upstream reservoir storage, no action, and flood plain evacuation. (Grant-Florida)
W72-14274

HILLSDALE LAKE, BIG BULL CREEK, KANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-202 917-F. $3.00 in paper copy. November 1971. 60 p, 2 map, 4 photo, 4 tab.

Descriptors: *Kansas, *Multiple-purpose projects, *Dam construction, *Environmental effects, Flood control, Water quality control, Recreation, Reservoir construction, Water supply, Missouri River, Turbidity, Silting, Fisheries, Stream fisheries, Wildlife habitats, Aquatic habitats, Streamflow, Alteration of flow, Relocation, Social aspects, Highway relocation, Flood protection, Channel improvement, Flood plain zoning.
Identifiers: *Environmental impact statement, *Hillsdale Lake (Kan), *Big Bull Creek (Kan).

The Hillsdale Lake project is a multiple-purpose project designed to provide flood control, water supply, water quality control, recreation, and fish and wildlife in Miami County, Kansas. The project is part of the Missouri basin plan. A 4,580 acre surface area lake will be created by the rolled earthfill embankment. Recreation sites will be constructed and road and utility relocations will be required. Environmental impacts include: modification of stream flow, temporary adverse effects during construction, flood control downstream, reduced siltation downstream, creation of mudflats within the lake, increased water shortage for downstream marshes, relocation of 92 families, and alteration of the downstream fishery and water quality. Unavoidable adverse effects include: inundation of 4,580 acres of cropland, grassland, and woodland; loss of wildlife habitats and wildlife; elimination of certain water species who live only in flowing water; loss of a stream environment for 12 miles; increased water shortage in downstream marshes; and temporary turbidity, soil erosion, and pollution during construction. Alternatives include: alternate lake sites, no action, single-purpose water supply reservoir, flood plain zoning, and levies and channelization. (Grant-Florida)
W72-14275

NATIONAL ENGINEERING HANDBOOK, SECTION 2-ENGINEERING PRACTICE STANDARDS: PART 1, ENGINEERING CONSERVATION PRACTICES.
Soil Conservation Service, Washington, D.C.

Soil Conservation Service National Engineering Handbook, Section 2, Part 1, April 1971 (revised), various paging.

Descriptors: *Soil conservation, *Engineering structures, *Standards, *Soil mechanics, *Design criteria, Federal Government, Hydraulic structures, Dams, Canals, Floodways, Irrigation systems, Floodgates, Flood protection, Dikes, Drainage systems, Land clearing.
Identifiers: *Soil Conservation Service, *Engineering handbook.

This handbook contains engineering standards for the construction of water retaining structures, drainage systems, irrigation systems, stream channel stabilization works, soil conservation structures and ponds. These standards establish the lowest limit of technical excellence permissible in the planning, design, and construction of these structures. The many variations in climate, soils, topography, or other physical features are factors that influence the adaptation of construction standards in a specific area. Most of these standards have been in use for many years and except for minor changes are as published in the original draft of the SCS National Engineering Handbook. However, the progress made in methods through experience and research, require that standards for conservation practices be reviewed periodically and revised as necessary. (Woodard-USGS)
W72-14364

SAND STUDIES CAN IMPROVE WELL DESIGN.
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W72-14513

WINTERS CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-14559

LEVEE AND DRAINAGE MODIFICATIONS SCAPPOOSE DRAINAGE DISTRICT; COLUMBIA RIVER, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 04D.
W72-14560

DUST ABATEMENT AT CANYON FERRY LAKE, CANYON FERRY UNIT, HELENA--GREAT FALLS DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Billings, Mont. Region 6.
For primary bibliographic entry see Field 04D.
W72-14565

LEVEE PROTECTION AND STREAM IMPROVEMENTS, SUGAR CREEK AT AND IN THE VICINITY OF BREWSTER, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.

Available from the National Technical Information Service as PB-200 340F. $3.00 in paper copy, $0.95 in microfiche. February 15, 1972. 29 p, 1 map.

Descriptors: *Ohio, *Environmental effects, *Flood control, *Channel improvement, Levees, Pumping plants, Alternate planning, Flood protecton, Multiple-purpose projects, Watermanagement (Applied), Administrative decisions, Comprehensive planning, Adoption of practices, Storm runoff, Flood frequency, Aquatic habitats, Fisheries.
Identifiers: *Environmental Impact Statements, *Brewster (Ohio).

The proposed project consists of two separate actions: modification and construction of levees, and installation of a pumping station at Brewster, Starke County, Ohio; and the modification of Sugar Creek and some tributaries adjacent to Brewster. The primary purpose of the revised levee system is to prevent entrance of floodwaters from Beach City Lake when the project is utilized for impounding runoff from major storms. The other part of the project consists of snagging and clearing Sugar Creek in order to improve the flow characteristics, reduce stages on Sugar Creek, and improve drainage from inside the levee. The project will provide flood protection, improve normal drainage from the protected area, reduce the threat of headwater flooding on Sugar Creek, and decrease the frequency of pumping operations. Adverse environmental effects include changes in land use, decrease in the productivity and desirability of the fishing, loss of some farmland, reduction of fish and wildlife habitat, and temporary increases in erosion and sedimentation. Alternatives considered include floodproofing, evacuation, dam modification, modification of operational procedures, construction of floodway diversions, and no action. Comments are included from various state and local agencies. (Widman-Florida).
W72-14567

MUD MOUNTAIN DAM AND RESERVOIR, WHITE RIVER, WASHINGTON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.

Available from the National Technical Information Service as PB-200 931D. $3.00 in paper copy, $0.95 in microfiche. July 12, 1971. 14 p.

Descriptors: *Washington, *Environmental effects, *Flood protection, *Dam construction, Channel improvement, Levees, Flood plains, Alternate planning, Tunnel linings, Planning, Water management (Applied), Fish passages, Recreation, Flooding, Earthdams, Reservoir construction, Sediment control.
Identifiers: *Environmental Impact Statements, *Mud Mountain Dam, Wash.

Mud Mountain Dam is a 700 foot long, 425 foot high earth-cave and rockfill structure on the White River near Enumclaw, Washington. The project provides flood control for several towns, farms, and industries in the flood plain along the White River and 106,000 acre-feet of flood storage. Upstream salmon and trout runs are blocked by the dam, but fish passage facilities are provided. Construction of the project and partial removal of vegetation from the reservoir have altered the natural appearances of the area, however, there is some seasonal growth. Adverse environmental effects include: loss of land used for timber and wildlife production; occasional non-adherence to water quality standards affecting stream turbidity with resulting adverse effect on food organisms and eggs in gravel; and injury to juvenile fish using the stream for a nursery area. Because Mud Mountain Dam has been in operation since 1948, the only other possible alternatives concern various schemes for control of the river flow. Considerable study has resulted in a plan to line a test section of the 9-foot tunnel with abrasion-resistant steel in 1971. (Widman-Florida)
W72-14570

SCITUATE HARBOR, SCITUATE, MASSACHUSETTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-14572

GENERAL SOIL MAP LOWER PANTANO WASH AREA, PIMA COUNTY, ARIZONA - A SPECIAL REPORT WITH SELECTED ENGINEERING INTERPRETATIONS,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 07C.
W72-14578

DRAINAGE PIPE STUDY,
Louisiana Dept. of Highways. Research and Development Section.
D. G. Azar.
Available from NTIS, Springfield, Va. 22151 as PB-207-306, Price $3.00 paper copy; $0.95 microfiche. Louisiana Dept. of Highways Research Report No 57, May 1971. 53 p, 16 fig, 1 tab.

Descriptors: *Drains, *Pipes, *Durability, *Soil types, *Louisiana, Testing procedures, Soil tests, Metal pipes, Deterioration, Resistance, Treatment, Coatings, Asphalt.
Identifiers: *Drainage pipes, Life expectancies (Drains).

Estimated life expectancies were determined for several types of drainage pipes submerged in various types of soils in Louisiana. The California method of estimating service life of metal culverts is applicable to conditions found in Louisiana. Thus, by evaluation of soil characteristics in the laboratory, the expected life of metal pipe can be predicted. The life of a metal pipe can be extended by use of a zinc coating and by use of an asphalt coating. The asphalt coating adds an estimated 8 years to the life of the pipe. Tables show the relationship between estimated life and various soil conditions. (Woodard-USGS)
W72-14612

FIELD INVESTIGATION OF SELECTED FOUNDATION PIEZOMETERS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08G.
W72-14738

PRESQUE ISLE PENINSULA COOPERATIVE BEACH EROSION CONTROL PROJECT, SOUTH SHORE OF LAKE ERIE AT ERIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04D.
W72-14764

APPLEGATE LAKE, ROGUE RIVER BASIN, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-200 792-F, $3.00 in paper copy, $0.95 in microfiche. September 28, 1971. 103 p, 3 map, 8 tab.

Descriptors: *Oregon, *Dam construction, *Multiple-purpose projects, *Environmental effects, *Flood control, Irrigation, Water supply, Fish conservation, Wildlife conservation, Recreation, Water quality control, Rock mechanics, Sediment control, California, Land use, Fish migration, Fish reproduction, Wildlife habitats, Non-structural alternatives.
Identifiers: *Environmental Impact Statements, *Applegate Lake (Ore), Rogue River Basin (Ore).

The project calls for the construction and operation of a multiple-purpose dam and reservoir project in Jackson County, Oregon, and Siskiyou County, California. The principal features of the project are: a 2,720,000 cubic yard rockfill embankment dam, a gated spillway, regulating outlet works, fish collection facilities, and a 4.6 mile long reservoir. The project will result in a reduction of downstream floods, debris accumulation and loss of topsoil. There will be increased stream flows during summer and fall low periods. Adverse environmental effects include: blockage of upstream migration of anadromous fish, loss of fish spawning and rearing areas, loss of wildlife habitat and landscape scars. Alternatives to the project are no action, flood plain zoning, levee protection and different types of dams at the same and other locations. There will be an irretrievable commitment of about 988 acres of land which will be converted to reservoir bottom or shoreline. Comment has been solicited and received from appropriate federal, state and private agencies. (Waldron-Florida)
W72-14765

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Information Service as PB-208 962-D, $3.00 in paper copy, $0.95 in microfiche. November 1971. 38 p, 2 map, 19 tab.

Descriptors: *Pennsylvania, *Environmental effects, *Flood protection, *Multiple-purpose pro-

jects, Earth dams, Dams, Flood control, Water quality control, Streamflow, Stream improvement, Flooding, Reservoirs, Recreation facilities, Wildlife habitats, Habitats, Turbidity, Water control, Water quality, Benefits, Costs, Feasibility, Aesthetics, Project purposes.
Identifiers: *Environmental Impact Statements, *French Creek Basin (Pa), *Woodcock Creek Lake (Pa).

The project, consisting of a rolled earth embankment dam which will control a 46 square mile drainage area, is being constructed as a multi-purpose reservoir for flood control and water quality control for stream flow management. The project will provide a higher degree of flood protection for the French Creek Basin in Pennsylvania, while subjecting about 775 acres of land to inundation and resulting in the loss of approximately two miles of natural stream section. The flood protection and stream flow management will encourage the development of recreation facilities. Adverse effects include the loss of both wildlife habitat and free-flowing stream habitat. During construction, water quality will be affected by a temporary increase in stream turbidity and siltation. A potential for uncontrolled private development will also be created. A large multi-purpose reservoir on French Creek was considered as an alternative to the three-dam system of which this project is a segment and discarded due to local opposition. Other alternatives found impractical included levees, a dam on Woodcock Creek, and flood plain zoning. Foregoing action would not permit realization of optimum system flood control. (Ellis-Florida)
W72-14772

WELL LOG APPLICATIONS IN COAL MINING AND ROCK MECHANICS,
Schlumberger Well Services, Evansville, Ind.
L. O. Bond, R. P. Alger, and A. W. Schmidt.
Society of Mining Engineers of AIME, Preprint No. 69-F-13, 1969. 16 p, 8 fig, 12 ref.

Descriptors: *Rock mechanics, Rock properties, *Coal mines, Sampling, Well data, *Logging (Recording), Lithologic logs, Computer programs.
Identifiers: *Coal seams, Gamma ray logs, Density logs, Sonic logs, Neutron logs, *Thickness determinations, *Strength index.

Initial results of a logging program applied to coal prospects evaluation are presented. Particular applications discussed are: (1) identification of coal seams, (2) measurement of coal seam thickness, (3) evaluation of lithology and moisture index of formations surrounding coal seams, (4) determination of a 'strength index' for formations penetrated by the drill hole, and (5) analysis of coal quality. (Campbell-NWWA)
W72-14831

MECHANICS OF DIFFERENTIAL PRESSURE STICKING OF DRILL COLLARS,
Union Oil Co. of California, Brea.
H. D. Outmans.
Transactions, Society of Petroleum Engineers, AIME, Vol 213, p 263-274, 1958. 12 fig, 2 tab, 11 ref, 7 append.

Descriptors: *Rotary drilling, Drilling equipment, Hydraulics, Permeability, Drilling fluids.
Identifiers: *Differential pressure sticking, *Drill collars, Radial flow, Mud cake.

Drilling progress is often delayed by sticking of the drill string. The development of preventive and remedial methods has been hampered by incomplete understanding of the sticking mechanism. A recent laboratory investigation has indicated that one type of sticking may be attributed to the difference in pressure between the borehole and formation. The primary cause for differential pressure sticking is cessation of pipe movement, whereas differential pressure and standing time determine the severity of the sticking. (Campbell-NWWA)
W72-14834

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Sacramento, Calif.

Available from the National Technical Information Service as PB-207 435-D, $3.00 in paper copy. March 15, 1972. 120 p, 3 map, 8 photo, 15 tab, 1 chart, 37 ref, append.

Descriptors: *California, *Environmental effects, *Flood protection, *Multiple-purpose projects, Dams, Reservoirs, Flood control, Water management (Applied), Water control, Streamflow, Rivers, Wildlife habitats, Trout, Boating, Recreation, Irrigation water, Hydroelectric power, Water quality control, Fisheries, Water pollution control, Waste water (Pollution), Wild rivers, Rockfill dams.
Identifiers: *Environmental Impact Statements, *Stanislaus River (Calif), *New Melones Lake (Calif).

The New Melones Lake flood control project involves construction of a rockfill dam and reservoir on the Stanislas River, California, about 60 miles upstream from the confluence with the San Joaquin River. The multiple purpose project will provide flood control for agricultural lands and suburban areas, recreation, irrigation water yield, hydroelectric power generation, water quality control flows and fish and wildlife enhancement. The water quality releases will partially contribute to the solution of the pollution problem in the San Joaquin River. Inundation of 10,700 acres of land and sediments and nutrients from upstream will supply a source of water degrading agents. 16 miles of free flowing river supporting a significant trout fishery will be inundated and converted into a lake fishery. The Stanislaus River reach that is presently used by whitewater boating enthusiasts will be inundated. Secondary development both around the reservoir and downstream, stimulated by the project, could increase the residual waste entering the river unless controlled. Wildlife habitat within the reservoir basin will be eliminated. Alternatives considered include no action, a smaller or larger reservoir, channel and levee improvement, or flood plain management. (Ellis-Florida)
W72-14926

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.

Available from the National Technical Information Service as PB-201 532-D, $3.00 in paper copy. July 1971. 33 p, 5 plate.

Descriptors: *Alaska, *Environmental effects, *Dam construction, *Multiple-purpose projects, Flood protection, Alternate planning, Water resources development, Coordination, Project planning, Stream stabilization, Comprehensive planning, Water management (Applied), Levees, Wildlife habitat, Flooding, Reservoirs, Fisheries, Fish passages.
Identifiers: *Environmental Impact Statements, *Chena River Lakes (Alas).

The project, authorized by the Flood Control Act of 1968, is a multiple-purpose project located in interior Alaska, near the City of Fairbanks. The recommended project is designed to protect the City of Fairbanks and the surrounding community from damaging floods originating on the Tanana and Chena Rivers by a combination of two methods: two earthfill dams to regulate and restrict the Chena and Little Chena Rivers respectively; and a Tanana River levee system. The project will involve relocating 32 families or businesses, inundating a maximum 10,000 acres of marsh and stream habitat during peak flood levels, providing general recreational opportunities, providing habitat for fish and wildlife species, stabilizing flows, and requiring borrow excavation. Construction activities should not have a significant impact on water quality. Adverse environmental effects will include impounding about two miles of free-flowing stream habitat, incurring fishery losses during flood stages, and inundating potential Arctic grayling spawning habitat. Fish passage facilities will be incorporated to facilitate passage of anadromous and resident fish species. Structural and non-structural alternatives were studied and found to be economically unfeasible, environmentally detrimental, or both. (Widman-Florida)
W72-14932

LOCAL PROTECTION PROJECT, WATERLOO, IOWA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Rock Island, Ill.

Available from the National Technical Information Service as PB-201 850-D, $3.00 in paper copy. May 19, 1971. 19 p.

Descriptors: *Iowa, *Environmental effects, *Flood protection, *Dam construction, Levees, Reservoirs, Dredging, Channel improvement, Multiple-purpose projects, Project planning, Water resources development, Dams, Flood control, Water management (Applied), Turbidity, Aquatic life, Wildlife habitats.
Identifiers: *Environmental Impact Statements, *Waterloo (Iowa).

The project will provide protection from flooding of Cedar River, Black Hawk Creek, and Virden Creek in Waterloo, Iowa. Protection will consist of earthen levees and concrete floodwalls, a small dam and detention reservoir on Virden Creek, and deepening and widening of the Cedar River channel at specific locations. Adverse environmental effects would include the alteration of the natural shoreline habitat; obstruction of views of natural areas; loss and alteration of aquatic environment in the proposed dredge areas from increased turbidity due to construction and subsequent maintenance operations; loss of bottomland habitat in the borrow areas; and a temporary deterioration of land areas by ponding. Alternatives include no project and five small flood control reservoirs upstream of Waterloo. Included are brief comments from interested agencies. (Widman-Florida)
W72-14933

AN EARTH FILL DAM ON PERMAFROST: HESS CREEK DAM, LIVENGOOD, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
F. F. Kitze, and O. W. Simoni.
Available from NTIS, Springfield, Va 22151 as AD-742 216, Price $3.00 paper copy; 95 cents microfiche. Technical Report 196, March 1972. 50 p, 51 fig, 9 tab, 10 ref.

Descriptors: *Earth dams, *Cold regions, *Alaska, *Cold weather construction, Methodology, Permafrost, Embankment, Engineering structures, Reservoirs, Dams, Flow control, Construction materials, Evaluation.

The Hess Creek in Alaska is a combination hydraulic fill and rolled earth fill structure containing about 479,000 cu yd of earth fill. A steel sheet pile cutoff wall runs along the base centerline. A 48-in.-diameter metal pipe outlet with control gate was installed through the embankment at one end and a spillway 1300 ft long and 100 ft wide to accommodate flood flow. The performance and present condition of the dam suggest that con-

struction of earth fill embankments on permafrost is feasible and practical. The embankment appears to have had little or no detrimental effect on the underlying permafrost. The refrigeration system installed at the base of the embankment seems to have accomplished its purpose of refreezing foundation soil thawed during the summer construction period. (Woodard-USGS)
W72-14939

8E. Rock Mechanics and Geology

THE ROLE OF ROCK STRENGTH ANISOTROPY IN NATURAL HOLE DEVIATION,
Shell Oil Co., New York.
R. T. McLamore.
Journal of Petroleum Technology, p 1313-1321, November, 1971. 10 fig, 6 ref.

Descriptors: *Rotary drilling, *Rock mechanics, *Anisotropy, Drilling equipment.
Identifiers: Drill bits, Chipping, Hole deviation.

The influence exerted by the interaction of rock and bit is a major factor preventing a comprehensive solution to the problem of natural hole deviation. Described here is an analysis of the bit-tooth chipping mechanism in dipping laminated anisotropic rock. There are encouraging indications that the tendency of the bit to deviate in such rock can be diminished by proper bit-tooth design. (Campbell-NWWA)
W72-14481

EFFECT OF BIT WEIGHT ON DRILLING RATE,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 08C.
W72-14482

EFFECT OF ROTARY SPEED ON DRILLING RATE,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 08C.
W72-14483

HARD ROCK DRILLING,
Hughes Tool Co., Houston, Tex.
L. L. Payne, and W. Chippendale.
Drilling Contractor, p 58-62, June, 1953. 10 fig.

Descriptors: *Rotary drilling, *Drilling equipment, Chert, Abrasion, Rock mechanics.
Identifiers: Tungsten carbide, *Rock bits, *Hard rock drilling.

In drilling hard formations it is necessary to know the characteristics of the formation being drilled which cause it to fall into the category of 'Hard Rock.' Inasmuch as the physical properties of rock examined at the surface may not represent those properties as presented to the rock bit cutters, it is important to study the nature of these changes in properties. An important advancement has been the introduction of a bit employing the use of sintered tungsten carbide inserts as cutting elements. This type of rock bit has shown remarkable results in West Texas, New Mexico, Oklahoma, and the Rocky Mountain areas when used in formations which react to a crushing action. The use of heavy weights and relatively slow rotary speeds is recommended with this type of bit. Some formations, however, which are classified as 'hard' due to their high abrasive properties may have relatively weak binders, and will not respond readily to the crushing action of this type of bit. (Campbell-NWWA)
W72-14485

WELL LOGS PREDICT DRILLABILITY, AID COMPUTERS,
California Univ., Berkeley.
For primary bibliographic entry see Field 08G.
W72-14487

THE ELECTROHYDRAULIC EFFECT: POTENTIAL FOR ROCK DRILLING.

Ground Water Age, Vol 4, No 8, p 34-37, April 1970. 2 fig.

Descriptors: Electrodes, *Drilling, Granites, Tensile stress, Compressive strength, *Tensile strength, Rock properties, *Rock mechanics.
Identifiers: *Electrohydraulic effect, Spark gap, Conductive plasma, *Fracture mechanisms, *Brittle failure, Hoop stresses.

Cavitation was first considered as a possible new energy source for fragmenting rock, but small-scale tests indicated that the pulses from the collapse of tiny vapor bubbles lacked sufficient energy to produce effective fracturing. This fact led to an investigation of the underwater spark discharge, which is a more effective generator of collapsible gas or vapor bubbles. The secondary collapse pulse, however, turned out to be negligible compared with the primary pressure pulse caused by the sudden expansion of the spark channel. The explosive expansion of the spark channel, or the electrohydraulic effect, thus became the prime interest of this study. (Campbell-NWWA)
W72-14830

FURTHER STUDIES OF THE RELATION OF PHYSICAL PROPERTIES OF ROCK TO ROCK DRILLABILITY,
California Univ., Berkeley.
W. H. Somerton, F. Esfandiari, and A. Singhal.
Society of Petroleum Engineers, AIME Paper 2390, 4th Conference on Drilling and Rock Mechanics, Austin, Texas, January 1969. 9 p, 14 fig, 2 tab, 9 ref.

Descriptors: *Drilling, Physical properties, *Rock properties, Rock mechanics.
Identifiers: *Drillability, *Sonic velocity, Triaxial strength, Sonic logs.

The correlation of physical properties of rocks with drilling performance has been extended and some new methods of measuring rock drillability have been proposed. The conclusion that sonic velocity is a good indicator of rock drillability has been substantiated, provided a mineralogical factor is taken into account. Drilling strength, however, shows a linear relation to triaxial strength, which is only slightly dependent on mineralogical character. Triaxial elastic moduli values correlate well with rock drilling parameters. (Campbell-NWWA)
W72-14832

LABORATORY DRILLING PERFORMANCE OF THE FULL-SCALE ROCK BIT,
Jersey Production Research Co., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-14833

TUNNELS--MACHINE EXCAVATION, RATE OF PROGRESS, MACHINE DATA.
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

Available from WRSIC, Springfield, Va. 22151 as PB-207 303 - Price $3.00 paper cover; $0.95 cents microfiche. Report REC-ERC-72-9, February 1972. 7 p.

Descriptors: *Tunnel construction, *Water conveyance, *Rock mechanics, *Tunneling machines, Methodology, Engineering structures, Hydraulic structures, Drilling, Reviews, Tunnel design, Colorado, New Mexico, Utah, Nevada.
Identifiers: Tunneling machine data.

Information on 7 machine-bored water tunnels constructed in Colorado, New Mexico, Utah, and Nevada by the Bureau of Reclamation is presented graphically and pictorially. Machine data, rates of progress, tunnel profiles, and rock types and strengths are given for each tunnel. The bored diameters of these tunnels vary from 9 to 20 ft. Rocks encountered in boring were shale, sandstone, siltstone rhyolite, and rhyodacite. The compressive strengths of these rocks were 1,400 to 17,000 psi. The boring rates of the machines used varied from 37 to 107 ft for the average calendar day. The maximum progress was 403 ft in one 3-shift day. This rate was attained in 17.3 hr of machine time while boring an 8 ft, 7 in. finished diameter tunnel through shale having a maximum compressive strength of 6,000 psi. Contract and miscellaneous data also are given for each of the tunnels. (Woodard-USGS)
W72-14960

8F. Concrete

INVESTIGATION OF CONCRETE AGGREGATES AND RIPRAP, KASKASKIA RIVER, ILLINOIS, NAVIGATION IMPROVEMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. J. Houston, and A. D. Buck.
Available from NTIS, Springfield, Va 22151 as AD-740 663, Price $3.00 paper copy; $0.95 microfiche. Army Engineer Waterways Experiment Station Miscellaneous Paper No 6-730, August 1965. 103 p, 2 tab.

Descriptors: *Hydraulic structures, *Navigable rivers, *Materials testing, *Aggregates, *Concrete mixes, *Illinois, *Riprap, Engineering structures, River training, Channel improvement, Analytical techniques, Evaluation.
Identifiers: *Kaskaskia River (Ill), Navigation improvement.

Properties of materials present in locally available sources of concrete aggregate and riprap were investigated for use in the Kaskaskia River, Illinois, Navigation Improvement project in the St. Louis District. The coarse aggregate and riprap materials were crushed limestone, and the fine aggregate was a natural sand which was deficient in the fine fractions. A supply of fine sand was used in making up the size deficiencies. Of the five coarse aggregate sources tested, four were considered as potential suppliers of both riprap stone and coarse aggregate. The other source was considered only as a supplier of riprap. None of the materials contain properties that render them unsuitable for the purposes for which they were tested. (Woodard-USGS)
W72-14616

8G. Materials

FIELD TESTS OF WATER PIPE LININGS: A SUMMARY OF 15TH-YEAR SHASTA AND 10TH-YEAR COLLBRAN PERFORMANCE,
Bureau of Reclamation, Denver, Colo.
J. L. Kiewit.
Bureau of Reclamation Report REC-ERC-72-1 Jan 1972. 72 p, 49 fig, 7 tab, 10 ref, append.

Descriptors: *Protective coatings, *Field tests, *Fresh water, *Test results, Coatings, Linings, Paints, Siphons, Laboratory tests, Performance tests, Screening, Erosion, Penstocks, Epoxy resins, Synthetic rubber, Steel pipes, Water analysis, Asphalts.

Identifiers: *Shasta Dam (Calif), Collbran Project (Colo), Neoprene, Southside Canal (Colo), Phenolic coatings, Immersion, Red lead, Coal-tar coatings, Vinyl-resin coatings, Coal-tar epoxy paints, Metal coatings.

Performance of lining systems for metalwork in continuous fresh water immersion is reported for 2 Reclamation field tests: a penstock at Shasta Dam, Calif (initiated 1949), and a siphon on the Collbran Project, Colo (initiated 1959). Of 26 initial linings, 1 phenolic, 2 red lead phenolic, and 2 vinyl resin linings gave excellent performance for 15 yrs at Shasta. Twenty-five of 36 linings in the Collbran siphon remain defect-free after 10 yrs of immersion. Only a liquid applied neoprene at Collbran was virtually unaffected by moderate sand erosion. Catalyzed phenolic paint, asphalt enamel, coal-tar enamel, and systems containing 13-16 mils of sprayed zinc metal appear suitable for mild erosion exposures. Collbran field lining performance correlated well with laboratory results, indicating the slightly more severe laboratory immersion test probably predicts paint performance accurately for waters naturally occurring at higher elevations. Paints VR-3 and VR-6 vinyl resin, CA-50 coal-tar, and coal-tar epoxy performed about the same in laboratory tests as on Bureau structures. (USBR)
W72-14245

HVDC INTERFERENCE ON MAJOR CANADIAN PIPELINE COUNTERACTED,
Trans Mountain Oil Pipe Line Co., Vancouver (British Columbia).
For primary bibliographic entry see Field 08C.
W72-14250

NEW FAST-DRILLING MUDS ALSO PROVIDE HOLE STABILITY,
National Lead Co., Houston, Tex. Baroid Div.
T. C. Mondshine.
Oil and Gas Journal, Vol. 65, p 84-89, March 1966. 2 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Rheology.
Identifiers: *Hole stability, Rig mechanics.

Industry mud engineers and researchers are developing low-solids drilling muds designed to speed penetration and provide hole stability. Many troublesome shales once thought to require high-solids muds are being drilled faster and at less cost with these water-base, low-solids muds. The following recent developments in mud technology have combined to put such fluid systems within practical reach: (1) Development of agents that control filtrate loss without detrimental increases in viscosity; (2) A better understanding of mud rheology, which, in many cases, permits improvement in cutting-lifting capacity without resorting to large amounts of clay and chemicals; (3) Big strides in solids control, including development of a new double-deck shale shaker; (4) A better understanding of shale chemistry. (Campbell-NWWA)
W72-14477

DRILLSTEM TESTER FREES STUCK PIPE,
Atlantic Refining Co., Casper, Wyo.
B. J. Sartain.
The Petroleum Engineer, p B-87, B-9, October, 1960. 2 fig.

Descriptors: *Rotary drilling, *Fishing, Drilling equipment.
Identifiers: *Differential pressure sticking, Drillstem test tool, Packer.

A pipe stuck by differential hydraulic pressure was released with a drillstem testing tool which might lead to a new hydraulic fishing tool. This tool accomplished in one run what $13,000 worth of conventional fishing equipment did not. Drillstem tester fishing string makes use of a hydraulic tester above the packer. When the packer is seated above the stuck pipe, the tester is opened, creating a pressure drop inside the borehole which releases the stuck pipe. (Campbell-NWWA)
W72-14486

WELL LOGS PREDICT DRILLABILITY, AID COMPUTERS,
California Univ., Berkeley.
W. H. Somerton, and S. El-Hadidi.
The Oil and Gas Journal, p 78-86, November, 1970. 6 fig, 1 tab, 15 ref.

Descriptors: *Drilling, *Optimization, Compressive strength.
Identifiers: *Sonic logs, *Transit time, *Drillability, Well logs, Rock properties.

Optimal scheduling of drilling operations and computerized drilling control require knowledge of the resistance of rock to drilling. The possible use of well-log data for the prediction of drillability can be considered. Sonic-log transit times correlate well with rock drillability, providing a mineralogical factor is taken into account. In optimization of drilling operations, several equations are required. Equations commonly used are: (a) drilling rate, (b) bit tooth wear, (c) bit bearing wear, and (d) the cost analysis of the entire process. (Campbell-NWWA)
W72-14487

WATER-SHUTOFF TECHNIQUES IN AIR OR GAS DRILLING,
Technical Drilling Service, Inc., Midland, Tex.
C. K. Sufall.
A.P.I, Drilling and Production Practice, p 74-77, 1960. 2 fig, 5 ref.

Descriptors: *Drilling, *Grouting, Resins, Gels.
Identifiers: *Air drilling, *Gas drilling, Permeable zones, Shutoff techniques.

Water-shutoff techniques have reached a point where they are generally accepted for field usage if economic gain can be realized. The success, both economical and that of shutting off permeable zones, is a tribute to the planning of a job and the fine work done by the research and service organizations. Several types of shutoff material are now readily available through the service companies as are the tools and techniques needed to complete a water-shutoff job. (Campbell-NWWA)
W72-14488

TESTING AND EVALUATING LOST CIRCULATION MATERIALS,
Oil Well Research, Inc., Los Angeles, Calif.
C. C. Wright.
Drilling Contractor, p 64, 84-97, September-October, 1963. 5 fig, 12 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Fractures (Geologic), Circulation.
Identifiers: *Lost circulation, *Mud losses, Cavernous formations, Vugs.

A lost circulation control program is aimed at drilling the well at minimum cost, both in time and materials. There are two basic approaches to lost circulation control: prevention and cure. Some limiting factors to be considered are bridging agents, cementing agents, gelling agents, oil soluble agents, mud compatibility, and testing gelling agents. (Campbell-NWWA)
W72-14490

ROTARY AIR-DRILLING OF PHOSPHATE DEPOSITS IN SOUTHEASTERN IDAHO,
Harris Drilling Co., Granger, Utah.
H. D. Harris.
In: Anatomy of the Western Phosphate Field, 15th Annual Field Conference, Intermountain Association of Geologists, Salt Lake City, Utah, p 167-171, 1967. 5 fig.

Descriptors: *Rotary drilling, *Phosphates, *Sampling, Drilling equipment, Core drilling, Exploration, Mineral industry, Idaho.
Identifiers: *Gas drilling, Down-hole percussion tool, Compressors, Truck-mounted rigs.

A rapid, low-cost method of obtaining samples for the evaluation of phosphate deposits in southeastern Idaho is provided by the use of a truck-mounted rotary drill rig utilizing compressed air as the circulating medium. The seismograph-type drilling rig commonly equipped for mud or air drilling is compact, fast, portable and is suited for operation in the rugged terrain in which the phosphate beds occur. Air-derived cuttings represent a complete and relatively uncontaminated sample of the drilled interval within certain limitations. (Campbell-NWWA)
W72-14492

A NEW INDEX FOR DETERMINING AMOUNT OF CALCIUM CARBONATE SCALE FORMED BY A WATER,
National Aluminate Corp., Chicago, Ill.
J. W. Ryznar.
Journal of the American Water Works Association, Vol. 36, No. 4, p 473-486, April, 1944. 4 fig, 3 tab, 10 ref.

Descriptors: *Piping systems (Mechanical), Hardness (Water), Corrosion, *Calcium carbonate, *Scaling, Inorganic compounds, Dissolved solids, Water chemistry, Hydrogen ion concentration, *Chemical precipitation.
Identifiers: Langelier Index.

The purpose of this investigation was to obtain a formula that will give a quantitative index of the amount of calcium carbonate scale that would be formed by water at any temperature up to 200 degree F; and to predict, if possible, the corrosiveness of waters that are non-scale forming. The Langelier Index is modified for more quantitative use. (Campbell-NWWA)
W72-14493

DOWN-THE-HOLE TV, THE GREATEST SHOW IN EARTH,
Inspectronic Corp., Long Island, N.Y.
D. P. Lloyd.
Ground Water Age, Vol. 8, No. 6, p 28-35, June, 1970.

Descriptors: *Water wells, Well screens, Well data, *Logging (Recording), Turbidity, *Electronic equipment, Cameras, Flocculation.
Identifiers: *Closed circuit TV, Videotape, Submersible pumps.

For many years, contractors from various industries, particularly the well drilling industry, have questioned the nature and quality of work in areas not accessible to man. Down-the-hole TV gives this opportunity. And it is fast becoming a more useful and important tool -- especially with the technological advancements of the electronics age. Its technical name is CCTV (Closed Circuit Television) but it's more popularly known as Down-the-hole TV. Its basic function is to record, for above-ground observers, the intricacies and problems which go along with bore holes, well screens, pumps, caissons, and sewers. The system is described in some detail. Advantages are emphasized. (Campbell-NWWA)
W72-14496

RATING PUMP PERFORMANCE BY CAPACITY,
Universal Oil Products, St. Paul, Minn. Johnson Div.

For primary bibliographic entry see Field 08C.
W72-14497

INDUCTION-TUNED METHOD TO DETERMINE CASING LENGTHS IN HYDROGEOLOGIC INVESTIGATIONS,
Pennsylvania State Univ., Middletown, Pa. Capitol Campus.
For primary bibliographic entry see Field 08B.
W72-14501

SUPPLEMENTING SAMPLE LOGS,
V. B. Carter.
Ground Water, Vol 4, No 3, p 49-51, July, 1966.

Descriptors: *Logging (Recording), *Water wells, *Drilling, Water quality, Saline water, Aquifer characteristics, *Conductivity.
Identifiers: Temperature survey, *Sample logs, Brown water.

In the past 20 years there has been a substantial increase in the application of electric well logging to water wells. In the early days, there were very few wells being logged, principally city supply wells and other larger commercial wells. Now, it is not uncommon to be called to service water wells of all sizes, even the small back yard well. The well drilling industry is becoming more and more aware of the benefits that can be derived from use of the electric log, and there will almost certainly be an increase along these lines in the years ahead. There are some good reasons for this growth and acceptance of the electric log, and pointing out some of these reasons and applications of the electric logs to water well drilling is the purpose of this paper. (Campbell-NWWA)
W72-14505

RECENT DEVELOPMENTS IN THERMOPLASTIC PIPING,
Plastic Pipe Inst., Silver Spring, Md.
F. W. Reinhart.
Journal of the American Water Works Association, Vol 60, No 12, p 1404-1410, December, 1968.

Descriptors: *Plastic pipes, *Standards, Polymers, *Materials testing, Hydrostatic pressure, Design standards.
Identifiers: *Water piping, *Polyvinyl chloride pipes, *Thermoplastics.

The increase in quality of thermoplastic pipe and fittings has been due to: (1) improved extrusion and molding machinery and techniques used to form plastic pipe and fittings, (2) improvements in thermoplastic piping materials, (3) policies and procedures used to develop recommended hydrostatic design stresses, (4) the National Sanitation Foundation (NSF) inspection and certification programs, and (5) the increase in quality and quantity of the standards for plastic piping. The total effect of these developments has resulted in higher quality pipe and fittings, lower costs, increased confidence on the part of users and engineers and improved performance. (Campbell-NWWA)
W72-14511

WELL PERFORMANCE SHOWN BY SIMPLE TEST,
Johnson (Edward E.) Inc., St. Paul, Minn.
J. L. Mogg.
Johnson Driller's Journal, Vol 34, No 3, p 1-3, May-June, 1962. 2 fig, 1 tab.

Descriptors: *Testing procedures, *Water wells, Transmissivity, Permeability, Specific capacity, Well screens, *Aquifer characteristics.
Identifiers: *Well development, Backwashing, Surging.

A 'water input test' to check development work is described. The test is performed by filling the well casing with water, then noting the rate at which the water level drops. Charts are included for illustration. (Campbell-NWWA)
W72-14514

GRAPHICAL METHOD FOR DETERMINING COEFFICIENT OF TRANSMISSIBILITY,
Illinois State Water Survey, Urbana.
S. C. Csallany.
Journal of the American Water Works Association, Vol 58, No 5, p 628-634, May, 1966. 3 fig, 1 tab, 6 ref.

Descriptors: *Water wells, Hydraulic gradient, *Graphical analysis, Drawdown, *Pumping testing, Aquifer testing, Aquifer characteristics.
Identifiers: *Well yield, *Transmissibility, Numerical solutions, Graphic solutions.

This method attempts to determine accurately the coefficient of transmissibility from specific capacity data. Specific limitations are noted on the use of the graphs. (Campbell-NWWA)
W72-14516

TECHNIQUES OF EVALUATING EFFECTS OF WATER ON DRAINAGE STRUCTURES IN ALABAMA,
Geological Survey of Alabama, Montgomery. Water Resources Div.
J. S. Ellard.
Circular 75, 1971. 14 p, 1 plate, 3 fig, 1 tab, 7 ref.

Descriptors: *Drains, *Steel pipes, *Hydraulic structures, *Durability, *Corrosion, Regression analysis, Least squares method, Water chemistry, Water properties, Water types, Dissolved oxygen, Hydrogen ion concentration, Resistivity, *Alabama, Evaluation, Analytical techniques.

Field inspection and classification of galvanized steel culverts in Alabama was based on an empirical evaluation of existing corrosion and structural conditions. These two conditions were used as the basis of organizing the field data for analysis. Two methods of regressional analysis were used in predicting 'years to perforation' of galvanized steel culverts. One method uses three variables; pH, resistivity, and dissolved oxygen characteristics of the water passing through individual culverts. Resistivity values in excess of 15,000 ohm/cm and dissolved oxygen values less than 4.5 ppm (parts per million) are values synonymous to a passive corrosion condition. Waters with resistivities less than 15,000 ohm/cm and dissolved oxygen values greater than 4.5 ppm appear to be corrosive. A second regressional analysis using the method of least squares involved only pH. 'Years to perforation' predictions from both methods were found to be similar. (Woodard-USGS)
W72-14522

DRAINAGE PIPE STUDY,
Louisiana Dept. of Highways. Research and Development Section.
For primary bibliographic entry see Field 08D.
W72-14612

INVESTIGATION OF CONCRETE AGGREGATES AND RIPRAP, KASKASKIA RIVER, ILLINOIS, NAVIGATION IMPROVEMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08F.
W72-14616

FIELD INVESTIGATION OF SELECTED FOUNDATION PIEZOMETERS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. R. Furlow.
Available from NTIS, Springfield, Va 22151 as AD-735 702. Price $3.00 paper copy; $0.95 microfiche. Miscellaneous Paper S-69-31, July 1969. 20 p, 23 fig, 4 tab, 2 append.

Descriptors: *Piezometers, *Testing, *Analytical techniques, Instrumentation, On-site tests, Investigations, Mississippi, Correlation analysis, Variability.
Identifiers: *Instrument performance.

The behavior and relative merits of several types of piezometers were studied through field installation procedures and observational data. Selected piezometers were installed at three sites with different piezometric conditions in the vicinity of Vicksburg, Miss. Descriptions of selected piezometers, installation procedures, and observational data for periods ranging from 6 months to 1 year duration after installation are included. The facility of installation and observation was approximately equal for all piezometers tested. The instruments included open standpipe, hydraulic, and diaphragm piezometers. (Woodard-USGS)
W72-14738

WELL LOG APPLICATIONS IN COAL MINING AND ROCK MECHANICS,
Schlumberger Well Services, Evansville, Ind.
For primary bibliographic entry see Field 08D.
W72-14831

LABORATORY DRILLING PERFORMANCE OF THE FULL-SCALE ROCK BIT,
Jersey Production Research Co., Tulsa, Okla.
D. S. Rowley, R. J. Howe, and F. H. Deily.
Transactions, Society of Petroleum Engineers, AIME, p 71-81, 1961. 12 fig, 6 tab, 24 ref.

Descriptors: *Rotary drilling, *Laboratory tests, Permeability, Drilling equipment, Rock mechanics, Drilling fluids.
Identifiers: Formation hardness, *Drilling rate.

Laboratory drilling tests with hard-formation rock bits were made under rock and borehole fluid pressures simulating a 3,000-ft. borehole. The effects of bit weight and rotary speed on drilling rate and bit rotary power were determined in a hard, impermeable dolomite. With added bit weight, the drilling rate and rotary power both increased at an increasing rate; but with added rotary speed, the rate and power both increased at a decreasing rate. The rock volume removed per unit of energy increased as weight was raised or as rotary speed was reduced. Empirical quadratic equations for drilling rate and rotary power were obtained, and bit mechanical efficiency was calculated. (Campbell-NWWA)
W72-14833

CORROSION POTENTIAL OF NTA IN DETERGENT FORMULATIONS.
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05G.
W72-14851

EFFECTIVE USE OF TV SEWER INSPECTION AND SEALING,
Halliburton Co., Duncan, Okla.
T. Lenahan, and J. Herndon.
Public Works, Vol 103, No 7, p 74-76, July 1972. 5 photo, 1 fig, 1 tab, 3 ref.

Descriptors: *Sewers, *Inspection, *Grouting, City planning, Long-term planning, Costs, Management, Maintenance, Leakage.
Identifiers: *Television, *Sealing, Savings.

The use of TV for troubleshooting in sewer lines plagued with complaint calls and line stoppages has become common practice. Problem analysis is keyed by this inspection tool. Users of TV systems

have saved significant amounts of time, labor, and money. In some cases, TV inspection of older lines has resulted in extensive savings on planned rehabilitation programs. The major components of a television inspection system are: camera, mounting skids, light source, cable and reel, measuring device, pulling unit, control unit, and monitor. To operate the system it is necessary to insert a small steel cable through the sewer line between two manholes to pull the camera through the line. The camera, complete with light and mounted on skid runners, is connected to the towing cable, a back-up cable, and the TV cable. A grouting system is intended to be used in conjunction with the TV system. It enables the operator to isolate revealed leaks with an air-inflated packer. The leak can be grouted without excavation, with chemical grouting operations performed remotely from the surface. Many municipalities are finding that a real source of savings in the operation of their collection systems is the TV inspection of new lines as they are installed. By using the TV system to inspect an operating line, many problems can immediately be found and a decision for remedial action can then be based on known considerations. The use of television on a regularly scheduled daily basis provides a means for updating or verifying existing sewer maps or plates to show locations of manholes, service connections, or line size variations, as well as locating line sags, infiltration, or broken pipe. (Strachan-Chicago)
W72-14898

8H. Rapid Excavation

THE ELECTROHYDRAULIC EFFECT: POTENTIAL FOR ROCK DRILLING.
For primary bibliographic entry see Field 08E.
W72-14830

8I. Fisheries Engineering

NOTES ON BIOLOGICAL CHARACTERISTICS AND MIGRATION OF THE MASU SALMON. ONCORHYNCHUS MASOU (BREVOOT), IN THE OFFSHORE AREAS OF THE WEST COAST OF KAMCHATKA PENINSULA, (IN JAPANESE),
North Pacific Fisheries Inst., Sapporo (Japan).
K. Shimazaki.
Bull Fac Fish Hokkaido Univ., Vol 22, No 1, p 37-45. 1971. Illus. Maps. English summary.
Identifiers: *Fish physiology, *Fish migration, Oncorhynchus masou, Kamchatka, Peninsula, *Salmon, USSR.

Information obtained from the measurement of the biological characteristics of the samples from 1968 to 1970 and from the migration of the masu salmon is presented. Masu salmon concentrate in the waters south of 53 degree N. The center of distribution was located off the west coast of Kamchatka Peninsula. The average of catch per unit of effort declined rather markedly from the maximum recorded in early June. The average fork length was approximately 45 to 46 cm. No significant difference was found between the fork lengths of males and females. The fork length of the males showed greater variation than those of the females. The proportion of females was 62.4% (58.6-68.3%). The maturity indices (ratio of gonad weight to body weight) were 6 to 7% (90-110 g) for females and about 2% (25-40 g) for males. It may be considered that the natal streams of the masu salmon in this area are located along the west coast of the Kamchatka (from the Bolishaya River to the Icha River). In this area hooks used for the long-line were found in the mouth of some of the masu salmon. These were apparently the same kind of hooks as used only in the Japan Sea south of Hokkaido. These data indicate that the masu salmon in the west coast of the Kamchatka migrate from the Japan Sea.--Copyright 1972, Biological Abstracts, Inc.
W72-14295

SEXUAL MATURATION AND REMATURATION TIMES IN THE SPRING-SPAWNING VOLGA-CASPIAN STURGEON, ACIPENSER GUELDENSTAEDTI BRANDT,
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Saratov (USSR).
V. I. Shilov, Y. K. Khazov, and N. K. Ivoilova.
Identifiers: Acipenser guldenstadti, *Sexual maturation, Spawning, Spring, *Sturgeon, USSR, *Volga-Caspia sturgeon.

Studies on sexual maturation and times of repeated maturation were conducted on A. guldenstadti in the Volgograd Reservoir from 1960-1969. Evaluation of the cross-section of the first ray of the thoracic fin permitted determination of the number of secual maturations in 65% of the spawning sturgeons. Sexual maturation in the males is first achieved when they reach a length of 80-130 cm at the age of 10-31 yr, and in the female when they are 11-35 yr old and 90-125 cm in length. Repeated sexual maturation in the males is observed every 4 to 14 yr, and in the females every 5-14 yr. Such observations agreed well with studies on labeled sturgeons kept in reservoirs after spawning, in which the mean time for repeated maturation of the gonads was 5 yr for the males and 7 yr for the females.--Copyright 1972, Biological Abstracts, Inc.
W72-14530

A FISHERY PROJECT IN LAKE VICTORIA, NYANZA,
Swedish Natural Science Research Council, Stockholm.
E. Bergstrans.
Zool Revy. Vol 33, No 1/2. p 3-16. 1971. Illus. English summary.
Identifiers: Bagrus, Clarias, *Fishery management, Haplochromis, Kenya, *Lake Victoria, Nyanza, Protopterus, *Tilapia.

A short description is given of the lake, the economically most important fishes, Haplochromis, Tilapia, Bagrus, Clarias, Protopterus and the development of the fishing industry from 1900. The FAO-project, Lake Victoria fisheries Research Project, started in 1957. To study the state of the Tilapia-fishery, investigations were made in the fishing camps around Buvuma Island concerning the catch, effort and catch per effort of Tilapia spp. The results showed that catch per net-night decreased from 2 Tilapia in 1957 to 0.1 Tilapia in 1969 while effort had increased from 46,000 netnights/mo. in 1957 to 70,000 in 1969. The situation was similar in Nyanza Gulf, Kenya, while in Tanzania the catches in some places were good. To study the fish stocks in deeper waters a lakewide survey was made, using bottom-trawl. The catches of Haplochromis in the trawl were high enough to justify a future trawl-fishery in Lake Nyanza. The most important problem of the fishermen is the decreasing catch of Tilapia. If the distribution of the fishermen was more even and they also caught other species, the situation could be improved. However, no regulations made by the fishery department will be of any effect if department personnel do not establish close contacts and educate the fishermen.--Copyright 1972, Biological Abstracts, Inc.
W72-14587

SIZE RELATIONSHIP BETWEEN SALMON JUVENILES IN SHORE WATERS AND THEIR PREY ANIMALS,
Hokkaido Univ., Sapporo (Japan). Faculty of Fisheries.
Shun Okada, and Akira Taniguchi.
Bull Fac Fish Hokkaido Univ., Vol 22, No 1, p 30-36. 1971. Illus. Maps.
Identifiers: Copepods, Decapods, Euphausiids, *Juveniles, Oncorhynchus-Gorbuscha, Oncorhynchus-Keta, Parathemisto-Japonica, *Salmon, *Predator-prey relationship.

The stomach contents of 94 chum and 43 pink juvenile salmon, Oncorhynchus keta and O. gorbuscha sampled by the trap set-nets in the shore waters near Mori and Usujiri, southern Hokkaido, during the period from May 28-June 13, 1970 were examined. Small-size prey animals such as microcopepods, young Parathemisto spp., decapods zoea and insects were the food for juveniles smaller than 55 mm in fork length and large-size prey animals such as adults of P. japonica and euphausiids for juveniles larger than 55 mm. The body width of the largest prey animals eaten by various size juveniles (36-104 mm in fork length) ranged from 0.5 mm-3.8 mm. The size of the largest food eaten by juveniles changed rapidly from a small-size group to a large-size group when the predators attained to about 55 mm in fork length. Pre- or post-larvae of 1 sp. of pricklebacks also seemed to be important prey for both small and large juveniles in shore waters.--Copyright 1972, Biological Abstracts, Inc.
W72-14642

NATURAL REPRODUCTIVE CONDITIONS OF THE PIKE-PERCH (LUCIOPERCA LUCIOPERCA) IN THE PSKOV-CHUD WATERS,
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
I. T. Negonovskaya.
Vopr Ishtiol. Vol 11, No 4, p 740-744. 1971. Illus. Map.
Identifiers: Lucioperca lucioperca, *Perches, *Pike-perch, *Pskov-Chud, Fish reproduction, USSR.

The relatively low population of L. lucioperca in the Pskov-Chud waters has been attributed in the past to inadequate spawning grounds. Studies conducted in 1967 showed that, in fact, the spawning ground was quite adequate and that the low population was due to consumption of pike-perch larva and young by perch and, to a lesser degree, striped perch. Since the pike-perch young left the banks early in their development and moved into the more central portions of the lakes, they became easy prey for the perch and the striped perch.--Copyright 1972, Biological Abstracts, Inc.
W72-14645

EFFECT OF TEMPERATURE ON THE BODY FORM AND MORTALITY IN THE DEVELOPMENTAL AND EARLY LARVAL STAGES OF THE ALASKA POLLACK, THERAGRA CHALCOGRAMMA (PALLAS),
Hokkaido Univ., Sapporo (Japan). Faculty of Fisheries.
Ikuso Hamai, Kenichiro Kyushin, and TetsuichiroKinoshita.
Bull Fac Fish Hokkaido Univ. Vol 22, No 1, p 11-29. 1971. Illus.
Identifiers: *Alaska pollack, Artemia-Salina, *Water temperature, Larvae, *Mortality, Nitzschia-Closterium, Pollack, Theragra-Chalcogramma.

Fertilized eggs were incubated and hatched larvae were reared at 3 constant water temperatures of 10 degree, 6 degree and 2 degree C in circulating or still water conditions. The larvae were fed with Artemia salina nauplii and Nitzschia closterium. The rate of the embroyonic development was higher temperature. Incubation time required from fertilization to 50% hatching ranged from 10 days at 10 degree C to 24.5-27.4 days at 2 degree C. Percentage of hatching was as high as 83-94% at 2 degree C and was lower in the higher temperatures. The average body length of the newly hatched larvae was about 4.60-4.72 mm. Growth was better at a higher temperature. High temperatures operated on the auditory vesicle to make its diameter larger in the larval stage, but no signifi-

cant influence of temperature upon the development of the eye was observed throughout the embryonic and larval stages. Survivals were better at a lower temperature. The survival rate during the yolk absorption period ranged from 20% at 10 degree C to 59% at 2 degree C. No contribution from N. closterium as food for the larval survival was recognized. The effect of chloromycetin on increasing the survival rate in the larval stage was confirmed.--Copyright 1972, Biological Abstracts, Inc.
W72-14685

PERCEPTION OF POLARIZED LIGHT BY YEARLING SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Saint Francis Xavier Univ., Antigonish (Nova Scotia). Dept. of Biology.
P. A. Dill.
J Fish Res Board Can. Vol 28, No 9, p 1319-1322. 1971. Illus.
Identifiers: *Fish physiology, *Fish migration, *Light, Oncorhynchus nerka, Perception, *Salmon.

Food-conditioning experiments conducted in the laboratory demonstrated that groups of yearling O. nerka can discriminate between vertical and horizontal planes of linearly polarized light. Removal of the adipose eyelid, a possible analyser of polarized light, did not abolish the response. The findings support the hypothesis that these fish can use polarization patterns for orientation during their seaward migration.--Copyright 1972, Biological Abstracts, Inc.
W72-14689

THE VOLGA DAM AND THE STURGEON FISHES (IN RUSSIAN),
A. V. Pavlov.
Vopr Ikhtiol. Vol 11, No 4, p 643-649. 1971.
Identifiers: *Fish management, Dams, Fish, *Sturgeon, USSR, *Volga River.

The diversion of water into Astrakhan region by a dam in the upper reaches of the Volga will have an adverse effect on the sturgeon fishes, since a large portion of the spawning fishes shall be retained in the lower waters. Consequently, special locks shall have to be provided to permit the fish to migrate and, to compensate for the loss in fish, 1 or 2 fish breeding stations should be set up in the region of the dam and the young should be released into the eastern part of the Volga delta.--Copyright 1972, Biological Abstracts, Inc.
W72-14739

ECOLOGY, STRUCTURE AND POPULATION MODELS OF THE SOUTH KURILE CHUM SALMON ONCORHYNCHUS KETA (WALB.), (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
V. N. Ivankov, and V. L. Andreev.
Vopr Ikhtiol, Vol 11, No 4, p 615-629, 1971, Illus.
Identifiers: Ecology, South Kurile Islands, Oncorhynchus keta, Fish populations, *Salmon, Spawning, USSR, *Fish reproduction, *Fish migration.

Studies conducted from 1956-1967 on the chum salmon in the South Kurile islands showed that O. keta undergoes spawning migration late in the year (Sept.-Dec.). The high rate of growth of this species resulted in large specimens (72.3 cm long and 4.04 kg in weight). With respect to age, the population of the South Kurile salmon was similar to that found in the Andyr and Yukon rivers; of the total population, 16.7% were 3 yr old, 56.4% were 4 yr old, 26.5% were 5 yr old, and 0.2% were 6 yr old. Despite the large sizes and the rapid growth rate, the female carries only 2557 eggs which are in the fourth stage of development at the time of migration. Spawning is most intense in Nov. with water temperatures around 5-6 deg C. During the incubation time approximately 54% of the eggs and embryos perish.--Copyright 1972, Biological Abstracts, Inc.
W72-14758

GROWTH, MATURATION AND FECUNDITY OF THE SAKHALIN ISLAND RIVER CHAR (SALVELINUS ALPINUS), (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
O. F. Gritsenko.
Vopr Ikhtiol. Vol 11, No 4, p 664-677. 1971. Illus.
Identifiers: *Trout, Fish populations, Char, Fecundity, *Growth rates, Maturation, *Salmon, *Sakhalin Island, Salvelinus alpinus, USSR.

Growth, maturation and fecundity of the char (Salvelinus alpinus) in the rivers of Sakhalin Island were investigated in view of the decrease in the numbers of Pacific salmon (genus Oncorhynchus) whose larva and young serve as food for char. The studies were conducted from Aug. 1961 to Oct. 1966. The results showed that the rate of growth, maturity and fecundity was greater in the rivers well supplied with a population of salmon. In general, the river char was similar in its characteristics to the migratory char. The char encountered in the rivers of Sakhalin Island show the highest fecundity due to the abundance of salmon young and larva which provide adequate food during its relatively short life span and thereby assures more rapid maturation and more frequently repeated spawning.--Copyright 1972, Biological Abstracts, Inc.
W72-14767

CHENA RIVER LAKES FLOOD CONTROL PROJECT, FAIRBANKS, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 08D.
W72-14932

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WASHINGTON STATE'S WATER,
Washington State Water Research Center, Pullman.
D. C. Flaherty.
1971. 45 P, 12 REF.

Descriptors: *Water resources development, *Hydrology, *Washington, *Projects, *Publications, Reviews, Groundwater, Surfaces, Water demand, Water utilization, Water pollution, Water balance, Evapotranspiration, Trees.

The hydrologic work that was completed in the State of Washington during the 1971 fiscal year and some work that was in progress after June 30, 1971 are described. Reports are included that were made during that period or have been published since. These reports are: If the Pump Runs Dry; Basic Studies; As the River Goes, Parking Lots and Forests; The Lake Wreckers; Do Trees Waste Water; Early Warning of Ground-water pollution; What Price Water; Models and Water Quality; and The Public and Water Planning. (Woodard-USGS)
W72-14618

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

INFORMATION SOURCES ON WATER QUALITY INCLUDING THERMAL POLLUTION.
For primary bibliographic entry see Field 05G.
W72-14406

10C. Secondary Publication AND Distribution

DDT IN WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W72-14431

COMPOSITION OF FLUID INCLUSIONS,
Geological Survey, Washington, D.C. Geologic Div.
For primary bibliographic entry see Field 02K.
W72-14519

ANNOTATED BIBLIOGRAPHY ON GREAT LAKES HYDROLOGY,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02H.
W72-14681

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

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3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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